Final Integrated Natural Resources Management Plan for Naval Base Ventura County Point Mugu and Special Areas

December 2013

FINAL

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NAVAL BASE VENTURA COUNTY POINT MUGU AND SPECIAL AREAS, CALIFORNIA

December 2013

Prepared for:



Navy Region Southwest Naval Base Ventura County Point Mugu and Special Areas Environmental Division

Under Contract with:

Naval Facilities Engineering Command, Southwest Coastal Integrated Products Team 2739 McKean St. Bldg. 291 San Diego, CA 92101 **Contract No: N62470-08-D-1008 FZN9**

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INRMP ACCEPTANCE PAGE

This Integrated Natural Resource Management Plan (INRMP) (December 20B) has been prepared in accordance with regulations, standards and procedures of the Sikes Act, as amended (16 United Sates Code [U.S.C.] 670a *et seq.*), U.S. Department of Defense Instruction 4715.03, Chief of Naval Operations Instruction (OPNAVINST) 5090.1 C CH-I, *Environmental Readiness Program Manual*, and in cooperation with the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, and the National Oceanic and Atmospheric Administration National Marine Fisheries Service. This INRMP provides for the management and stewardship of all natural resources present on Naval Base Ventura County Point Mugu and Special Areas.

U.S. Navy Approving Officials:

Captain Lawrence Vasquez Installation Commanding Officer Naval Base Ventura County Point Mugu, California

Mr. Daniel T. Shide Installation Environmental Program Director Naval Base Ventura County Point Mugu, California

Mr. Douglas Powers Natural Resources Program Manager (EV51) San Diego, California

4/10/14

Date

4/3/14

Date

03 APR 20/2

Date

Approval1

INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN NAVAL BASE VENTURA COUNTY POINT MUGU AND SPECIAL AREAS, CALIFORNIA

APPROVAL

Through a Tripartite Agreement signed January 2006, the Department of Defense, U.S. Department of Interior, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife, have a statutory obligation to coordinate preparing, reviewing and implementing Integrated Natural Resource Management Plans (INRMP). The U.S. Fish and Wildlife Service has participated in the revision of this INRMP, in accordance with the Sikes Act (16 U.S.C. 670a *et seq.*) as amended.

Concurring Agency-U.S. Fish and Wildlife Service

Stephen P. Henry Field Supervisor U.S. Fish and Wildlife Service Ventura, California

Date

INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN NAVAL BASE VENTURA COUNTY POINT MUGU. CALIFORNIA

Based on a review of the NBVC Point Mugu INRMP and in consideration of the effects of that plan on NOAA trust resources, the National Marine Fisheries Service recommends that the Navy continue to implement the INRMP through 2014.

Our recommendation shall not be interpreted as an automatic preclusion of NBVC Point Mugu lands or marine habitats from consideration for designation as critical habitat under the ESA. Any such preclusion would be considered during the regulatory processes associated with the designation of critical habitat.

William W. Stelle, Jr.

b. 20,2014

William W. Stelle, Jr. Regional Administrator West Coast Region National Marine Fisheries Service

INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN NAVAL BASE VENTURA COUNTY POINT MUGU AND SPECIAL AREAS, CALIFORNIA

APPROVAL

Through a Tripartite Agreement (herein referred to as a Memorandum of Understanding [MOU]) signed January 2006, the Department of Defense, U.S. Department of Interior, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife, have a statutory obligation to coordinate preparing, reviewing and implementing INRMPs. The California Department of Fish and Wildlife, as the designated state wildlife agency has participated in the revision of this INRMP, in accordance with the Sikes Act (16 U.S.C. 670a *et seq.*) as amended.

Concurring Agency-California Department of Fish and Wildlife

6-2-14

Date

Edmund Pert Regional Manager South Coast Region California Department of Fish and Wildlife San Diego, California

An Integrated Natural Resources Management Plan (INRMP) is a long-term planning document to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. The Sikes Act, as amended, requires the U.S. Department of Defense (DoD) to prepare and implement an INRMP for each installation that contains significant natural resources. The U.S. Navy (Navy) is required to ensure ecosystem management is the basis for all management of its lands (Sikes Act, as amended [16 United States Code {U.S.C.} 670a]; DoD Instruction 4715.03). This INRMP provides an adaptive ecosystem-based natural resources program that efficiently supports the DoD mission and provides for the sustainability of installation lands. This INRMP will help installation commanders effectively manage natural resources to ensure the sustainability of all ecosystems within the installation; ensure no net loss of the capability of installation lands to support the DoD mission; conserve and rehabilitate natural resources on military installations; sustain multipurpose use of the resources and public access to military installations to facilitate the use of those resources; participate as appropriate, in regional ecosystem initiatives; and demonstrate conservation benefits for species listed under the Endangered Species Act.

The Naval Base Ventura County (NBVC) Point Mugu and Special Areas INRMP includes all lands owned, leased, withdrawn, or otherwise used for military training by Naval Base Ventura County, with the exception of NBVC San Nicolas Island and NBVC Port Hueneme. Though still under the responsibility of the NBVC commanding officer, San Nicolas Island and Port Hueneme installations are covered under separate INRMPs (Table ES-1). This INRMP addresses terrestrial and aquatic natural resources at NBVC Point Mugu and Special Areas. Submerged lands and resources up to 3 nautical miles out from Point Mugu (mean lower low water line) and 0.25 nautical mile out from Channel Islands Special Areas (San Miguel and Prince Islands) coastline are to be discussed and considered under this INRMP. Navy facilities on Santa Cruz Island and Santa Rosa Island are in upland habitat, with no activities occurring on the coastline.

This document is the first formal revision of the 2002 NBVC Point Mugu INRMP (Tetra Tech 2002) and follows updated DoD and Navy INRMP guidelines. This revision was undertaken to update the resource goals and objectives of NBVC Point Mugu and includes the addition of NBVC Special Areas (Table ES-1). Additionally, the 2013 NBVC Point Mugu and Special Areas INRMP incorporates changes in federal regulations and associated habitat conservation provisions, and updates natural resources information, such as new observations of species listed under the Endangered Species Act (tidewater goby [*Eucyclogobius newberry*]and least Bell's vireo [*Vireo bellii pusillus*]).

NBVC Facility Name	Acreage	Addressed in This INRMP
Point Mugu ¹	4474.0	Yes
Port Hueneme ²	1610.2	No
San Nicolas Island ²	17428.0	No
NBVC Special Areas		
Laguna Peak	39.0	Yes
Santa Cruz Island ³	7.9	Yes
Santa Rosa Island ⁴	0.01	Yes
Prince Island ⁵	37.9	Yes
San Miguel Island ⁵	9533.3	Yes
Fort Hunter Liggett Blackjack	7.2	Yes
Fort Hunter Liggett Vehicle Maintenance Yard (Old Tech)	2.6	Yes
Fort Hunter Liggett Hunting Lodge (Recreation Center)	1.2	Yes
Camarillo Housing-Catalina Heights	52.3	No*
Camarillo Airport	4.34	No*
Santa Ynez Peak ³	58.0	No*
Tassajara Peak ³	0.04	No*
Red Mountain ³	0.04	No*

Note: 1= A portion of this property is under a Memorandum of Agreement with the National Park Service.

2= This property is covered under a separate INRMP.

3= This property is leased by the Navy.

4= Navy use of this property is via an in-grant permit from the National Park Service.

5= This property is under a Memorandum of Agreement with the National Park Service.

*= There are no significant biological resources within the NBVC area of responsibility. Under the Sikes Act, INRMPs are to address installations with significant biological resources.

The National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136) amended the Endangered Species Act (7 U.S.C. §136, 16 U.S.C. §1531 *et seq.*) to limit areas eligible for designation as critical habitat. Specifically, Section 4(a)(3)(B)(i) of the Endangered Species Act (16 U.S.C. 1533[a][3][B][i]) now provides: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an Integrated Natural Resources Management Plan prepared under Section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." The benefits provided by this INRMP for each federally listed species at NBVC Point Mugu are addressed in Appendix F (INRMP Benefits for Threatened and Endangered Species). Federally listed species known to occur at NBVC Point Mugu are listed in Table ES-2. No special status species occur on Navy properties at Fort Hunter Liggett. In the event that they occur on Navy property, NBVC Environmental Division would coordinate with the U.S. Army and the U.S. Fish and Wildlife Service to ensure no impacts to listed species occurred. Additionally, this INRMP would be updated to include management provisions for those species (Section 5.5). Federally listed and special status species that occur at NBVC Channel Islands Special Areas are not managed by the Navy, under the Memorandum of Agreement in Appendix P. For a complete list of special status species that occur at NBVC Point Mugu and Special Areas, see Appendix G.

Family Name	Scientific Name	Common Name	Conservation Status
VEGETATION			
Orobanchaceae	Chloropyron maritimum subsp. maritimum	Salt marsh bird's-beak	FE,SE
FISH			
Gobiiadae	Eucyclogobius newberryi	Tidewater goby	FE
BIRDS			
Rallidae	Rallus longirostris levipes	Light-footed clapper rail	FE, SE
Laridae	Sterna antillarum browni*	California least tern	FE, SE
Charadriidae	Charadrius nivosus nivosus	Western snowy plover	FT
Vireonidae	Vireo bellii pusillus	Least Bell's vireo	FE, SE

Notes: * = Current name: Sternula antillarum browni (accepted by American Ornithological Union in 2006)

FE = Federally Endangered FT = Federally Threatened

FI = Federally Threaten SE= State Endangered

SE= State Endangered ST= State Threatened

The 2013 NBVC Point Mugu and Special Areas INRMP establishes planning and management strategies; identifies natural resources constraints and opportunities; supports the resolution of land use conflicts; provides baseline descriptions of natural resources necessary for development of conservation strategies and environmental assessment; serves as the principal information source for the preparation of future environmental documents for proposed actions at NBVC Point Mugu and Special Areas; and provides guidance for annual natural resources management reviews, internal compliance audits, and annual budget submittals. The INRMP fully integrates and coordinates the natural resources program with other NBVC plans and activities. Throughout the development of this INRMP, management concerns were identified in a number of natural resource areas. Some of these natural resources concerns could have an impact on the NBVC mission or future planning operations. This INRMP addresses realistic, workable solutions (presented herein as strategies) for each concern, through the identification of goals and objectives. The recommendations presented herein are balanced with the requirements of NBVC to accomplish its mission with the highest efficiency and are discussed in detail in Sections 3 through 6. Appendix C provides a list of projects to be implemented based on the discussions in those chapters.

Natural resources constraints and opportunities are presented in Figure 2-3 for Point Mugu, and detailed in Section 2.2.5 and Section 2.2.6 for NBVC Channel Islands Special Areas, and Section 2.3.5 and 2.3.6 for NBVC Fort Hunter Liggett Special Area. The Navy defines constraints or encroachment primarily as any action planned or executed that inhibits, curtails, or has the potential to impede the performance of Navy activities. Encroachment challenges can include urban development; environmental constraints such as water quality or endangered species; population growth; competition for air, land, and sea space; competition for resources such as potable and irrigation water; and safety arcs and footprints (Onyx Group 2006). Opportunities are areas on an installation where there is little to no restriction on training. Opportunities may include potential buffer areas and corridors, and encroachment partnering areas.

This INRMP was prepared and organized in accordance with the Sikes Act, as amended, DoD Instruction 4715.03 *Natural Resources Conservation Program*, Chief of Naval Operations Instruction 5090.1C CH-1 *Environmental Readiness Program Manual*, and the most recent series of DoD, U.S. Fish and Wildlife Service, and Navy guidance on the Sikes Act and INRMPs (DoD 2010, 2011; Navy 2006). Numerous Navy personnel, tenants, and related organizations, as well as federal, state, and city representatives and other external organizations, were invited to participate in development and review of this document (Section 7.1.1 INRMP Implementation and Responsibilities). The U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife (formerly California Department of Fish and Game), and the National Oceanic and Atmospheric Administration/National Marine Fisheries Service have reviewed and signed this INRMP, indicating their mutual agreement with the Commanding Officer regarding natural resources management at NBVC Point Mugu and Special Areas. In addition, the public was invited to review the document through the National Environmental Protection Act process (Navy 2013a).

To fulfill the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), and in accordance with Chief of Naval Operation guidance (DoD 2010), an Environmental Assessment has been prepared to analyze potential effects of implementing this INRMP (Appendix M). The Navy will implement recommendations in this INRMP within the framework of regulatory compliance, Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be, nor must be, construed to be a violation of the Anti-Deficiency Act (31 U.S.C. 1341 et.seq.).

NBVC Point Mugu and Special Areas installations are achieving a no net loss of training lands or reduction in operational flexibility and growth through implementation of this INRMP. The implementation of the natural resources management strategies presented herein will support current and future training and facilities projects. Similar to NBVC's 2002 INRMP (Tetra Tech 2002), all projects and actions included in this INRMP to manage listed and sensitive species, flora, and fauna are compatible with NBVC's current mission requirements and should allow for any new operations that are compatible with NBVC's mission, without additional encumbrances.

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1.0 INTRODUCTION

1.1 PURPOSE OF THE PLAN

An Integrated Natural Resources Management Plan (INRMP) is a long-term planning document to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. The Sikes Act, as amended, requires preparation and implementation of INRMPs at all Department of Defense (DoD) installations in the U.S. that contain significant natural resources. An INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are established for DoD installations. The main purpose of an INRMP is to help commanders more effectively manage natural resources to ensure installation lands remain available and in good condition to support the military mission; conserve and rehabilitate natural resources on military installations; sustain multipurpose use of the resources and public access to military installations to facilitate use of those resources; participate, as appropriate, in regional ecosystem initiatives; and demonstrate conservation benefits for species listed under the Endangered Species Act (ESA). The U.S. Navy (Navy) is required to ensure ecosystem management is the basis for all management of its lands (Sikes Act, as amended [16 United States Code [U.S.C.] 670a]; DoD Instruction 4715.03).

The Sikes Act stipulates that this INRMP provide for:

- Public access that is necessary and appropriate for the use described in this INRMP, subject to requirements necessary to ensure safety and military security;
- Specific natural resources management goals and objectives and time frames for acting on them;
- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetlands protection, enhancement, and restoration where necessary, for support of fish, wildlife, or plants;
- Integration of and consistency among the various activities conducted under the INRMP;
- Sustainable use of natural resources by the public, to the extent that use is consistent with needs of the fish and wildlife resources;
- Enforcement of natural resource laws and regulations;

- No net loss in the capability of the military installation lands to support the military mission of the installation; and,
- Such other activities as the Secretary of the Navy determines appropriate.

1.1.1 Achieving No Net Loss to the Military Mission

The military mission, derived from Title 10 of the U.S.C., requires the Navy to "maintain, train and equip combat-ready naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas." In keeping with the principal use of military installations to ensure the preparedness of the U.S. Armed forces, the Sikes Act mandates that the INRMP shall provide for no net loss of the capability of the installation's lands to support the military mission. Naval Base Ventura County (NBVC) is achieving no net loss of training lands or reduction in operational flexibility and growth through implementation of the revised 2013 Point Mugu INRMP. Similar to NBVC's 2002 INRMP, all projects and actions included in this INRMP to manage listed and sensitive species, flora, and fauna are compatible with NBVC's current mission requirements and should allow for any new operations without additional encumbrances. Changes in land use, such as converting uplands to wetlands, support the mission by allowing projects, training, or expansion into wetland areas. The INRMP also provides an avenue for exclusion from critical habitat designation under Section 4(a)(3)(B)(i) of the ESA, which is pivotal to no net loss of military training. This INRMP priority is to sustain the mission while sustaining and improving the health of our natural resources.

By direction of the Office of the Undersecretary of Defense memorandum of 08 August 1994, *Implementation of Ecosystem Management in the Department of Defense*, INRMPs are required to ensure that ecosystem-based management is the basis for all future management of DoD lands and waters. The DoD and the Navy have adopted a policy of ecosystem-based management for INRMPs, with the goal of ensuring that military lands are managed to support realistic training and testing operations, while preserving and enhancing ecosystem integrity and biological diversity. The DoD (DoD Instruction [DoDINST] 4715.03, *Natural Resources Conservation Program*) describes ecosystem-based management as "a process that considers the environment as a complex system functioning as a whole, not a collection of parts, and recognizes that people and their social and economic needs are a part of the whole."

Based on an ecosystem approach, this INRMP takes a large geographic view to ensure the overriding purpose of protecting the properties and functions of natural ecosystems (DoDINST 4715.03 *Natural Resources Conservation Program*). Because ecosystem boundaries are rarely synonymous with property ownership, installations such as NBVC Point Mugu and Special Areas are encouraged to form cooperative partnerships with resource management agencies, as appropriate, and take part in public awareness initiatives to manage ecosystems more successfully. The Office of the Undersecretary of Defense memorandum provides principles and guidelines for implementing ecosystem management on DoD lands. Management includes participation in regional ecosystem initiatives.

1.2 SCOPE OF THE PLAN

The NBVC Point Mugu and Special Areas INRMP includes all lands owned, leased, withdrawn, or otherwise used for military training by NBVC (see Table 1-1), with the exception of the Port Hueneme and San Nicolas Island installations, which are managed under separate INRMPs. In addition to terrestrial resources, this INRMP addresses Pacific Ocean marine resources up to 3 nautical miles (NM) seaward from Point Mugu, to encompass testing and research activities; and 0.25 NM seaward from San Miguel Island, to include Prince Island and other offshore rocks.

This document is the first formal revision of the 2002 INRMP (Tetra Tech 2002). This revision was undertaken to:

- Update the resource goals, objectives, and strategies of NBVC Point Mugu.
- Add the NBVC Special Areas, managed under this INRMP (Figure 1-1 and Table 1-1): Camarillo Housing at Catalina Heights (52 acres), Camarillo Airport (4.34 acres), Fort Hunter Liggett (10.8 acres), Laguna Peak (39 acres), Red Mountain (0.04 acre), Santa Ynez Peak (antenna, no land), Tassajara Peak (antenna, no land), Prince Island (38 acres), San Miguel Island (9,533 acres), Santa Cruz Island (8 acres), and Santa Rosa Island (0.01 acre).
- Incorporate current DoD and Navy INRMP guidance.
- Incorporate current Special Status Species information, including new observations of federally endangered tidewater goby (*Eucyclogobius newberryi*).
- Update NBVC operational activities and major tenant commands at the installation.

This INRMP was prepared and organized in accordance with the Sikes Act, as amended, DoD Instruction 4715.03 *Natural Resources Conservation Program*, Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 *Environmental Readiness Program Manual*, and the most recent series of DoD (2006), U.S. Fish and Wildlife Service (USFWS) and Navy (Navy 2006) guidance on the Sikes Act and INRMPs.

An INRMP Working Group, consisting of internal Navy and external stakeholders, was formed to develop this INRMP. Stakeholders are listed in Appendix M. Numerous Navy personnel, tenants, and related organizations, as well as federal, state, and city representatives and other external organizations, were invited to participate in the development and review of this document (Section 7.1.1, INRMP Implementation and Responsibilities). In addition, the public was invited to review the document through the National Environmental Policy Act (NEPA) process (Navy 2013a). The USFWS, the California Department of Fish and Wildlife (CDFW) (formerly the California Department of Fish and Game [CDFG]), and National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS) have participated in the development of this INRMP. As signatories of this INRMP, they are in mutual agreement with the Commanding Officer regarding natural resources management at NBVC Point Mugu and Special Areas.

The Navy and Point Mugu will implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be nor may be construed to be a violation of the Anti-Deficiency Act (31 U.S.C. 1341 *et seq.*).

NBVC Facility Name	Acreage	Addressed in This INRMP
Point Mugu ¹	4474.0	Yes
Port Hueneme ²	1610.2	No
San Nicolas Island ²	17428.0	No
NBVC Special Areas		
Laguna Peak	39.0	Yes
Santa Cruz Island ³	7.9	Yes
Santa Rosa Island ⁴	0.01	Yes
Prince Island ⁵	37.9	Yes
San Miguel Island ⁵	9533.3	Yes
Fort Hunter Liggett Blackjack	7.2	Yes
Fort Hunter Liggett Vehicle Maintenance Yard (Old Tech)	2.6	Yes
Fort Hunter Liggett Hunting Lodge (Recreation Center)	1.2	Yes
Camarillo Housing-Catalina Heights	52.3	No*
Camarillo Airport	4.34	No*
Santa Ynez Peak ³	58.0	No*
Tassajara Peak ³	0.04	No*
Red Mountain ³	0.04	No*

TABLE 1-1: NBVC FACILITIES

Note: 1= A portion of this property is under a Memorandum of Agreement with the National Park Service.

2= This property is covered under a separate INRMP.

3= This property is leased by the Navy.

4= Navy use of this property is via an in-grant permit from the National Park Service.

5= This property is under a Memorandum of Agreement with the National Park Service.

*= There are no significant biological resources within the NBVC area of responsibility. Under the Sikes Act, INRMPs are to address installations with significant biological resources.

The 2013 revised NBVC INRMP establishes planning and management strategies; identifies natural resources constraints and opportunities; supports the resolution of land use conflicts; provides base natural resources descriptions necessary for the development of conservation strategies and environmental assessment; serves as the principal information source for

preparation of future environmental documents for proposed NBVC actions; and provides guidance for annual natural resources management reviews, internal compliance audits, and annual budget submittals. The INRMP fully integrates and coordinates the natural resources program with other NBVC plans and activities.

Throughout development of this INRMP, management concerns were identified in a number of natural resources subject areas. Some of these natural resources concerns could have an impact on the NBVC mission or future planning operations. One of the purposes of this INRMP is to identify the goal and objectives for the installation and to obtain workable and useful solutions for each concern. These recommendations are balanced with the requirements of NBVC to accomplish its mission with the highest efficiency and are discussed in detail in Sections 3.0, 4.0, 5.0, and 6.0. Appendix C provides a list of projects to be implemented based on the discussions in Section 3 through 6.

The National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136) amended the ESA (72 U.S.C. § 136, 16 U.S.C. § 1531 *et seq.*) to limit areas eligible for designation as critical habitat. Specifically, Section 4(a)(3)(B)(i) of the ESA (16 U.S.C. 1533[a][3][B][i]) now provides that: "The Secretary [of the Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under Section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." The benefits provided by this INRMP are addressed for each federally listed species in Appendix F (INRMP Benefits for Threatened and Endangered Species). For a complete list of special status species that occur on NBVC Point Mugu and Special Areas, see Appendix G.

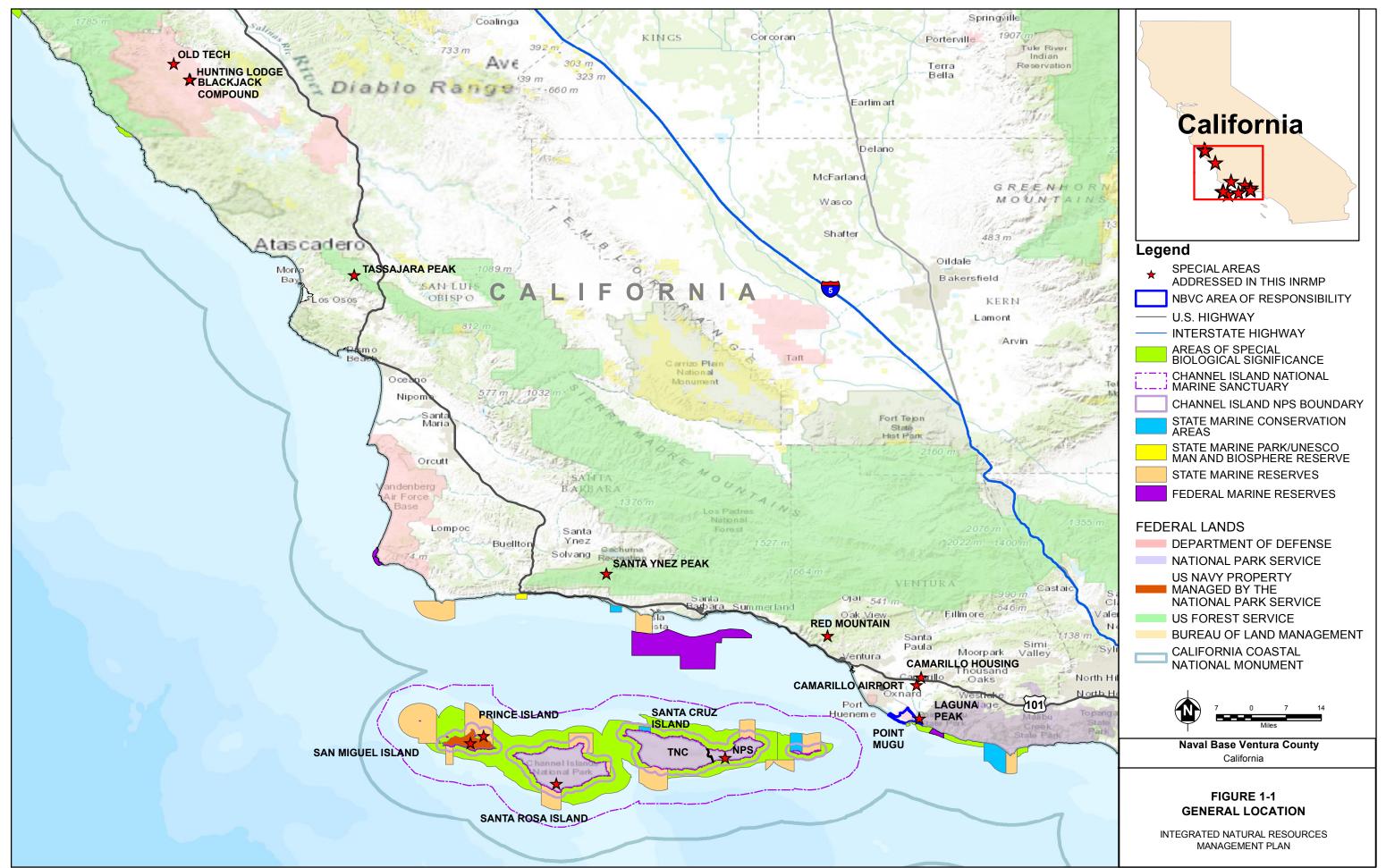
1.3 AUTHORITY

The Sikes Act directs the DoD to take the appropriate management actions necessary to protect and enhance the land and water resources on all installations under its control. DoDINST 4715.03, *Natural Resources Conservation Program*, has been implemented to establish fundamental land management policies and procedures for all military lands to preserve the military mission while simultaneously protecting the natural resources. Naval Facilities Engineering Command (NAVFAC) MO-100.1 (Maintenance Operating Manual, *Natural Resources Land Management*) provides basic technical guidance for land management practices of all DoD land and water resources. OPNAVINST 5090.1C CH-1, *Environmental Readiness Program Manual, Chapter 24 Natural Resources Management* (Navy 2011a), further establishes program responsibilities and standards for complying with resource protection laws, regulations, and Executive Orders (EOs) to conserve and manage natural resources on Navy installations in the U.S. and its territories and possessions. The Navy Chief of Naval Operations INRMP Guidance for Navy Installations, *How to Prepare, Implement, and Revise INRMPs, April 2006*, supplies guidelines on the process and procedure for developing an INRMP.

The effects of implementing this INRMP are addressed under NEPA by the Environmental Assessment (Appendix M). NEPA documentation was prepared in accordance with Chief of

Naval Operations guidance on conducting NEPA analysis of alternatives and methodologies for accomplishing the management objectives of the INRMP (DoD 2010). Other federal legal requirements that are the primary drivers for natural resources management are listed in Appendix B (U.S.C., Public Laws, EOs, and Code of Federal Regulations [CFR]).

The development of this INRMP is in accordance with the 2011 DoD guidance (DoDINST 4715.03) (DoD 2011) and is also consistent with Navy guidance (both the Chief of Naval Operations Guidance of April 2006, and OPNAVINST 5090.1C CH-1), to ensure compliance with all guidelines (Navy 2006, 2011a; DoD 2010, 2011). The organization and outline of this INRMP is consistent with the 2010 DoD Template for INRMPs (DoD 2010), as detailed in the Appendix L Crosswalk to DoD INRMP Template Table of Contents (DoD Manual 4715.03).



Author: GK. Date: 10/8/2013. Data Source: TetraTech and NBVC GIS databases; ESRI data.

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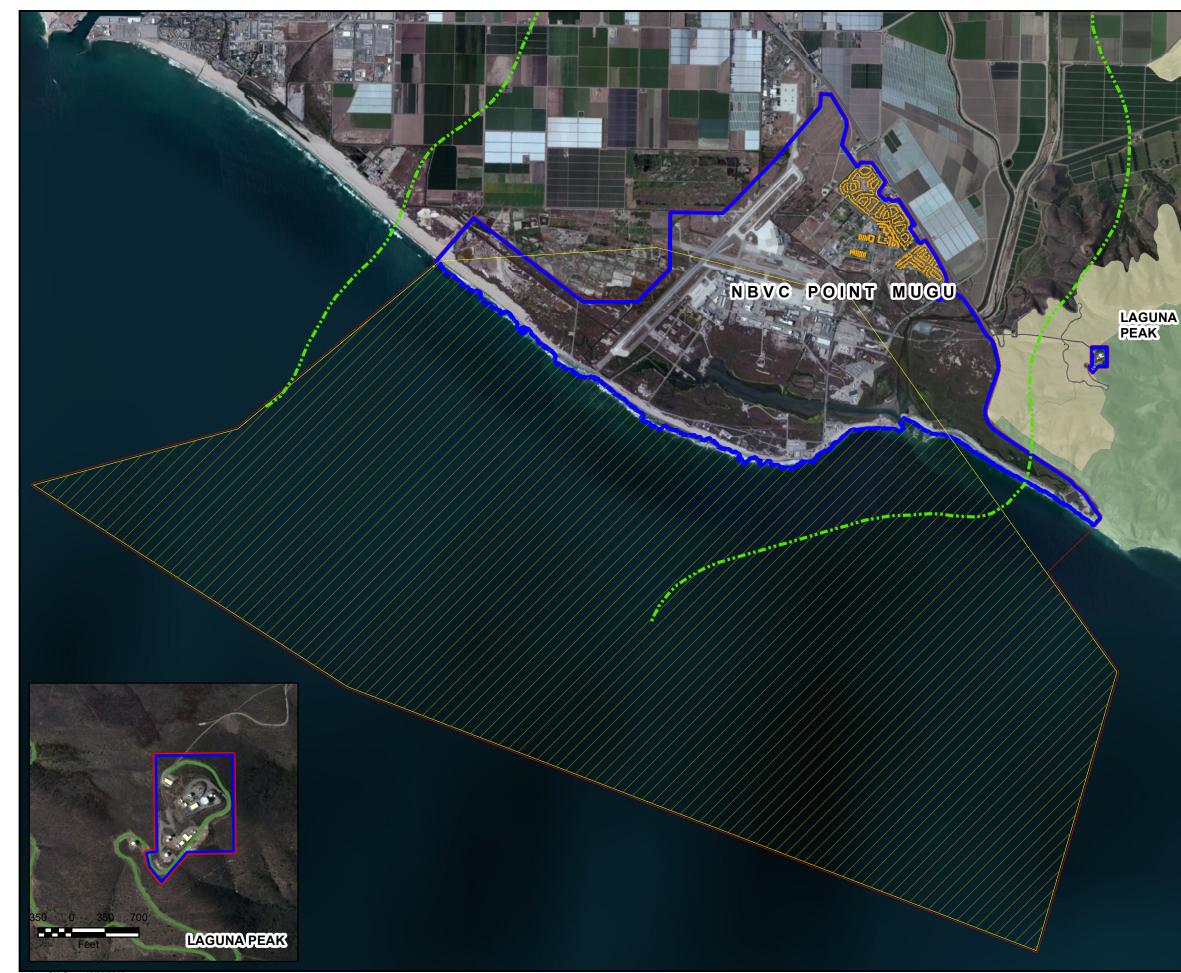
1.4 LOCATION AND PLANNING FOOTPRINT

The NBVC Point Mugu and Special Area locations are detailed on Figure 1-2, Figure 1-3, and Figure 1-4, and described below and in the following subsections. Acreages are detailed in Table 1-1.

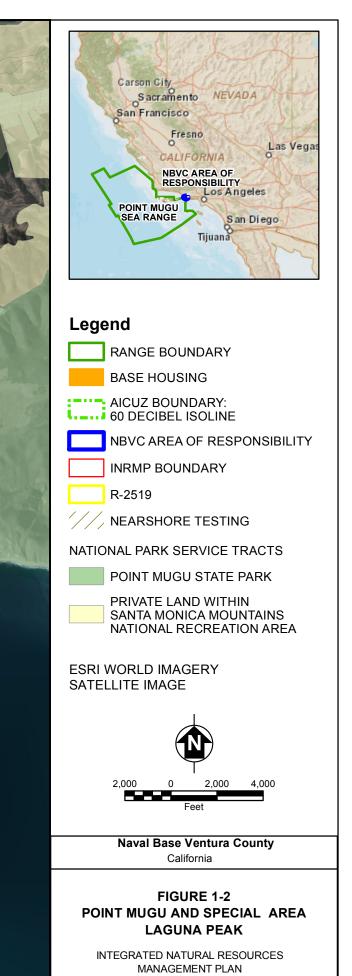
At NBVC Point Mugu, this INRMP addresses submerged lands up to 3 NM out from the Point Mugu shoreline, to include the area of military research and testing conducted offshore of Point Mugu.

At NBVC Channel Islands Special Areas, offshore areas 0.25 NM out from San Miguel and Prince Island coastlines are to be discussed and considered under this INRMP, to include all offshore rocks in that area. In offshore waters, this INRMP overlaps federal jurisdictions including Channel Islands National Park, NOAA's Channel Islands National Marine Sanctuary, and the Navy's Point Mugu Sea Range Operating Area (Section 1.7, Integrating Other Plans and Documents). The Channel Island National Park jurisdiction extends to 1 NM from each island within its jurisdiction. Nearshore and marine waters up to 6 NM offshore of Santa Cruz, Santa Rosa, San Miguel, and Prince Islands are part of the Channel Islands National Marine Sanctuary, protected and managed in accordance with the National Marine Sanctuaries Act, as amended 16 U.S.C. 1431 *et seq.* (Figure 1-1).

The State of California's jurisdictional purview extends 3 NM offshore of the coast and coastal islands. These areas are subject to additional state regulations where federal sovereign immunity has been waived by Congress. Ocean waters offshore Point Mugu and Channel Islands are designated by the State as Areas of Special Biological Significance (ASBS), a subset of state water quality protection areas afforded special protections, as determined by the State Water Resources Control Board. ASBS waters host unique species diversity and are considered key to a sustainable, resilient coastal environment and economy. U.S. Territorial Waters extend 12 NM from shore (DoD 2002).



Author: GK. Date: 12/30/2013. Data Source: TetraTech, NBVC, and NPS GIS Databases. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.



INRMP = Integrated Natural Resources Management Plan NBVC= Naval Base Ventura County AICUZ = Air Installations Compatible Use Zones

1.4.1 NBVC Point Mugu and Special Area Laguna Peak

NBVC Point Mugu (also referred to herein as both "installation" and "base"), encompasses 4,486 acres of coastal land in Ventura County, California, approximately 50 miles northwest of the City of Los Angeles (Figure 1-1). NBVC Point Mugu owns submerged lands that extend some distance into the Pacific Ocean. The submerged land boundary was never precisely delineated and mapped (Tetra Tech 2002). The jurisdiction of the Navy's Point Mugu Sea Range Operating Area encompasses 36,000 square miles from the mainland shore to more than 180 NM seaward (Figure 1-2). The operating area controls Special Use Airspace over the Pacific Ocean, including the ocean surface and an unlimited altitude of airspace (Naval Facilities Engineering Command, Pacific 2008). Restricted airspace (R-2519) over the Point Mugu airfield, beach, and to 3 NM offshore precludes the public and non-participating aircraft and vessels from entering this area during testing activities (Figure 1-2). Restricted waters that are permanently closed to the public extend approximately 100 to 300 yards off shore (Tetra Tech 2013g).

NBVC Point Mugu is bordered by Highway 1 to the north and east, the Pacific Ocean to the south and west, the Ventura County Game Reserve to the west and northwest, and Ormond Beach at the west (Figure 1-1). The NBVC Special Area Laguna Peak, northeast of Point Mugu and north of Highway 1, is detailed on Figure 1-2. NBVC Point Mugu's closest neighboring communities are Oxnard, Camarillo, Newbury Park, Thousand Oaks, Port Hueneme, and Ventura. Immediately northwest of NBVC Point Mugu are two duck hunting clubs: the Point Mugu Game Reserve and the Ventura County Game Reserve. These clubs provide up to 620 acres of freshwater pond habitat for migratory waterfowl, shorebirds, waders, and other migratory and resident birds. To the north of the base are wide expanses of agricultural land, with some small agriculturally oriented residential developments. Industrial development in the vicinity of NBVC Point Mugu includes the Ormond Beach electric power generating plant, located 1.5 miles northwest of the base. NBVC Special Area Laguna Peak encompasses 39 acres 1.5 miles northeast of Point Mugu and north of Highway 1 at the western extreme of the Santa Monica Mountains. This acreage includes a paved access road through privately owned land and a paved and landscaped antenna site at the top of the mountain. The foothills of the Santa Monica Mountains are private and public open space lands are used for grazing, agriculture, and Directly east of NBVC Special Area Laguna Peak, Point Mugu State Park recreation. encompasses 14,000 acres. The portion of the state park located along the coastline, near NBVC Point Mugu, hosts campgrounds and beach facilities. Point Mugu State Park, Mugu Lagoon, and the privately owned foothills are all part of the Santa Monica Mountains National Recreation Area (Tetra Tech 2002). The Navy, U.S. Department of the Interior's National Park Service (NPS), and California State Parks boundaries are shown in Figure 1-2.

1.4.2 NBVC Channel Islands Special Areas

At 96 square miles (61,440 acres), Santa Cruz Island (Figure 1-3) is the largest of the California Channel Islands and of the islands discussed herein, the closest island to NBVC Point Mugu (25 miles offshore). The western 76 percent of Santa Cruz Island is privately owned and managed by The Nature Conservancy (TNC); the NPS owns and manages the rest. The Navy leases

approximately 8 acres of developed land from TNC on the isthmus, which joins the east and west sides of the island. The Navy leased parcel is a TNC inholding on the NPS portion of the island.

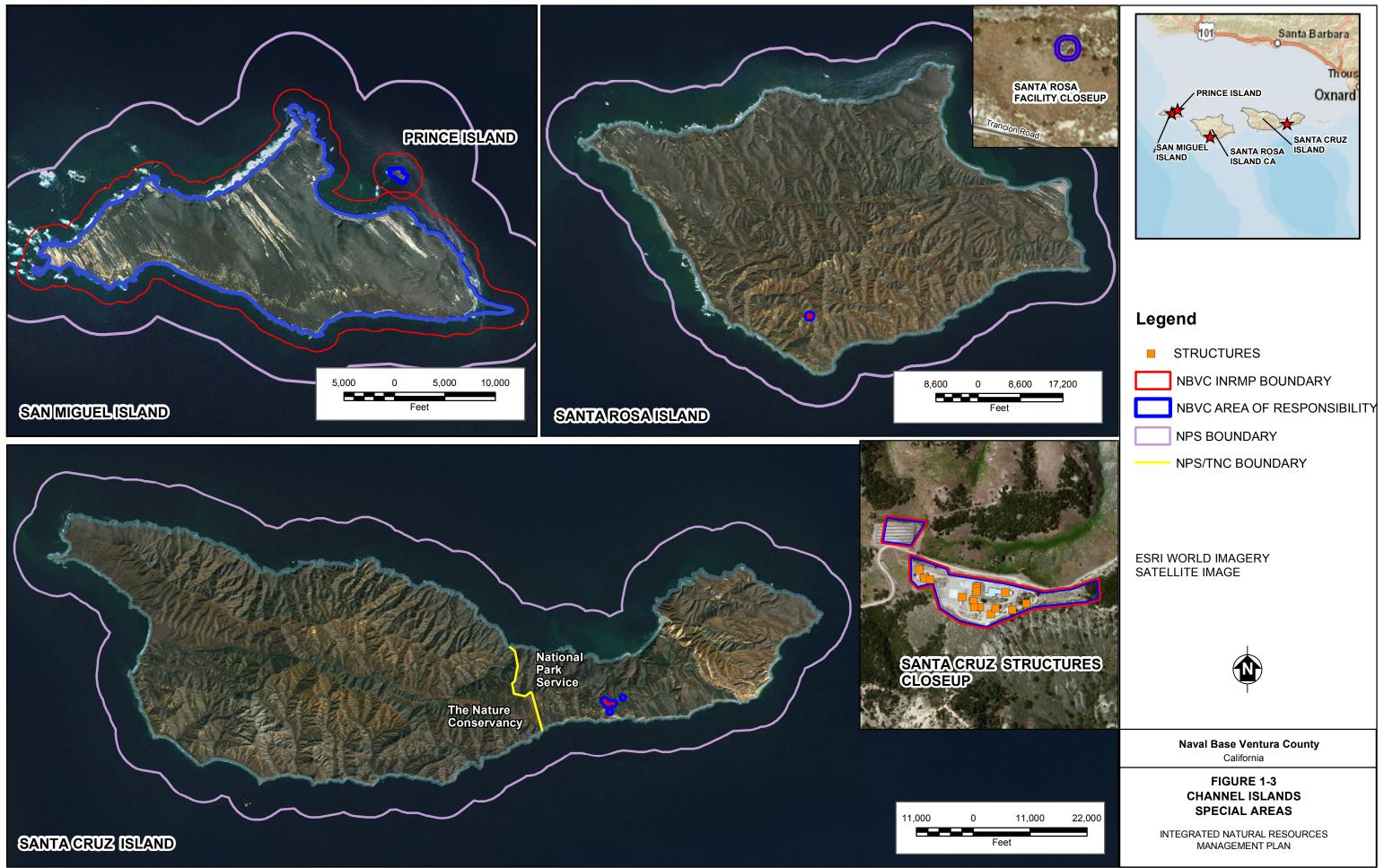
The second largest of the Channel Islands, Santa Rosa Island, covers 84 square miles (about 53,000 acres) (Figure 1-3). Santa Rosa is approximately 48 miles west of NBVC Point Mugu and 31 miles southwest of the City of Santa Barbara. Santa Rosa Island has been owned by the NPS since 1986. The Navy has an in-grant permit for the use of 0.01 acre of developed land on the northeast side of the island.

San Miguel Island is 26 miles off Point Conception in Santa Barbara County, 3 miles west of Santa Rosa Island, at the western edge of the island chain (Figure 1-3). San Miguel Island, including Prince Island, is approximately 22 square miles (14,000 acres) in size. The island is approximately 8 miles long, from east to west, and ranges from 2 to 4 miles wide. San Miguel is surrounded by numerous islets and rocks, the largest being Prince Island to the northwest (Figure 1-3). San Miguel and Prince Island are property of the U.S. Navy, but through a Memorandum of Agreement between the Department of the Navy and the Department of the Interior (dated 07 May 1963, amended 20 October 1976 and supplemented December 1985 and September 1991 [U.S. Department of the Interior and Navy 1991]), the NPS has operational jurisdiction for management of the islands (Section 2.2.3, Leases and Real Estate Outgrants) (Appendix P Memoranda of Agreements and Memorandum of Understanding). In 1980, Congress designated San Miguel and Prince Islands as part of the Channel Islands National Park. President Jimmy Carter signed the legislation, Public Law 96-199, on 05 March 1980. The new national park would include Santa Barbara and Anacapa Islands (the former Channel Islands National Monument) and add Santa Rosa, Santa Cruz, and San Miguel Islands, the latter to remain under the ownership of the Navy but managed by the NPS (USDOI 2005).

The military operations, facilities, and natural resources of NBVC Channel Island Special Areas are detailed in Sections 2.0 Military Mission and Operations, and Section 4.0 Current Condition and Management of Natural Resources at NBVC Channel Islands Special Areas.

1.4.3 NBVC Fort Hunter Liggett Special Area

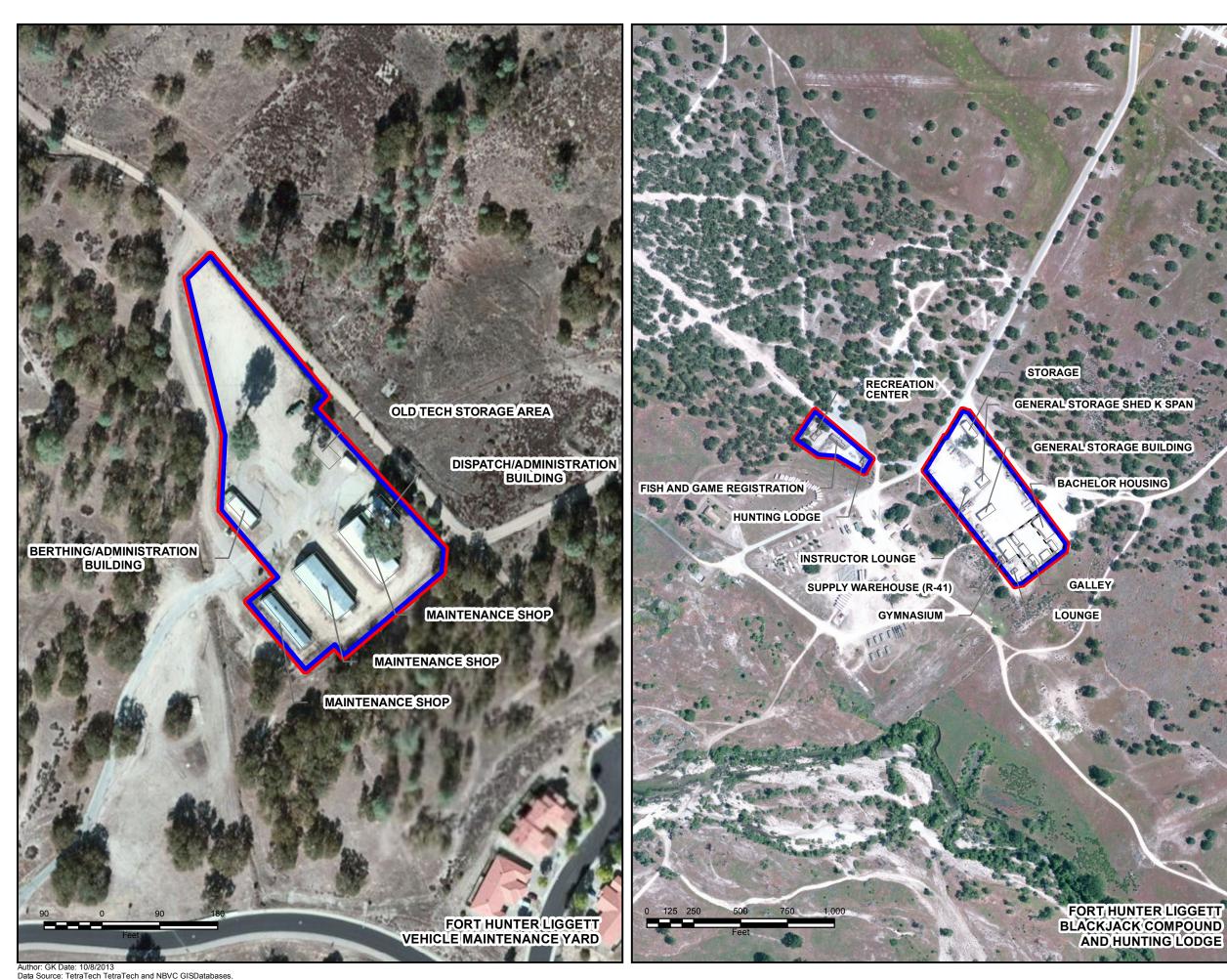
NBVC Fort Hunter Liggett Special Area includes 10.8 acres of mostly developed land within the U.S. Army Combat Support Training Center at Fort Hunter Liggett, California. Fort Hunter Liggett is the largest U.S. Army (Army) installation in the U.S. Army Reserve (KTU+A 2010). In this document, the U.S. Army installation at Fort Hunter Liggett is referred to as "Fort Hunter Liggett." Fort Hunter Liggett comprises 165,000 acres in west-central California, approximately 70 miles southeast of the City of Monterey, 23 miles southwest of King City, and 12 miles west of Lockwood (Figure 1-4). Los Padres National Forest borders the north and west sides of Fort Hunter Liggett Special Area is detailed in Section 2.0 Military Mission and Operations, and Section 5.0 Current Condition and Management of Natural Resources at NBVC Channel Islands Special Areas.



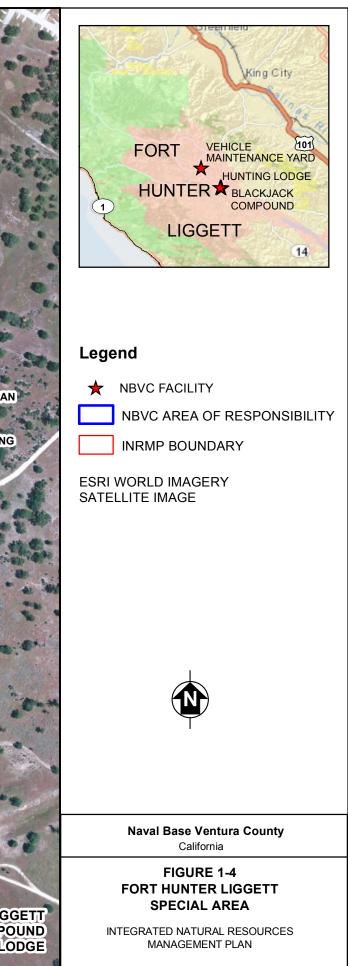
Author: GK Date: 10/8/2013 Data Source: TetraTech, NBVC, and NPS GIS Databases.

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INRMP = Integrated Natural Resources Management Plan NBVC= Naval Base Ventura County NPS= National Park Service; TNC=The Nature Conservancy



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INRMP = Integrated Natural Resources Management Plan NBVC= Naval Base Ventura County

1.4.4 Antenna Sites, Camarillo Housing at Catalina Heights, and Camarillo Airport

There are no significant biological resources resources at these Special Areas, and so these sites are not discussed further in this document, beyond the summary description below.

NBVC Special Areas are geographically distinct areas that are remote from the host installation's main/primary site. Navy Special Areas are assigned to an installation within the geographic Commander Navy Installation Command Region in which they occur. Regions assign Special Areas to installations based on geographical command, mission, and administrative considerations (Naval Facilities Engineering Command 2008). NBVC Special Areas are shown on Figure 1-1 and include antenna rack spaces leased by the Navy, and Camarillo Housing at Catalina Heights, a residential development. The antenna sites include:

- Red Mountain, a 0.04-acre rack space and antenna platform in Ventura County;
- Santa Ynez Peak, an antenna with no land in Santa Barbara County; and
- Tassajara Peak, an antenna space and ancillary equipment on a communications tower, with no land, in San Luis Obispo County.

The antenna sites are reviewed for NEPA compliance each year that leases are renewed; the lease renewals qualify for Categorical Exclusion. At the antenna sites, land use would not change and no impacts to the human or natural environment would occur.

NBVC Special Area Camarillo Housing at Catalina Heights encompasses 52 acres of developed land in the City of Camarillo, Ventura County, California, north of Highway 101 and south of Las Posas Road (Figure 1-1). Camarillo housing has 315 units and 16 mobile home spaces, owned by the Navy (Onyx Group 2006). Camarillo Housing is developed land with no significant biological resources. As such, this special area is not discussed further in this document. If a change to the housing area and presence of biological resources occurs, management of those resources will be addressed in INRMP updates and revisions.

NBVC Special Area Camarillo Airport is 4.34 acres of developed land consisting of a runway, airport terminal, buildings, and a parking lot. No significant natural resources are at the Camarillo Airport and, as such, this special area is not discussed further in this document.

1.5 INRMP Vision, GOALS AND OBJECTIVES

The important points regarding the military mission and natural resources at NBVC Point Mugu and Special Areas are summarized below:

• Navy land use at NBVC Point Mugu and Special Areas is largely confined to existing developed areas.

- Land-based military training activities occur in designated training zones, consisting of disturbed open space areas.
- Many of the natural areas at NBVC Point Mugu are federally regulated; activities that occur in these areas require coordination with regulatory agencies.
- Many of the natural areas at NBVC Point Mugu are habitat for federally listed species that are vulnerable to human disturbances.
- Most activity in the natural areas at Point Mugu is conducted by NBVC Environmental Division (NBVC ED) and is focused on resource management.

The vision for this INRMP is to institutionalize a Navy conservation ethic and fully comply with regulatory requirements. This vision will be achieved by maintaining the continued ability of the Navy at Point Mugu and Special Areas to support mission requirements while improving the conditions for long-term certainty and permanence through applying the principles of ecosystem management, adaptive management, and cooperative management, in an integrated approach.

INRMPs have goals that are shaped by DoD guidelines and directives, pertinent laws and regulations, public needs, public values, ecological theory and practice, and management experience. For the purposes of this INRMP, a "goal" is a broad statement of intent, direction, and purpose. A goal is an enduring, visionary description of an end outcome, but is not necessarily completely attainable. It describes a desired outcome related to the mission, rather than an activity or process.

The goals of the NBVC Point Mugu and Special Areas INRMP are to:

- Achieve sustainable military readiness while maintaining ecosystem resilience to mission impacts.
- Conserve and enhance through adaptive management principles, functioning ecological communities, and sensitive species recovery.
- Achieve collaborative internal and external partnerships to maximize mutual benefits, such as identifying additional funding sources, improving cost-effectiveness, and sharing compatible data.
- Improve DoD personnel, contractor, and public awareness of the natural resources and how impacts to these resources can affect the military mission.

The planning terms used in this document such as "goal," "objective," and "strategy" cover a gradient of specificity and durability, ranging from very broad, enduring concepts to specific implementation or management processes. Below are explanations of the planning terms used in Sections 3 through 6. The objectives and their associated management strategies addressed in Sections 3.0 through 6.0 were developed through expert interviews conducted with installation

further discussed below.

managers. This collaborative and interactive process allowed specific concerns to be identified, current management practices to be documented, and the adequacy of those practices to address those specific concerns to be assessed. Objectives and management strategies were then collaboratively developed and reviewed by stakeholders (Section 7.1.1 INRMP Implementation and Responsibilities) to guide future practices to reconcile those deficiencies to ensure that specific concerns are addressed. The purpose for including specific concerns, current

Specific Concerns: The discussion of specific concerns identifies management concerns or issues specific to NBVC Point Mugu and the Special Areas. These specific concerns may describe any aspect of the status and trend of the resource that may be a concern to its health, abundance, or stability, or address what controlling factors may be involved. For example, at NBVC Point Mugu, the land and airspace surrounding the lagoon are mission critical resources that are also used by fish and wildlife protected under federal regulations. Many of the habitats on base have been greatly reduced on a regional scale and are sensitive to impacts such as soil erosion, pollution, changes in hydrology, invasive species, and human disturbances. Specific concerns are identified and addressed for each resource detailed for NBVC Point Mugu and Special Areas in Section 3.0 through Section 5.0.

management, assessment of current management objectives, and management strategies is

Other questions that specific concerns address include:

- Are there known threats to the health of the resource?
- Does the resource have any particular vulnerabilities (for example, a small breeding area in few locations)?
- Does the expansion of the resource create a problem for other resources or the military mission?
- Is there uncertainty about the status or trend of the resource such that environmental documentation (NEPA or other laws), adaptive management, or ecosystem management is impaired (is there sufficient inventory and monitoring)?

Current Management: The discussion of current management states how the resource is currently managed under the NBVC ED, directives of natural resource laws and regulations, Records of Decision, Biological Opinions, permits, zoning, policies, the NEPA site approval process, and inventory or survey reports. Details specific to the installation should include the type of management approach used to carry out the natural resources program, such as ecosystem, adaptive, or cooperative management (DoD 2010).

The purpose of the current management discussion is to describe the tools and plans used for natural resource management at NBVC Point Mugu and Special Areas, specific to each INRMP topic.

Assessment of Current Management: The discussion of the assessment of current management at NBVC Point Mugu and Special Areas relates the specific concerns to management adequacy for each INRMP topic. This discussion states the installation's findings with respect to data gaps, any military mission conflicts, the ability to support avoidance and minimization of impacts, or the sustainability of natural resource uses. This discussion considers the relationship among risks, vulnerabilities, uncertainties, costs, and benefits to develop objectives and management strategies that support adaptive management.

Objective: The previous discussions lead to the identification of an objective and management strategy for each INRMP topic. For this INRMP, an objective describes the desired outcome in terms of the structure and function of what is being protected. An objective should be a specific statement that describes a desired future end-state or successful outcome that supports an INRMP goal or Navy policy. The objective can be quantitative and should be followed by a "standard" that is an observable indicator by which successful attainment of a condition stated in the objective is measured. Navy guidance defines objectives as "measurable targets for achieving the goals" (Navy 2006).

Management Strategy: A management strategy is an explicit description of the ways and means by which the objective will be achieved. Management strategies are developed and presented using a step-down approach. Management strategies detailed in Sections 3 through 6 are the basis for developing projects identified in Section 7.5, Implementation Summary and Schedule; and Appendix C, NBVC Point Mugu INRMP Project List. All management strategies developed in this INRMP support projects pertaining to each INRMP topic. A management project may be supported by a single management strategy or may be supported by multiple strategies categorized in various INRMP topics. For example, a project related to terrestrial invasive exotic species control may be supported by management strategies discussed in terrestrial vegetation communities and in the terrestrial invasive exotic species section. Thus, all the projects included in this INRMP will support an ecosystem-based management approach if fully implemented, funded, and enforced.

1.6 ECOSYSTEM APPROACH AND ADAPTIVE MANAGEMENT

The DoD and the Navy have adopted a policy of ecosystem-based management for INRMPs. The DoD (DoDINST 4715.03, *Natural Resources Conservation Program*) describes ecosystembased management as "a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem-based management is a process that considers the environment as a complex system functioning as a whole, not a collection of parts, and recognizes that people and their social and economic needs are a part of the whole." The DoD goal with regard to ecosystem-based management is "To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations." The regulatory context and strategies for reaching this goal are detailed in the DoD's Ecosystem Services Policy (DoD 2011).

DoD and Navy Instructions mandate an ecosystem framework and approach for the INRMP (DoDINST 4715.03 and OPNAVINST 5090.1C CH-1, *Environmental Readiness Program Manual*). Ecosystem management in DoD draws on a long-term vision of integrating ecological, economic and social factors. This approach takes a long-term view of human activities, including military uses, and biological resources as part of the same environment. The goal is to conserve and enhance ecosystem integrity and to sustain both biological diversity and continued availability of those resources for military readiness and sustainability and other human uses (as defined in OPNAVINST 5090.1C CH-1). Managing for sustainability and ecosystem management are approaches that attempt to integrate long-term goals with short-term project lists.

The ecosystem mandate is accomplished by applying principles of sustainable use at several scales — with an emphasis on partnerships, public outreach, long-term monitoring, and adaptive management. Consistent with Navy policy (DoDINST 4715.03 and OPNAVINST 5090.1C CH-1), ecosystem-based management shall include:

- A shift from single species to multiple species conservation.
- Formation of partnerships necessary to consider and manage ecosystems that cross boundaries.
- Use of the best available scientific information and adaptive management techniques.

An adaptive management approach is a requirement for INRMPs under DoDINST 4715.03, and is defined as: "The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans and using the resulting information to improve the plans" (DoD 2011). Adaptive management occurs through the INRMP annual review and revision process, as described below in Section 7.2. Installation natural resource managers also practice adaptive management on a continuous, dayto-day basis, in response to a range of environmental or programmatic variables, which may require a change in management strategy. Adaptive management is partly implemented through the Navy's Environmental Management System (EMS) to integrate environmental considerations into day-to-day activities across all levels and functions of Navy enterprise. Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" (24 January 2007), required each DoD component to adopt an EMS. An EMS is a formal management framework that provides a systematic way to review and improve operations, create awareness, and improve environmental performance. Systematic environmental management as an integral part of day-to-day decision making and long-term planning processes is an important step in supporting mission readiness and effective use of resources. The most significant resource for every organization is their senior leadership's

commitment and visibility in EMS implementation and sustainability. A robust EMS is essential to sustaining compliance, reducing pollution, and minimizing risk to mission. The Navy's EMS has a concerted focus on preventing pollution, consistent regulatory compliance, and reducing environmental impacts, including environmental practice for energy and transportation functions, using a "plan-do-check-act" management model (OPNAVINST 5090.1C CH-1 [Navy 2011a]). It conforms to the International Organization for Standardization 14001:2004 EMS standard.

The Navy commitment to environmental sustainability, regulatory compliance, and mission readiness is implemented on a project by project basis through the Site Approval and Project Review Board (SA/PRB) process, codified in NBVC Instruction 11010.1A, to ensure NEPA compliance. All projects at NBVC Point Mugu and Special Areas must go through the SA/PRB. Projects are reviewed for regulatory compliance by an interdisciplinary team, including members of NBVC ED. Projects must receive site approval from local and regional Navy planning. The project screening process is a streamlined means for project sponsors to comply with NEPA and the applicable state and federal laws, regulations and guidelines described in Appendix B. This process is further described in Section 6.4, Regulatory Compliance.

1.7 INTEGRATING OTHER PLANS AND DOCUMENTS

The INRMP provides guidance and direction for natural resources management activities and provides a framework for plan implementation. The INRMP is consistent with and integrates other planning documents from a variety of sources listed in Table 1-2 and Table 1-3.

The need for the INRMP to be consistent with different planning processes, such as any applicable USFWS recovery plans and state wildlife action plan, is not mandatory (Navy 2006). However, the INRMP must state whether it is consistent with these plans. Certain related or neighboring planning processes may affect this INRMP. In the process of development of this INRMP, the INRMP Working Group assessed its consistency with the plans described below.

1.7.1 Navy Plans and Reports

Table 1-2 details Navy plans and reports referenced and incorporated into the development of this INRMP. This list is not exhaustive; many plans are discussed in the appropriate section.

Title	Date
Naval Air Warfare Center Weapons Division Point Mugu Sea Range Environmental Impact Statement/ Overseas Environmental Impact Statement (DoD 2002)	2002
Bat Survey Report and Management Plan for NBVC Point Mugu, California (Brown and Berry 2003)	2003
Naval Base Ventura County Activity Overview Plan (Onyx Group 2006)	2006
Naval Base Ventura County Activity Encroachment Action Plan, Final Report (Onyx Group 2008)	2008
Marine Resources Assessment for the Southern California and Point Mugu Operating Areas (NAVFAC Pacific 2008)	2008
Integrated Cultural Resources Management Plan for Point Mugu and Port Hueneme, Naval Base Ventura County (NBVC), California (ASM Affiliates, Inc. 2010)	2010
Naval Base Ventura County San Nicolas Island and Fort Hunter Liggett Activity Overview Plan (KTU+A 2010)	2010
Integrated Pest Management Plan, NBVC, California (NAVFAC SW 2011)	2011
NBVC Point Mugu Shoreline Protection Study Report (BradyG2 2012a)	2012
NBVC Point Mugu Shoreline Protection Plan (BradyG2 2012b)	2012
Storm Water Pollution Prevention Plan, NBVC Point Mugu (TriEco-Tt JV 2012)	2012
Bird Aircraft Strike Hazard Plan for Naval Base Ventura County Point Mugu, California (Navy 2012)	2012

TABLE 1-2: NAVY PLANS AND REPORTS INCORPORATED INTO THIS INRMP

1.7.1.1 Consistency with the NBVC Integrated Cultural Resource Management Plan

The SA/PRB provides the primary planning mechanism for projects conducted by the Natural Resource program to be reviewed by other programs, such as Cultural Resources. An Integrated Cultural Resource Management Plan for NBVC was developed in 2010. The Integrated Cultural Resource Management Plan includes NBVC Point Mugu and Special Areas Laguna Peak and Camarillo Housing, and Port Hueneme in its planning footprint. Fort Hunter Liggett Special Area and the Channel Islands Special Areas are not included. The primary objective of the Integrated Cultural Resource Management Plan is to "provide readily accessible support for efficient management of cultural resources and proactive conformance with requirements and compliance mandates, in the course or supporting the Navy mission" (ASM Affiliates, Inc. 2010). The plan is intended to provide strategic guidance to NBVC to support a conservation and stewardship program for historic and archaeological resources present on property owned or controlled by the Navy. The cultural resource conservation and stewardship program enables NBVC to comply with DoD cultural resource instructions such as DoDINST 4715.16 Cultural Resources Management, EOs such as EO 11593 Protection and Enhancement of the Cultural Environment, and cultural resource laws including but not limited to the American Antiquities Act, Archaeological Resources Protection Act, Archaeological and Historic Preservation Act, NHPA, and the Historic Sites Act. Cultural resource management activities encompassed in the Integrated Cultural Resource Management Plan include access restrictions to archaeological sites and surveys of historic and archaeological resources.

The SA/PRB process reviews all projects that may affect sensitive natural or cultural resources at NBVC Point Mugu and Special Areas and sufficiently protects cultural and historical resources. There is potential that maintenance landscape activities may not be submitted for review or assessed through the SA/PRB. The Cultural Resource program should review landscaping or exotic removal projects that occur in or near historic structures. Geographic information system (GIS) files and maps of cultural resources should be provided during the project planning phase to avoid impacts to the historic landscape.

1.7.2 Regional Plans and Initiatives

<u>Coastal Resilience Project:</u> TNC's Coastal Resilience project works to provide tools and information to inform decision-making, with a primary goal of identifying vulnerable human and natural communities and enabling adaptive solutions, emphasizing the important role of ecosystems. TNC is working with partners at local and global scales to demonstrate how nature can provide cost-effective solutions to help sustain and protect human communities, using an ecosystem-based adaptation strategy. Ecosystem-based adaptation includes a range of actions for the management, conservation, and restoration of ecosystems that will help reduce the vulnerability and increase the resilience of coastal communities. Locally, the Coastal Resilience Ventura project involves a diverse group of interested parties, including representatives from the agricultural community, insurance industry, the DoD, municipal officials, and homeowners, among others.

<u>California Wildlife Action Plan</u>: To receive federal funds through the State Wildlife Grants Program, a state must have developed statewide comprehensive wildlife conservation plan by 01 October 2005 through the Consolidated Appropriations Act of 2005 (Public Law 108-447). The State Wildlife Grants Program provides federal money to every state and territory for costeffective conservation aimed at preventing wildlife from becoming endangered (Public Law 108-447).

Congress also directed that the strategies must identify and be focused on the "species of greatest conservation need" yet address the full array of wildlife and wildlife-related issues (CDFW 2009). The 2007 California Wildlife Action Plan identified statewide and regional conservation issues based on regional landscape types, regional habitats, and ecosystem-level species needs and requirements, rather than prescribing management actions using a species-by-species approach (CDFW 2007). The plan identified five key stressors affecting wildlife and their habitats in the south coast region of NBVC (CDFW 2007):

- Growth and development
- Water management conflicts and degradation of aquatic ecosystems
- Invasive species
- Altered fire regimes
- Recreational pressures.

Marine stressors identified in this region include:

- Overfishing
- Degradation of marine habitats
- Invasive species
- Pollution
- Human disturbance.

The conservation actions identified by the CDFW for the south coast region were taken into consideration when preparing this document. The plan identified conservation actions to be undertaken to restore and protect wildlife and their habitats in this region, including reducing habitat fragmentation, protecting and restoring coastal wetlands, and protecting sensitive and wildlife habitats (Bunn and others 2007). The management strategies presented in this INRMP were developed with these conservation actions in mind; they complement conservation activities contained within the California Wildlife Action Plan as follows:

- The INRMP management strategies are consistent with a number of statewide and south coast region-specific conservation actions.
- NBVC works with a number of local, state, and federal agencies and non-profits on a number of statewide and regional conservation management efforts.
- NBVC has an active Integrated Pest Management Program and coordinates with other agencies to improve effectiveness through information sharing and landscape planning efforts.
- NBVC seeks encroachment buffer opportunities and works with state, federal, and conservation organizations.
- NBVC considers natural resources conservation education a high priority in managing natural resources.
- NBVC has started to consider the most current projections of the effects of global warming in its conservation planning and ecosystem restoration work.
- NBVC seeks to adequately fund projects and staff to sufficiently manage sensitive species and important wildlife habitats on NBVC.

In addition, the plan listed the light-footed clapper rail (*Rallus longirostris levipes*) as a species at risk in the south coast region. Numerous other special status species were also detailed in the plan that occur or could occur, at NBVC Point Mugu. NBVC ED manages these species and habitats to support regional recovery efforts, as detailed in Section 3.5 Special Status Species and Their Protection.

<u>California Marine Life Protection Act Master Plan for Marine Protected Areas:</u> In 1999, the legislature approved and the governor signed the Marine Life Protection Act (Stats. 1999, Chapter 1015). The Marine Life Protection Act required that CDFW develop a Master Plan to guide the adoption and implementation of a Marine Life Protection Program, which includes a statewide network of Marine Protected Areas. The Marine Life Protection Act identifies a set of goals for the Marine Life Protection Program, including conservation of biological diversity and the health of marine ecosystems; recovery of wildlife populations; improvements to recreational and educational opportunities consistent with biodiversity conservation; protected Areas have defined objectives, effective management and enforcement, and are designed on sound science; and ensuring Marine Protected Areas are managed, to the extent possible, as a network (CDFG 2008b).

The limit of discussion of this INRMP at NBVC Channel Islands Special Areas include waters managed by Channel Islands National Park as Marine Protected Areas, through the Memorandum of Agreement between the DoD and the U.S. Department of the Interior, National Park Service (Appendix P). Under the Memorandum of Agreement, ocean waters off shore from San Miguela and Prince Islands are managed by the Channel Islands National Park. However, NBVC land use and regional planning efforts are conducted according to the conservation and sustainable use strategies outlined in this INRMP and are complementary with other regional conservation efforts.

<u>California's Ocean Action Plan:</u> Related to the California Ocean Protection Act, on 18 October 2004, Governor Arnold Schwarzenegger released an ocean action plan, Protecting Our Ocean: California's Action Strategy, with four primary goals:

- 1. Increase the abundance and diversity of species in California's oceans, bays, estuaries and coastal wetlands;
- 2. Make water in these bodies cleaner;
- 3. Provide a marine and estuarine environment that Californians can productively and safely enjoy;
- 4. Support ocean-dependent economic activities.

Part of this ocean action plan is full implementation of the Marine Life Protection Act. Among other policies, the ocean action plan also addresses the relationship between California's management activities and DoD as follows: coordinate California ocean and coastal management activities that affect military facilities and operations with DoD, as well as requesting DoD to coordinate its activities and operational needs with the State of California to the extent possible without compromising national security objectives (CDFG 2008b). With implementation of this INRMP, NBVC goals are consistent with the ocean action plan. The goals and management strategies outlined herein support the sustainable use and conservation of natural resources, while also providing support of the military mission.

<u>Calleguas Creek Watershed Management Plan</u>: The Calleguas Creek Watershed Management Plan was drafted in 1996 to develop a resources management and protection program and strategy for the 341-square-mile Calleguas Creek Watershed in southeastern Ventura County. Watershed stakeholders initiated the comprehensive plan that, when implemented, would guarantee the long-term health of natural resources in the watershed. Led by a broadly representative Steering Committee, the plan has two phases or volumes. The first volume presented action recommendations and technical tools to address coordinated environmental and resource management by public agencies and private-sector participants. Volume two focuses on how responsible parties in the watershed will act collectively to address significant water quality improvements and meet the mandatory standards of the federal Clean Water Act and the California Porter-Cologne Act.

NBVC is a stakeholder in the Calleguas Creek Watershed Management Plan. The NBVC Water Quality Program and the water quality objectives outlined in this INRMP are consistent with the goals of the Calleguas Creek Watershed Management Plan (Section 3.2.3 Water Resources and Water Management).

<u>Regional Water Quality Control Board's (RWQCB) Los Angeles Basin Plan</u>: The Los Angeles RWQCB Basin Plan is designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. Specifically, the Basin Plan:

- Designates beneficial uses for surface and ground waters;
- Sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy; and
- Describes implementation programs to protect all waters in the region.

In addition, the Basin Plan incorporates (by reference) all applicable state and regional board plans and policies and other pertinent water quality policies and regulations (Los Angeles RWQCB 1994). The implementation of management strategies outlined in this INRMP, specifically those related to water quality and soils protection (Section 3.2.2 Soils and Soil Conservation, and Section 3.2.3 Water Resources and Water Management), are consistent with the goals outlined in the Basin Plan.

Fort Hunter Liggett Integrated Natural Resources Management Plan: The Integrated Natural Resources Management Plan for the U.S. Army Combat Support Training Center at Fort Hunter Liggett, California (Fort Hunter Liggett 2011) provides for the management and stewardship of natural resources at the installation. The INRMP details several management programs and identifies resource-specific management strategies that enable the Army to manage the use and condition of natural resources while ensuring the safety and efficiency of the military mission. Management strategies include the following: protection and monitoring of special status species; protection and surveying wetlands; conducting invasive plant control; habitat restoration and enhancement; and management of the hunting and fishing program.

The strategies identified in Section 5.0 Current Condition and Management of Natural Resources at NBVC Fort Hunter Liggett Special Area are complementary and supportive of the Army's goals for natural resource stewardship at Fort Hunter Liggett.

<u>U.S. Army Reserve Integrated Cultural Resources Management Plan, Fort Hunter Liggett, California</u>: The Integrated Cultural Resources Management Plan for Fort Hunter Liggett (Fort Hunter Liggett 2003) establishes priorities and protocols for the identification and evaluation of historic properties within Fort Hunter Liggett. The document describes management procedures for known sites, as well as those that have not been inventoried. The plan also provides guidance and protocols for the inadvertent discovery of human burials or archaeological sites.

The strategies identified in Section 5.0 Current Condition and Management of Natural Resources at NBVC Fort Hunter Liggett Special Area are complementary and supportive of the Army's goals for cultural resource stewardship at Fort Hunter Liggett. Additionally, the SA/PRB process reviews all projects to ensure that natural, cultural, and historical resources at NBVC Point Mugu and Special Areas are protected. The SA/PRB process facilitates coordination between NBVC ED and the Army Cultural Resources Program to ensure compatibility of Navy projects with the goals and strategies of the Army's Integrated Cultural Resource Management Plan.

Table 1-3 lists other planning documents from a variety of sources. NBVC would also participate in regional landscape-level conservation planning efforts and initiatives such as Landscape Conservation Cooperatives or Population Vulnerability Assessments, as applicable. Landscape Conservation Cooperatives are a network of public-private partnerships, administered by the U.S. Department of the Interior, that provide shared science to ensure sustainability of the nation's land, water, wildlife, and cultural resources. Landscape Conservation Cooperatives provide science and technical expertise to support conservation planning at landscape scales and promote collaboration in defining shared conservation goals among its members (USFWS 2013).

TABLE 1-3: OTHER AGENCY AND REGIONAL PLANS AND INITIATIVES CONSIDERED IN THE DEVELOPMENT OF THIS INRMP

Authoring/Sponsoring Agency	Title	Date
Bureau of Land Management	California Coastal National Monument	2005
California Department of Fish and Game*	Marine Life Management Act Nearshore Fishery Management Plan	2002
California Department of Fish and Game*	Marine Life Protection Act Master Plan for Marine Protected Areas	2008
California Department of Fish and Game*	California Aquatic Invasive Species Management Plan	2008
California Department of Fish and Game*	Wildlife Action Plan	2007
California Department of Fish and Game and California Environmental Protection Agency	Ocean Action Plan	2004
Calleguas Creek Watershed Committee	Calleguas Creek Watershed Integrated Regional Water Management Plan, Volumes 1 and 2	2004 2005
National Park Service	Channel Islands National Park General Management Plan	1985
National Park Service	Channel Islands National Park Wildland Fire Management Plan	2006
The Nature Conservancy	Ventura Coastal Resiliency Project	NA
NOAA/NMFS	Channel Islands National Marine Sanctuary, Final Management Plan/ Final Environmental Impact Statement	2008
Pacific Fishery Management Council	The Coastal Pelagic Fishery Management Plan	1998
Pacific Fishery Management Council	Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery as Amended through Amendment 19 (including Amendment 15)	2008
Regional Water Quality Control Board	Los Angeles Region Basin Plan	1994
State Water Resources Control Board	Marine State Water Quality Protection Areas, Areas of Special Biological Significance	2003
U.S. Army	Integrated Cultural Resources Management Plan Fiscal Year 2003-2008, U.S. Army Reserve Training Center, Fort Hunter Liggett, California	2003
U.S. Army	Integrated Natural Resources Management Plan Fiscal Year 2004-2008, U.S. Army Reserve Training Center, Fort Hunter Liggett, California	2004
U.S. Fish and Wildlife Service	Draft Recovery Plan for Four Subspecies of Island Fox	2012
U.S. Fish and Wildlife Service	Light-Footed Clapper Rail Recovery Plan	1985
U.S. Fish and Wildlife Service	North American Waterfowl Management Plan	2004
U.S. Fish and Wildlife Service	North American Waterbird Management Plan	2002
U.S. Fish and Wildlife Service	United States Shorebird Conservation Plan	2001
U.S. Fish and Wildlife Service	Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (<i>Charadrius alexandrines</i> <i>nivosus</i> **)	2007
U.S. Fish and Wildlife Service	Recovery Plan for the Tidewater Goby (Eucyclogobius newberryi)	2005

TABLE 1-3: OTHER AGENCY AND REGIONAL PLANS AND INITIATIVES CONSIDERED IN THE **DEVELOPMENT OF THIS INRMP (CONTINUED)**

Authoring/Sponsoring Agency	Title	Date
U.S. Fish and Wildlife Service	Regional Seabird Conservation Plan Pacific Region	2005
U.S. Fish and Wildlife Service	Revised California Least Tern Recovery Plan	1985
U.S. Fish and Wildlife Service	Salt Marsh Bird's-beak Recovery Plan	1985
U.S. Fish and Wildlife Service	Thirteen Plant Taxa from the Northern Channel Islands Recovery Plan	2000
U.S. Fish and Wildlife Service	Partners-in-Flight Landbird Conservation Plans	
U.S. Fish and Wildlife Service	Draft Post-Delisting Monitoring Plan for the Brown Pelican	2009

Notes: * Current name: California Department of Fish and Wildlife. ** Current name: *Charadrius nivosus nivosus* (accepted by American Ornithologists' Union in 2006). NA= Not Applicable

2.0 MILITARY MISSION AND OPERATIONS

Southern California is home to the nation's largest concentration of naval forces. One-third of the U.S. Pacific Fleet makes its homeport in San Diego. The Southern California Range Complex is an adjacent ocean training range south of the Naval Air Warfare Center Weapons Division (NAWCWD) Point Mugu Sea Range that services a unique national military training capability in the southwestern U.S., centered around the Naval Auxiliary Landing Field, San Clemente Island. Other military bases in the region, including Vandenberg Air Force Base, benefit from the large expanse of the NAWCWD Point Mugu Sea Range, which provides electronic monitoring capabilities and controlled air and sea space. As part of the Navy's streamlined shore structure management, NBVC Point Mugu and Special Areas operate under the direction of Commander Navy Installations Command and Commander Navy Region Southwest in San Diego.

The following sections detail military mission-related functions and operations of NBVC Point Mugu and Special Areas. Section 2.1 details NBVC Point Mugu and Special Area Laguna Peak; Section 2.2 describes NBVC Channel Island Special Areas, and Section 2.3 details NBVC Fort Hunter Liggett Special Area.

2.1 NBVC POINT MUGU AND SPECIAL AREA LAGUNA PEAK

NBVC Point Mugu is a National Defense Resource that provides a unique combination of mission capabilities to the Navy and DoD. The mission of NBVC is "to provide integrated shore services to support the diverse needs of the fleet, fighter, and family in Ventura County" (http://cnic.navy.mil/Ventura/index.htm). NBVC Point Mugu provides site operation support services to the military defense complex in Ventura County that encompasses all military activities at NBVC Point Mugu, NBVC Port Hueneme, NBVC San Nicolas Island, and NBVC Special Areas.

The following sections detail the history and military mission-related functions and operations at NBVC Point Mugu and Special Area Laguna Peak.

2.1.1 Historical Overview

The following sections summarize the use of NBVC Point Mugu and Special Area Laguna Peak natural resources, pre- and post-Navy ownership.

2.1.1.1 Pre-Navy Land Use

Ethnohistory

Point Mugu and the surrounding area were occupied by the Chumash Indians before the Europeans first landed in 1542. Juan Rodriquez Cabrillo arrived near Point Mugu on 10 October 1542, and named the surrounding area "Mugu" after the Chumash word "muwu" for "beach." The village of "Muwu," a major Chumash cultural center during Cabrillo's time, existed until the late 1700s, when most of the inhabitants were removed to Mission San Buenaventura, located in what is now known as the City of Ventura. During the Spanish-Mexican period of 1769-1848, agricultural practices and specifically, cultivation of wheat, were established.

Spanish-Mexican Period (1769-1848)

In 1821, Mexico gained its independence from Spain and obtained California as its own. The new government dismantled the Spanish mission system in the mid-1800s and set up land grants, commonly known as "ranchos." By the 1840s, the Mexican ranchos extended along the coast of Ventura County and its major rivers and river valleys. The Point Mugu area, including Mugu Lagoon and extending to what is now Camarillo and the western fringe of the Santa Monica Mountains, was the location of two "ranchos," the Rancho El Rio de Santa Clara o La Colonia and the Rancho Guadalasca, owned by Ysabel Yorba. During that time, Mugu Lagoon was most commonly known as "Estero Grande," which meant a large lake near the sea, or a salt marsh (Swanson 1994).

Early American Period (1848-1880)

After the Mexican-American War of 1846-1848 and the transfer of government and ranchos to an American administration, the two ranchos at Mugu were divided and mapped. Initial maps of Rancho Guadalasca from 1861 depict Mugu Lagoon as a slough separated from the ocean by low sand banks. Two parcels of land near the lagoon were sold for development, but aerial photos taken between 1871 and 1876 show that no development had occurred. In 1876, these two parcels were sold to the Pacific Coast Steam Ship Company, which planned to develop a wharf site, but never did. Lack of development in and around the lagoon persisted, despite multiple land transfers among speculators.

Rancho El Rio de Santa Clara o La Colonia was mapped in 1867. By 1868, small parcels of the rancho had been sold to American settlers for agriculture, which spread to the northern outskirts of Mugu Lagoon (Swanson 1994).

Railroads, Agriculture, and Local Development (1870-1920)

The first railroad to come to Ventura County was the Southern Pacific in 1887. In 1901, this branch was incorporated into the Coast Line route between San Francisco and Los Angeles. The railroad contributed to a growth of agriculture by expanding transportation options beyond the existing steamships. However, the two largest crops produced in the Oxnard Plain, legumes and beets, did not reach Mugu Lagoon. The Mugu area remained mostly unsettled and unpopulated until the 1920s. Mugu Lagoon and the rest of Rancho Guadalasca saw unsuccessful attempts to settle and produce a viable crop on the land. Despite the establishment of rail lines along Calleguas Creek and the northwestern portion above the lagoon, the marshy land thwarted efforts to expand transportation to this area. Until the 1920s, Mugu Lagoon was used mostly as a drainage conduit (Swanson 1994).

Drainage and Agriculture (1920-1940s)

Since the 1880s, farmers have tried to use Calleguas Creek as a drainage system. In 1926, the lower portion of Calleguas Creek was channelized; levees were constructed in 1931 to further stabilize the creek.

In 1926, Oxnard Drainage District 2 was created to the east and southeast of Oxnard to improve the drainage at the duck clubs northwest of Mugu Lagoon. The drainage district administration attempted to mitigate the high water table and alkaline conditions that hindered agricultural development in that area. The district improved drainage by widening Pitcher Slough, a natural channel that drains toward the southeast into Mugu Lagoon, and establishing other smaller drainage ditches. Around that same time, Oxnard Drainage District 3 was created to serve the agricultural area immediately east and south of Oxnard, improving agricultural production in the area. Lands outside the duck clubs became cultivated lands (Swanson 1994).

Recreation and Agriculture (1920-1941)

The Mugu Lagoon could not support agriculture, so it was exploited largely for recreational hunting and fishing. Recreational access to the lagoon improved with the completion of the Pacific Coast Highway in 1920. The extensive erosion around the highway through Mugu made the roadway dangerous and earned it the name "Dead Man's Rock." Between 1937 and 1939, the roadway was stabilized; debris from construction was used to create a higher grade across the "Mugu flats," northwest of the construction zone.

The northern portion of Mugu Lagoon attracted waterfowl and hunters. Before the 1920s, hunting was mostly dominated by individuals and small groups of hunters. By the late 1920s, hunting clubs were firmly established for two reasons: direct competition with agriculture, and the change in the relationship between waterfowl and agriculture. Many farmers were pushing to find new ways to harvest crops in the marshlands surrounding the lagoon, which threatened the natural habitat of the waterfowl. In addition, the change from grain production to lima bean production threatened a food source for waterfowl: the grain that had fallen to the ground in the

fields was a source of food for ducks and geese. Hunting clubs were established in response to the apparent decrease in local duck populations. The clubs served to keep the supply of waterfowl constant by creating artificial ponds and feed centers.

The Ventura County Game Preserve and the Point Mugu Game Preserve, Inc., were established in 1908, and 1928, respectively. The preserves provided habitat and food sources for waterfowl to attract them for hunting purposes. The members built standing ponds supported by levees and walls and managed land for crop cultivation and duck feed. The wall and levee system kept tidal influence to a minimum, allowing for small crops of several varieties to be farmed (Swanson 1994).

Mugu Fish Camp (1929-1940)

The sand spit between the lagoon and the ocean was the site of the Mugu Fish Camp, which became regionally renowned in the late 1930s. In 1929, Long Bay Corporation obtained control of the mouth of the lagoon from the Pacific Coast Steam Ship Company. By 1929 and 1930, a 20-foot easement for an access road was put in place connecting the coastal highway with the mouth of the lagoon. This easement was complete with electric and telephone lines and gas and water pipes.

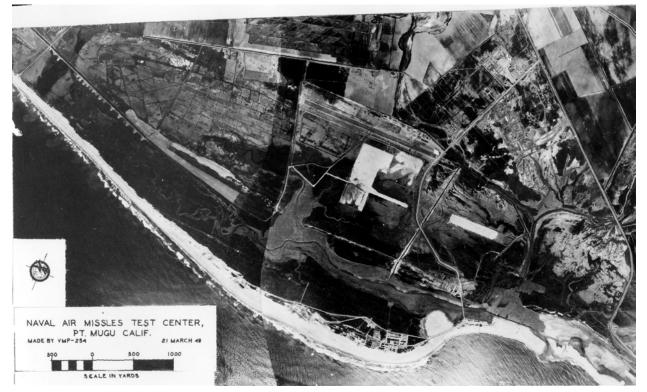
The Mugu Fish Camp was established when the easements were in place. The camp itself was located on the sand spit between the ocean and the lagoon, just west of the lagoon inlet. It was centered around a small wooden fishing pier and eight or nine small wooden shacks. The camp, which became an excellent hunting and fishing location, was connected to the mainland by a single-lane toll bridge now known as the Laguna Road Crossing. In 1941, the camp was shut down when the newest owners, of Japanese descent, were removed to a detention camp (Swanson 1994).

Additional information on the prehistory, ethno-history, and history of the Point Mugu and Special Area Laguna Peak area can be found in the *Integrated Cultural Resources Management Plan for Point Mugu and Port Hueneme, Naval Base Ventura County, California* (ASM Affiliates, Inc. 2010).

2.1.1.2 Historical Navy Land Use

In 1943, the Navy leased 4,000 acres of land around Mugu Lagoon for use as a training facility. In 1946, a temporary runway was constructed and the facility was recommissioned as the Naval Air Missile Test Center (see Photograph 2-1). In 1948, Congress appropriated funding for land acquisition and military construction to establish permanent operations at Point Mugu (Photograph 2-2). In 1949, the U.S. Naval Air Station was established. The Pacific Missile Test Range was established in 1958 and renamed the Pacific Missile Test Center in the mid-1970s. In 1993, the names were revised again: the Pacific Missile Test Center became Naval Air Warfare Center Weapons Division, and the U.S. Naval Air Station became Naval Air Weapons Station. In 1998, the installation name was changed to Naval Air Station Point Mugu, as a result of

changes in military operations at the base (ASM Affiliates, Inc. 2010; Onyx Group 2006). In 2000, Point Mugu was realigned and consolidated with NBVC.



PHOTOGRAPH 2-1: NAVAL AIR MISSILE TEST CENTER, POINT MUGU (1946) Source: Navy Historical Records

Currently, NBVC Point Mugu is a major center for naval weapons systems testing and evaluation. In addition, it provides range, technical, and base support for fleet users and other DoD agencies. NBVC Point Mugu currently maintains a fleet of more than 50 aircraft, many of which are uniquely configured to support the assigned test and evaluation mission for airborne weapons and electronic warfare systems. Aircraft are also used for mobile range instrumentation, range surveillance and clearance, target launch and recovery, and logistic support. The largest and most varied inventory of airborne targets in the Navy is maintained at NBVC Point Mugu. The installation also provides target support for the Mobile Sea Range operation around the world and, on request, at other test ranges that require sophisticated threat simulation support.

Additional information on historical Navy land use can be found in the *Integrated Cultural Resources Management Plan for Point Mugu and Port Hueneme, Naval Base Ventura County, California* (ASM Affiliates, Inc. 2010).



PHOTOGRAPH 2-2: NAVAL AIR MISSILE TEST CENTER, POINT MUGU (1956) Source: Navy Historical Records

2.1.2 Operations and Infrastructure

Activities and tenants associated with each land use category are described below. NBVC Point Mugu supports more than 40 tenant commands with diverse DoD missions, ranging from Seabee support, mobilization and military training, to test and evaluation of air and shipboard weapons systems for the strategic defense of the United States. It is a major shore command for aviation, supports Naval Construction Force mobilization, and supplies aircraft intermediate maintenance services to all military and transitory aircraft in the Ventura County area. NBVC Point Mugu operates and maintains base facilities including airfield operations for the U.S. Pacific Fleet units, NAWCWD, tenant commands, and transient units. Mission-related functions at NBVC Point Mugu and Special Areas include Air Operations, Research Development Acquisition

Testing and Evaluation (RDAT&E), Training, Ordnance, and Seabee Operations and Mobilization. Other branches of the military are supported through various tenant missions, including the U.S. Marines, U.S. Army, and U.S. Air Force (Onyx Group 2006). Occasionally, international military forces such as the Japanese Self-Defense Force and Israeli Defense Force use NBVC for training purposes.

NBVC Point Mugu and Special Area Laguna Peak host NAWCWD, its largest tenant, whose primary mission is developmental testing and evaluation of naval weapons systems. NBVC Point Mugu also supports the Commander Airborne Command Control and Logistics Wing and several other smaller tenant commands (Section 2.1.2 Operations and Infrastructure).

NBVC Point Mugu is responsible for command oversight of all airfield facilities; air traffic control tower operations; aircraft training (such as carrier deck certification); the Bird/Animal Aircraft Strike Hazard (BASH) program; maintenance and storage of weapons and their facilities; and aircraft maintenance facilities. The base also supports the Navy through troop mobilization, military training, and test and evaluation of land, sea, and air weapons systems.

NBVC Point Mugu has four runways: runway 21 to the north, runway 3 to the south, runway 9 to the west, and runway 27 to the east. The runways form an "X," which is described in this INRMP as the runway intersection. Airfield capabilities at NBVC Point Mugu enable Navy Commands to launch more than 205 missiles and 181 targets, supporting more than 1,870 range operations critical to air and sea weapons test and evaluation (Tetra Tech 2002).

NBVC Point Mugu has 853 buildings, including family housing units, food service buildings, recreational facilities, administration buildings, maintenance shops, training buildings, research facilities, and hangars. Many of the buildings were constructed on dredged material and other fill. Between NBVC Point Mugu and its counterpart, NBVC Port Hueneme, the installation employs more than 11,000 people, including 6,306 military personnel and 5,151 civilians (Tetra Tech 2012a).

Several of the more than 40 tenant commands supported by NBVC lands and facilities, conduct activities that may affect or be affected by natural resources and their associated environmental regulations (Table 2-1). The individual missions of these commands guide the activities of the tenants. For information on the other tenant commands at NBVC Point Mugu, please refer to the Activity Overview Plan (AOP) for NBVC (Onyx Group 2006). The AOP addresses regional land and facility requirements and provides land use recommendations.

NBVC Point Mugu also includes facilities on Laguna Peak located in the Santa Monica Mountains east of the main base. Laguna Peak encompasses approximately 16 acres of paved and landscaped land on the top of the mountain; both the NAWCWD and the Naval Satellite Operations Center use this area. Laguna Peak provides an elevated line-of-sight location for overlapping coverage of the Point Mugu Sea Range. The site also provides optics coverage, telemetry, airborne and surface target control, radio communication and data transmission, and surveillance radar.

Tenant Name	Mission Criticality	Land Use*	Command Summary
Airborne Tactical Advantage Company		Air Operations	The Airborne Tactical Advantage Company provides a growing fleet of tactical aircraft and services to the U.S. military, including the world's largest outsourced civilian airborne tactical air training, threat simulation, and research and development.
Channel Islands Air National Guard (146 th Airwing)	Mission Critical	Air Operations	The Air National Guard's federal mission is to maintain well- trained, well-equipped units available for prompt mobilization during war and provide assistance during national emergencies (such as natural disasters or civil disturbances). During peacetime, the combat-ready units and support units are assigned to most Air Force major commands to carry out missions compatible with training, mobilization readiness, humanitarian, and contingency operations. When Channel Island Air National Guard is not mobilized or under federal control, it reports to the governor of California. Under state law, the Air National Guard provides protection of life, property and preserves peace, order, and public safety. These missions are accomplished through emergency relief support during natural disasters such as floods, earthquakes, and forest fires; search and rescue operations; support to civil defense authorities; maintenance of vital public services and counterdrug operations.
Commander, Airborne Command Control and Logistics Wing Carrier Airborne Early Warning Squadron (VAW–112, VAW– 113, VAW-116, and VAW-117)	Mission Critical	Air Operations	Commander, Airborne Command Control and Logistics Wing conducts manning, training, and equipping the aircraft operations, weapons system management, battle space management, Field Carrier Landing Practices, search and rescue operations, electronic support, and communication and data link relay of four E-2C Hawkeye Squadrons.
Explosive Ordnance Disposal Mobile Unit 3	Mission Critical	Ordnance	Explosive Ordnance Disposal Mobile Unit 3 is now based in China Lake; however, for some ordnance found at NBVC, and determined unsafe for transport to China Lake, the unit may dispose of ordnance at NBVC. Explosive Ordnance Disposal Mobile Unit 3 provides immediate explosive ordnance disposal, diving, and demolition services on land or at sea in support of Navy assets aboard NBVC and on NAS Point Mugu Sea Test Range. Additionally, the unit provides emergency Explosive Ordnance Disposal support for flight operations, and support for local, state, and federal law enforcement agencies.
Fleet Logistics Support Squadron 55 (VR-55)	Mission Critical	Air Operations	VR-55 is a U.S. Navy C-130 squadron that provides around- the-clock logistical coverage to Naval assets deployed throughout the world. VR-55 is composed of Officers and Enlisted who are both Full Time Support and Selected Reserve.
Fleet Readiness Center Southwest – Site Mugu	Mission Critical	Air Operations	Fleet Readiness Center Southwest delivers responsive maintenance, repair and overhaul products and services in support of fleet readiness and national defense objectives. The Fleet Readiness Center supports aircraft carriers while in-port or at sea, and resource long and short-term detachments around the country and globe.

TABLE 2-1: NBVC POINT MUGU TENANT COMMANDS DISCUSSED IN THIS INRMP

Tenant Name	Mission Criticality	Land Use*	Command Summary
Naval Air Warfare Center Weapons Division (NAWCWD) (at Point Mugu,Special Area Laguna Peak, and Channel Islands Special Areas [Santa Cruz, Santa Rosa, and San Miguel Islands])	Mission Critical	RDAT&E	NAWCWD provides US Armed Forces with effective and affordable integrated warfare systems and life-cycle support to ensure battlespace dominance. They perform RDAT&E, logistics, and inservice support for weapons and aircraft weapons systems. The Naval Weapons Test Squadron is the principle Navy flight and ground test support activity for all NAWCWD aircraft and aircraft functions sited at NBVC Point Mugu, including logistics and fleet training support.
Naval Computer and Telecommunications Station San Diego- Ventura County Site	Mission Support	Information Technology and Communic ations	Naval Computer and Telecommuni-cations Station San Diego manages, maintains, and operates the information technology infrastructure and all Navy strategic communications in support of ashore and afloat war fighting customer.
Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC)	Mission Critical	RDAT&E	NAVFAC EXWC delivers specialized engineering and technology solutions that support sustainable facilities and provides logistics and expeditionary systems support for Navy combat force capabilities.
Naval Satellite Operations Center (at Point Mugu and Special Area Laguna Peak)	Mission Critical	RDAT&E	Naval Satellite Operations Center is responsible for the operation, management, and main-tenance of assigned satellite systems to provide reliable satellite services to war-fighters in support of Naval and national requirements.
Naval Test Wing Pacific, Naval Weapons Test Squadron (VX-30)	Mission Critical	Air Operations	Provides aircraft operations and RDAT&E support for weapons and weapons systems to the Naval Aviation Systems Team and fleet training services.
Navy Munitions Command Detachment Point Mugu	Mission Critical	Ordnance	Navy Munitions Command Detachment manages and supports NAWCWD RDAT&E, weapons maintenance, ammunition, and ordnance logistics.

TABLE 2-1: NBVC POINT MUGU TENANT COMMANDS DISCUSSED IN THIS INRMP (CONT	г.)
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Source: NBVC AOP, Onyx Group 2006 and Tetra Tech 2012b

Notes: * Land Use is described according to the 2006 AOP classifications. The most recent revision of land use classifications, provided by NBVC Planning and GIS departments in 2012, are shown on Figure1-5. RDAT&E= Research, Development, Acquisition, and Testing

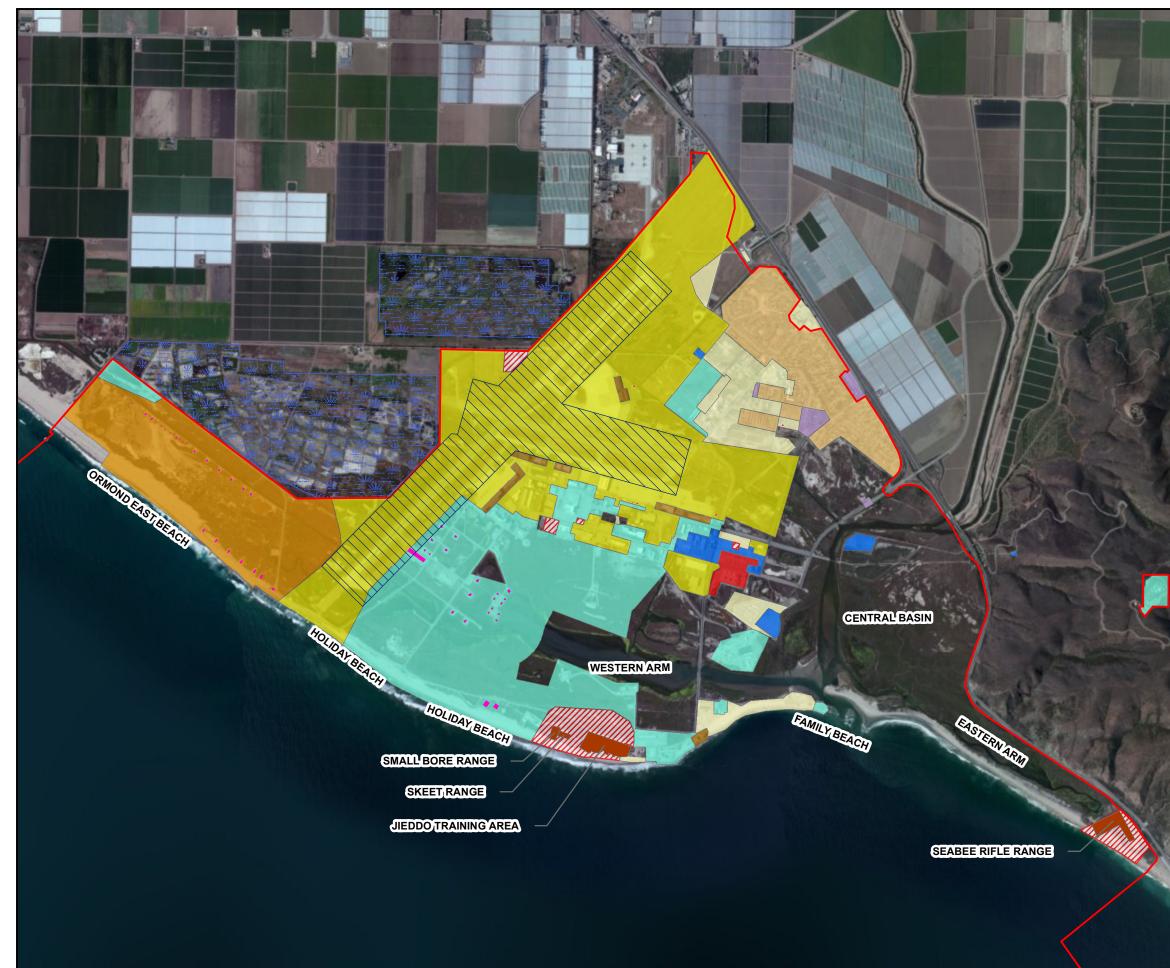
2.1.2.1 Military Land Use and Categories of Operations

NBVC Point Mugu encompasses approximately 4,490 acres, including the Mugu Lagoon, which is at the terminus of the Calleguas Creek watershed and includes 2,139 acres of wetland habitat delineated by the U.S. Army Corps of Engineers (USACE) as jurisdictional in 2011 (USACE 2013). In addition, approximately 179 acres of the base are devoted to airfields; 1,365 acres encompass urban and industrial areas; and 369 acres represent roads and paved areas; the remaining acreage includes landscaped, disturbed, and natural open upland areas.

The NBVC Point Mugu and Special Area Laguna Peak properties comprise 12 major land uses, as defined most recently by NBVC GIS and Planning departments for this INRMP: operations,

ordnance, training, maintenance, National Reserve, test and evaluation, fuel farm, public works, housing, community support, administration, and open space areas. Of these land uses, all but National Reserves and open space land uses are operational. Operational land uses are shown on (Figure 2-1). Table 2-2 details acreages for each land use designation. The operations category encompasses air operations land uses associated with the airfield and buffer space, terminal, storage, and mobilization facilities (Onyx Group 2006). Ordnance land uses are associated with magazines along the western panhandle of the base. Training land uses are in a small section along the central shoreline and at the rifle range in the far eastern portion of the base. RDAT&E land uses dominate the central portion of the base because of the extensive range-related functions and requirements. Laguna Peak land use is composed of the RDAT&E function (Figure 2-1). The heavily developed central portion of the base supports administration, public works, and logistics land uses. The housing area and community support functions are concentrated in the northeastern portion of the base and off base at Camarillo Housing at Catalina Heights. Integrated into the housing areas at Point Mugu are a variety of community and recreational support facilities. Camping and beach recreational areas are situated at the eastern end of the shoreline, west of the estuary mouth. Non-operational areas include open space (or natural resource management) areas, and National Reserve lands. Natural resources management area land uses are associated with the lagoon, salt marsh, open space areas, and at sandy beach and dune habitat along the coastline. Natural resources management area land uses are also designated at several wetland restoration sites that were previously managed under the NBVC Environmental Restoration Program. Further information on Environmental Restoration Program sites is in Section 6.5.

Regional land use is depicted on Figure 2-2 below.



Author: GK. Date: 10/10/2013. Data Source: TetraTech and NBVC GIS databases. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.





Legend

INRMP BOUNDARY AMMUNITION STORAGE AREA FIRING RANGES

Land Use 2008 Description

ADMINISTRATION		
AIRCRAFT OPERATIONS		
COMMUNITY SUPPORT		
FUEL FARM		
HOUSING		
MAINTENANCE		
TEST AND EVALUATION		
ORDNANCE		
PUBLIC WORKS		
TRAINING		
DUCK HUNTING CLUBS		
SURFACE AREA		
ESRI WORLD IMAGERY SATELLITE IMAGE		
1,0 <u>00 0 1,000 2,0</u> 00		
Feet		
Naval Base Ventura County		
Point Mugu		

FIGURE 2-1 POINT MUGU LAND USE

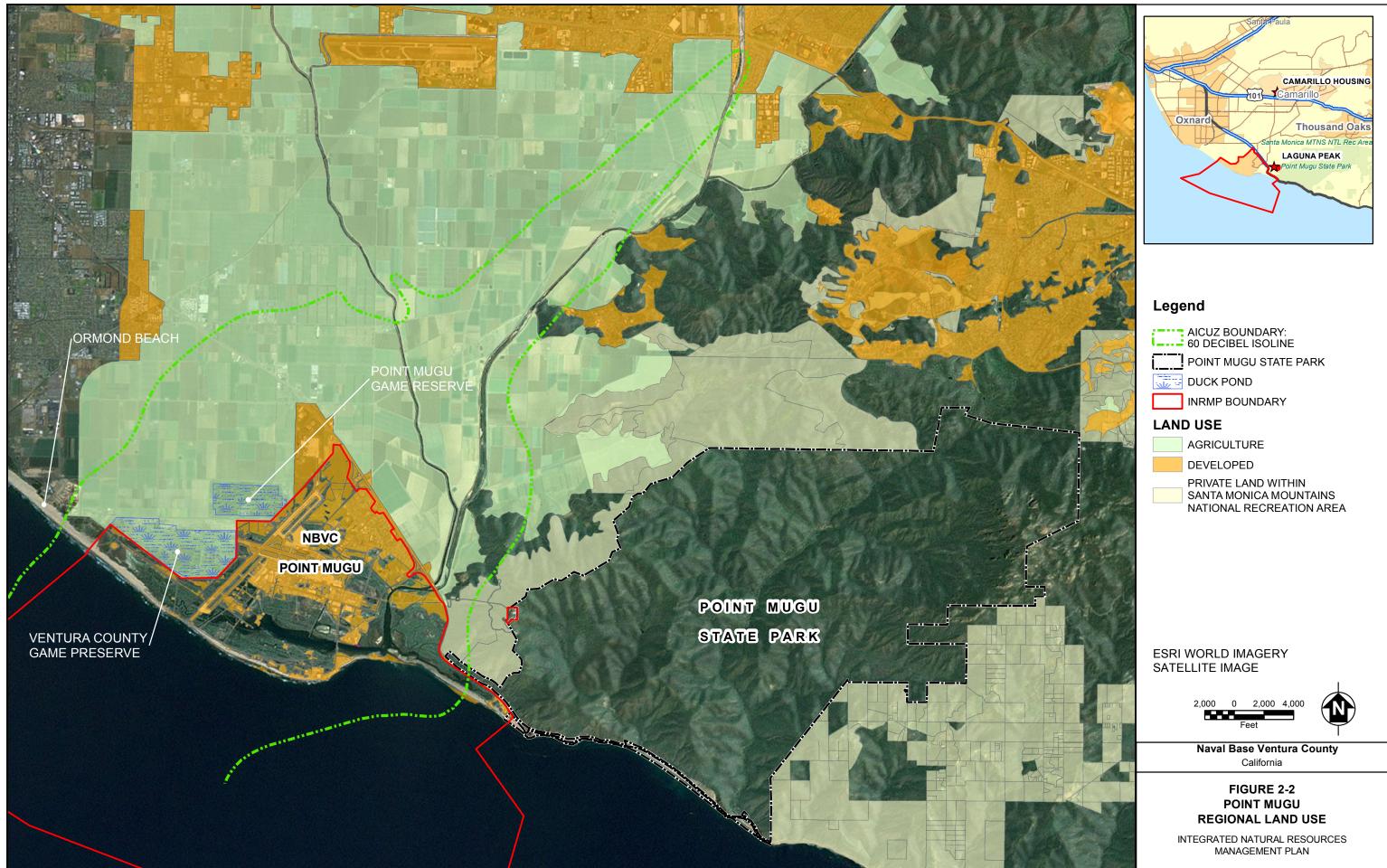
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

TABLE 2-2: NBVC POINT MUGU AND SPECIAL AREA LAGUNA PEAK LAND USE ACREAGE

LAND USE	ACRES			
Point Mugu				
Operational Areas				
Administration	17.04			
Community/Personnel Support	165.91			
Aircraft Operations	1,249.78			
Fuel Farm	18.61			
Housing	218.41			
Maintenance	24.73			
RDAT&E	820.41			
Ordnance	396.36			
Public Works	32.64			
Training	100.97			
Non-operational Areas				
National Reserve	1,001.15			
Open Space	260.44			
TOTAL	4,306.45			
Laguna Peak				
RDAT&E	39.01			

Note: Acreage is approximate and based on NBVC GIS shapefiles provided by NBVC Planning Department. Acreage does not include surface water.

Source: NBVC GIS database: 2008 Land Use.



Author: GK. Date: 10/10/2013. Data Source: TetraTech and NBVC GISDatabases.

This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

All development at NBVC Point Mugu is associated with the military; land uses and facilities were categorized and assessed in the NBVC AOP for Point Mugu, September 2006 (Onyx Group 2006). According to the AOP, land uses and facilities are categorized according to their mission criticality and considered Mission Critical, Mission Support, or Quality of Life. Land uses categorized by the AOP differ slightly from those shown on Figure 2-1 and are described below.

Mission Critical

Mission critical lands and facilities are those that directly support the mission of the installation and tenants. Mission critical functions at Point Mugu are air operations, RDAT&E, training, ordnance, and Seabee Operations/Mobilization. Mission critical land use at Special Area Laguna Peak is RDAT&E.

<u>Air Operations</u>: NBVC Point Mugu is homeport for several squadrons and a Wing Command. The installation supports Navy and Air National Guard C-130s, NAVAIR aircraft, and various sub-scale target drone aircraft (Onyx Group 2006). Tenants that conduct mission critical air operations at NBVC Point Mugu, and their associated aircraft used, include: Naval Test Wing Pacific, Naval Weapons Test Squadron (VX-30), which flies C-130, P3, and S3 aircraft; Commander, Airborne Command Control and Logistics Wing, Carrier Airborne Early Warning Squadron (VAW–112, VAW–113, VAW-116, and VAW-117) fly E-2C and E-2D aircraft; Fleet Logistics Support Squadron (VR-55) fly C-130s; Channel Islands Air National Guard operate C-130s; and the Airborne Tactical Advantage Company, which operates Mk-58 Hawker Hunters, L-39 Albatros, and F-21 Kfir aircraft. Fleet Readiness Center Southwest provides aircraft support services. Table 2-1 details the activities and command summaries for these tenants. Infrastructure related to air operations at NBVC Point Mugu include the airfield runways, taxiways, parking aprons, aircraft wash/rinse racks, aircraft hangars, communication towers, test facilities, fire station, storage buildings, administration, and maintenance shops.

The Commander, Airborne Command Control and Logistics Wing Carrier Airborne Early Warning Squadron regularly practice routine field carrier landing practices at and within the vicinity of NBVC Point Mugu and in the vicinity of habitat for special status species. The proximity of these activities to listed species, as well as to habitat for waterbirds, intensifies the risk to both natural resources and aircraft safety.

Seabee Operations/Mobilization: This mission-critical function is included in the aircraft operations land use. NBVC has the resources and capabilities to serve as one of the most effective and efficient mobilization areas on the West Coast. Assets include the airfield at NBVC Point Mugu and the deepwater port, railroad system, and laydown area at NBVC Port Hueneme. The airfield at NBVC Point Mugu is essential for efficient mobilization of personnel and equipment. NBVC Point Mugu supports the Seabees' ability to mobilize and meet required Office of the Chief of Naval Operations Time Phased Force Deployment Data timelines. The airfield can support mobilization of larger aircraft such as a 747, unlike the commercial airports at Oxnard and Camarillo, which do not have sufficient runway length and pavement load capacity.

The Defense Logistics Agency (see Mission Support) supports mobilization packing for the Seabees, the Army, Air Force, and Marine Corps units. Mobilization on even a modest scale is likely to include several military service branches, members of the Naval Construction Force, and significant amounts of material.

RDAT&E: Three tenant activities at NBVC Point Mugu conduct various RDAT&E functions —NAWCWD, Naval Facilities Engineering and Expeditionary Warfare Center, and Naval Satellite Operations Center (Table 2-1).

NAWCWD is the largest tenant organization at NBVC Point Mugu; it maintains approximately 188 facilities, primarily in the industrial area of the base. NAWCWD also has communication and missile tracking instrumentation facilities at Laguna Peak. The primary mission of NAWCWD is the developmental testing and evaluation of naval weapons systems. Responsibilities and activities are detailed in the Command Summary of Table 2-1 and summarized below:

- Performing RDAT&E, logistics and in-service support for guided missiles, free-fall weapons, targets, support equipment, crew systems, and electronic warfare systems;
- Integrating weapons and avionics on tactical aircraft;
- Operating the Navy's western land and sea range test and evaluation complex; and
- Applying new technologies to ensure battlespace superiority.

NAWCWD activities include missile launches and aircraft operations in the Point Mugu Sea Range, a 36,000-square-mile Special Use Airspace over the Pacific Ocean (Naval Facilities Engineering Command, Pacific 2008). The Point Mugu Sea Range parallels the California coastline for about 200 miles and extends seaward for more than 180 NM. The Point Mugu Sea Range is a primary test and evaluation range where air-to-air and surface-to-surface missiles are tested (Onyx Group 2006). NAWCWD aircraft take off from NBVC Point Mugu and pass over the Point Mugu Sea Range, away from Mugu Lagoon, to take part in missile operations. Naval Facilities Engineering and Expeditionary Warfare Center is headquartered at NBVC Point Mugu airfield for facility technology test and evaluation in support of its ocean and onshore facility programs (Onyx Group 2006).

Naval Satellite Operations Center operates, manages, and maintains assigned satellite systems, with facilities on Laguna Peak and laboratory and testing facilities at Point Mugu (Onyx Group 2006).

Training: The tenant commands at NBVC Point Mugu that have training missions are shown in Table 2-1. At times, NBVC receives requests from other tenants or military commands outside of NBVC to conduct training. Land use designated for on-the-ground training are identified on Figure 2-1, and include the following areas: the abandoned golf course, ball fields,

rifle ranges, and the Joint Improvised Explosive Device Defeat Organization Battle Course (JIEDDO), referred to as the "JIEDDO training area." The golf course and ball fields are used primarily for visiting military such as the Marines for ground troop training exercises associated with establishing temporary camps. Rifle ranges include the Small Bore Range, located off Holiday Beach, and the 31st Small Arms Range, located off Highway 1 at the eastern boundary of the installation (Figure 2-1). A trap and skeet range was in operation at NBVC Point Mugu until cleanup of the site occurred in 2012. The site is now part of the adjacent Small Bore Range, with potential use in the future as a trap and skeet range, or modified for use as a firing range. The rifle ranges are used at various times by visiting and resident members of the Armed Services for small arms certification, by NBVC Force Protection, and by Navy combat troops. The ranges are also available for use by outside enforcement agencies such as the Federal Bureau of Investigation. The JIEDDO training area is a pseudo-village built as a joint effort of the Armed Services to train troops in counter-improvised explosive device awareness and reaction. Activities are primarily conducted in the structures and along the roads and roadsides of the training area.

Ordnance: The NBVC Weapons program includes the NBVC Weapons Department and one tenant, NAWCWD. The Explosive Ordnance Disposal Mobile Unit 3 is based out of China Lake, but for some ordnance found at NBVC and determined unsafe for transport to China Lake, they may dispose of ordnance at Point Mugu (Table 2-1). The NBVC Weapons Department receives, stores, and issues ammunition in support of various tenants and transient aircraft squadrons, including units from the following: Commander, Naval Air Force U.S. Pacific Fleet; Commander, Naval Air Force U.S. Atlantic Fleet; Commander, Marine Forces; and Commander, Naval Reserve Forces. The program provides conventional ammunition management for ordnance held in assigned magazines and facilities at NBVC Point Mugu, including two small arms ranges and an armory. Conventional air-launched weapons are assembled and delivered to the Combat Aircraft Loading Area in support of Pacific Fleet training operations (Onyx Group 2006).

Mission Support

Mission support lands and facilities are those that indirectly support the mission of the installation and tenants. Mission support functions at NBVC Point Mugu include Supply/Logistics, Facilities/Sustainment Restoration Modernization, Utilities, Base Services, Information Technology (IT)/Communications, Federal Fire, Force Protection, Environmental, and Religious Services. Special Area Laguna Peak has no Mission Support lands or facilities.

<u>Supply/Logistics</u>: The Defense Logistics Agency supports NBVC Point Mugu, NBVC Port Hueneme, NBVC San Nicolas Island, and most tenant commands. At NBVC Point Mugu, the Defense Logistics Agency supports all aircraft squadrons by providing logistic support for aviation maintenance, squadron deployment, and operations functions. The supply function also provides logistic support for DoD units using the airfield during routine deployment and during mobilization. The majority of supply warehouses in NBVC are located at NBVC Port Hueneme. To meet the military's needs for rapid mobilization and deployment, most equipment and gear are packed and shipped in large standardized shipping containers by ship or aircraft.

<u>Fuel</u>: The Defense Logistics Agency manages fuel facilities at NBVC Point Mugu, Port Hueneme, and San Nicolas Island. Since 1997, the Defense Logistics Agency has implemented projects to reconstruct and update fuel facilities at all three locations. At NBVC Point Mugu, the Fuels Division manages and maintains a 1.5-million-gallon fuel farm, located east of Laguna Road, on the north and south sides of 13^{th} Street (Figure 2-1).

The Defense Logistics Agency provides reuse and recycling services to NBVC Point Mugu, Port Hueneme, and other DoD clients in the area from Long Beach to Paso Robles. The Defense Logistics Agency is currently involved in a joint venture with a private contractor to reuse or dispose of excess material. Computerized material trading replaced on-site auctions as part of the new Most Efficient Operation procedures. The goal of the procedures is to reduce or eliminate Defense Logistics Agency facility requirements by converting to a "virtual warehouse," where items will be shipped directly from the source to a new user. Recyclable electronics, rehabilitated equipment, and scrap metal are shipped directly to new users. This process has reduced storage, facility, and handling costs (Onyx Group 2006).

Facilities/Sustainment Restoration Modernization: Public Works facilities include buildings for automobile and general Public Works maintenance, and Public Works administrative functions. Public works facilities are generally grouped in small clusters at various locations around NBVC. The Public Works Department specializes in engineering, planning, facility maintenance and management, transportation operations, and utility energy management. NBVC Public Works, led by the Public Works Officer, is responsible for the sustainment, restoration, and modernization of facilities that includes maintenance, repair, replacement, and upgrades to NBVC Point Mugu facilities. Concerns, objectives, and strategies related to natural resources management in the context of facilities upgrades and maintenance are addressed in Section 6.7, Construction, Facility and Utilities Maintenance.

Transportation operations at NBVC Point Mugu consist of maintaining 69 miles of paved roads and the airport runways. Access to the base is by two entrance gates located on the northeastern perimeter, off Highway 1 at Naval Air Road and Las Posas Road. Vehicular circulation is via arterial and local roads; the largest roads (North Mugu Road and Las Posas) traverse the base from northeast to southwest from the entrance gates, connecting to 11th and 13th Streets, which go through the industrial and administrative areas at the center of the installation. Laguna Road and Perimeter Road provide access to the beaches and the southernmost parts of the base (Figure 1-2) (Navy 1997 and Onyx Group 2006).

As part of utility energy management, NBVC was established as a Navy Energy Showcase in April 1995. The goals of the showcase are to demonstrate the innovation and leadership of the Navy in the field of energy efficiency and conservation. The showcase strives to reduce energy use below the 30 percent reduction goal established by Executive Order (EO) 12902 "Energy Efficiency and Water Conservation at Federal Facilities" (08 March 1994). The purpose of the showcase is to produce energy cost savings in a manner that can be adapted and implemented by other Navy facilities (Onyx Group 2006).

NBVC has provided leadership in energy efficiency by exceeding the objectives of EO 13123 "Greening the Government through Efficient Energy Management" (03 June 1999) (superseding EO 12902) through efficient design practices and aggressive energy management. Projects in support of energy efficiency at NBVC Point Mugu include a basewide lighting retrofit and a solar-thermal heating system for the recreation center pool water (Tetra Tech 2012c).

The centerpiece of the showcase is the Navy's Energy Demonstration Facility at NBVC Port Hueneme. The facility uses environmentally sustainable building technologies and products, including photovoltaics, solar hot water, and sustainable landscaping.

Over time, this program can reduce energy costs. Energy efficient programs increase awareness of energy use and lay the groundwork for cost reduction through energy reduction (see Section 6.7.4, Sustainability in the Built Environment).

<u>Utilities:</u> The following sections summarize utilities infrastructure at NBVC Point Mugu. Concerns, objectives, and strategies related to natural resources management in the context of utilities upgrades and maintenance are addressed in Section 6.7, Construction, Facility and Utilities Maintenance.

Electrical Distribution: Electrical infrastructure at NBVC Point Mugu consists of overhead electrical distribution systems encompassing 411 primary poles and copper conductor lines that were recorded to be in adequate condition during a 2006 inspection, according to the AOP (Onyx Group 2006). Buildings with critical missions have stand-by generators. NBVC Point Mugu purchases electricity from the Southern California Edison Company and Strategic Energy.

Water Supply and Distribution: NBVC Point Mugu purchases all of its potable water from the Port Hueneme Water Agency, the wholesale provider for the City of Port Hueneme, the Channel Islands Beach Community Services District, and NBVC Point Mugu and Port Hueneme. The Port Hueneme Water Agency obtains water from the United Water Conservation District and Calleguas Municipal Water District. The Port Hueneme Water Agency serves a population of approximately 50,000 and has relatively fixed water requirements. It provides potable water by treating United Water Conservation District water at the Port Hueneme Water Agency Brackish Water Reclamation Demonstration Facility that uses three different desalination techniques. Calleguas Municipal Water District water is used to meet demand and is obtained from the Sierra Nevada Mountains and delivered through State Water Project reservoirs, aqueducts, and pump stations (City of Port Hueneme 2011).

Sanitary Sewer System: NBVC Point Mugu has a complete sanitary sewage collection system with lift stations, force mains, and manholes. The collected sewage is pumped through a 10-inch force main to the Oxnard Wastewater Treatment Plant for secondary treatment and discharge (Onyx Group 2006). One emergency pond remains from the four sewage ponds located east of Calleguas Creek, to be used in the event of a failure of the current sewage distribution system.

Base Services: Base services at NBVC are provided by the Commanding Officer, Chief Staff Officer, Administration, and Human Resources. Administrative facilities supporting base services and command staffs are dispersed throughout NBVC Point Mugu. In general, most stakeholders have administrative space in their main buildings. Other larger stakeholders have buildings solely dedicated to administrative support.

IT/Communications: NBVC IT personnel provide installation and implementation of comprehensive document management systems and the creation of Web-based applications. Naval Satellite Operations Center's headquarters are located at NBVC Point Mugu and the majority of its remote tracking, telemetry and command and control communications facilities are located on Laguna Peak. NAWCWD uses antenna fields located at 7th Street and C Street (Onyx Group 2006).

Federal Fire: The Federal Fire Department Ventura County provides NBVC Point Mugu with fire prevention, engineering and education programs, urban search and rescue, hazardous response, and emergency medical service. The department responds to and mitigates emergencies involving aircraft, ships, and structures 24 hours a day. The NBVC Point Mugu Fire Department has an agreement with the City of Oxnard and Ventura County for assistance with fire services. The Fire Department is composed of three stations at NBVC: Station 1 and Station 2 are located at NBVC Point Mugu to provide structural and aircraft fire protection.

Force Protection: NBVC Point Mugu security personnel provide security to protect activities and their facilities, materials, equipment, personnel, and documents against espionage, unlawful entry, and other acts that affect the ability of the command and its supported activities to perform their missions efficiently and effectively. Security personnel operate a 9-1-1 emergency telephone system. Other tasks include providing support to NBVC ED by enforcing sensitive area closures and communicating information on marine mammal strandings or injured wildlife (see Section 3.8). Other duties of force protection include providing information on all traffic and parking regulations, requirements for obtaining vehicle decals, passes and badges, bicycle registration, weapons registration, and temporary vehicle storage for deploying personnel. The Naval Criminal Investigative Service is collocated with Force Protection. NBVC has an Emergency Operations Center to manage disaster response and recovery. According to the AOP, NBVC is working toward a cohesive multi-tenant approach to enhance Emergency Operations Center capability (Onyx Group 2006).

Resource Management: The NBVC ED manages the Navy's natural and cultural resources through its environmental programs, which include the following: Natural Resources, Cultural Resources, Pollution Prevention, Air and Water Quality, Hazardous Materials, Solid Waste, Hazardous Waste, Site Cleanup, Field Operations, Emergency Planning, Pest Management, and Environmental Quality. NBVC ED personnel at Point Mugu include the following programs: Hazardous Waste Storage Facility, Compliance, Water Quality and Conservation, Planning, and Energy Conservation. The natural resource management programs for NBVC Port Hueneme and San Nicolas Island are also administered from the Environmental Division office.

The NBVC Recycling Program at Point Mugu has recycling offices and fully functional recycling centers. The NBVC Recycling Office assists individuals and activities in developing or expanding recycling programs by offering recycling information, equipment, and recyclable material pickup services.

<u>Religious Services</u>: The Religious Services Ministry and chapel at NBVC Point Mugu provide multi-faith religious services and support programs to assigned fleet personnel, civilians, and their dependents.

Quality of Life

Quality of life lands and facilities are those that support the well-being of the warfighter. Quality of life lands and facilities at Point Mugu include Housing, Recreation/Community Support, Food Services, Social Services, and Health Services. Special Area Laguna Peak has no Quality of Life lands or facilities.

Housing: Bachelor housing is provided for those who are single or stay at NBVC without their families. NBVC Point Mugu provides 1,091 beds for bachelor housing. Military family housing is mostly concentrated on the eastern end of the site. Approximately 1,546 civilian and military personnel and their dependents live on site in 798 family housing units. Figure 2-1 shows the location of housing facilities.

<u>Recreation/Community Support:</u> Morale, Welfare and Recreation (MWR) personnel provide a full range of recreation and hospitality services to meet the physical, social, leisure, and mental wellbeing needs of military personnel, their family members, DoD civilians, and other authorized personnel. NBVC Point Mugu is bordered by agricultural land and, as such, has few off-base recreation and community support opportunities in the immediate vicinity. NBVC's waterfowl hunting program supports quality of life for NBVC's listed personnel. Additional recreational opportunities on base include a fitness gym, soccer fields, a former golf course, and family beach. Other community support includes educational programs offered through the Navy College Office, Navy College Learning Center, and other on-base degree programs, such as the University of LaVerne, Embry Riddle Aeronautical University, and the University of Phoenix.

Refer to Section 6.9, Recreation and Public Access, for additional detail on recreational opportunities.

Food Services: The NBVC Defense Logistics Agency program handles food service facilities at the galley. The galley can serve 3,000 to 3,500 personnel per day. During mobilization, the galley must be able to handle a rapid influx of personnel, so it is set up for large areas with expansion capability.

Social Services: Social services at NBVC Point Mugu include Red Cross, the Fleet and Family Support Center, and youth programs. Services include clinical and financial counseling,

transition support, child development and childcare, Cardiopulmonary Resuscitation, and First Aid.

Health Services: The branch medical clinic at NBVC Point Mugu provides medical services to NBVC personnel, including urgent care, routine outpatient services, physical therapy, and non-therapeutic activities. The dental clinic offers routine general dental services to NBVC active duty personnel, including examinations, X-rays, treatment planning, preventive dentistry, and fillings.

2.1.3 Real Estate Summary: Leases and Real Estate Outgrants

The Point Mugu installation is composed of developed land with a mix of residential and industrial land uses, and open space or natural resource areas, and open water (Table 2-2). NBVC Point Mugu encompasses approximately 4,490 acres (including submerged lands not shown in Table 2-2), as follows: 2,139 acres of wetlands, 297 acres of beaches, 356 acres of uplands, 435 acres of airfield grasslands, and 1,263 acres of developed (paved) land. NBVC ED conducts management throughout the installation, as detailed in this INRMP. As of May 2013, NBVC has approximately 29 outgrant licenses, leases, and agreements with non-Navy entities for entry and/or use of NBVC property for a specific purpose, and one in-grant easement for Navy use of non-Navy property.

OPNAVINST 5090.1C CH-1 requires the Navy to identify areas that may be suitable and available for agricultural outleasing or commercial forestry. More specifically, the Military Construction Authorization Act provides for the use of DoD lands under a lease to an agency, organization, or person for agricultural outleasing or the production of and sale of forest products with commercial value. At NBVC Point Mugu, there are no lands suitable for agricultural or forest timber production as a result of its geographic setting in an estuary, existing developed lands, and operational requirements of existing open spaces. There are also no areas of the base that are used for a real estate outlease program. In the event that an outlease program were to develop at NBVC Point Mugu, NBVC ED would manage leased lands similarly to unleased lands: all proposed projects on leased lands would go through the SA/PRB screening process for NEPA compliance, codified in NBVC Instruction 11010.1A, which includes review by the NBVC ED Natural Resources Manager and other NBVC ED staff (Section 6.4 Regulatory Compliance).

The NPS manages the Santa Monica Mountains National Recreation Area southeast of NBVC Point Mugu. A large portion of Mugu Lagoon, including the eastern arm and central basin are covered under a Memorandum of Agreement (MOA) between the Department of the Navy and the Department of the Interior, entered into on 10 December 1974 (Appendix P). Per the MOA, "the Lagoon, other station wetlands, and adjoining uplands as mutually agreed upon" would be made available for transfer to the Department of the Interior for administration as part of the National Wildlife Refuge System, consistent with federal statutes and regulations, in the event that NBVC Point Mugu was no longer needed for national defense purposes. The MOA responsibilities of the NPS and Navy are detailed in Appendix P.

All proposed projects on leased land must go through the SA/PRB screening process and receive a site approval from local and regional Navy. As necessary, best management practices (BMPs) are required of the project to protect soil integrity and water quality. This project screening process is a streamlined means for project sponsors to comply with NEPA and the laws, regulations and guidelines described above. Section 6.4 Regulatory Compliance further describes the SA/PRB process.

2.1.4 Future Use Patterns and Plans: The NBVC Point Mugu Activity Overview Plan and Sustainable Planning and Design

The NBVC Point Mugu Activity Overview Plan identifies future use patterns and plans that focus on maximizing efficiency of existing spaces by upgrading current facilities and infrastructure. Efficient use of existing facilities is identified in the NBVC AOP as crucial to maintaining mission readiness (Onyx 2006). The AOP proposes a land use plan that depicts a long-range framework for development, renovation, and consolidation within the existing land use pattern. While the proposed land use plan does not recommend the addition of a large number of newly constructed facilities, it does recommend alterations to present land use designations, renovations, demolitions, and consolidation projects that will help the base maintain mission activities. The demolition of facilities, in particular, creates an opportunity to rebuild in the developed footprint, reducing the need to break new ground (Onyx Group 2006).

The AOP identified a preferred vision to construct facilities supporting new and expanded mission requirements, create more community support to meet facility requirements, eliminate duplication, and reduce infrastructure costs. The preferred vision presents an implementation strategy for meeting short-term, mid-term, and long-term planning actions for land and facility use (Onyx Group 2006).

Short-term planning actions are those that will occur within 5 years. These actions consist of high-priority construction to meet immediate deficiencies; reuse of facilities with minor to no modification; conversion of Navy-owned land into training ranges; modifications or conversions of leased facilities; and minor construction with few development constraints.

Mid-term planning actions are those that will occur between 5 to 10 years and consist of projects that typically require a series of actions. Those actions include projects that must be processed through the Installation Integrated Priority List and actions predicated on prior planning actions such as facility demolitions or user relocation.

Long-term planning actions occur beyond 10 years, to be implemented by 2030. Long-term planning projects are those that are lower on an Installation Integrated Priority List than other similar projects; are predicated on facilities exceeding their life expectancy prior to 2030; have significant costs that would preclude mid-term implementation; or that depend on implementation of mid-term actions (Onyx Group 2006).

Projects recommended for implementation are detailed in the NBVC AOP. They consist largely of infrastructure improvements in existing footprints. The recommended projects are based on the principles of sustainable planning and design, with the goal of implementing strategies for buildings and landscapes that conserve the environment, reduce life cycle costs, increase energy efficiency, and improve the quality of living conditions (Onyx Group 2006). Operating costs can be lowered by reducing the energy use through high-performance building systems, employing renewable energy sources, optimizing solar orientation, and reducing the amount of materials and man hours required for maintenance. Providing good ventilation, natural task lighting, and avoiding items that emit chemicals can optimize living conditions (Onyx 2006). See Section 6.7.4, Sustainability in the Built Environment, for detail on sustainable strategies employed by the Navy.

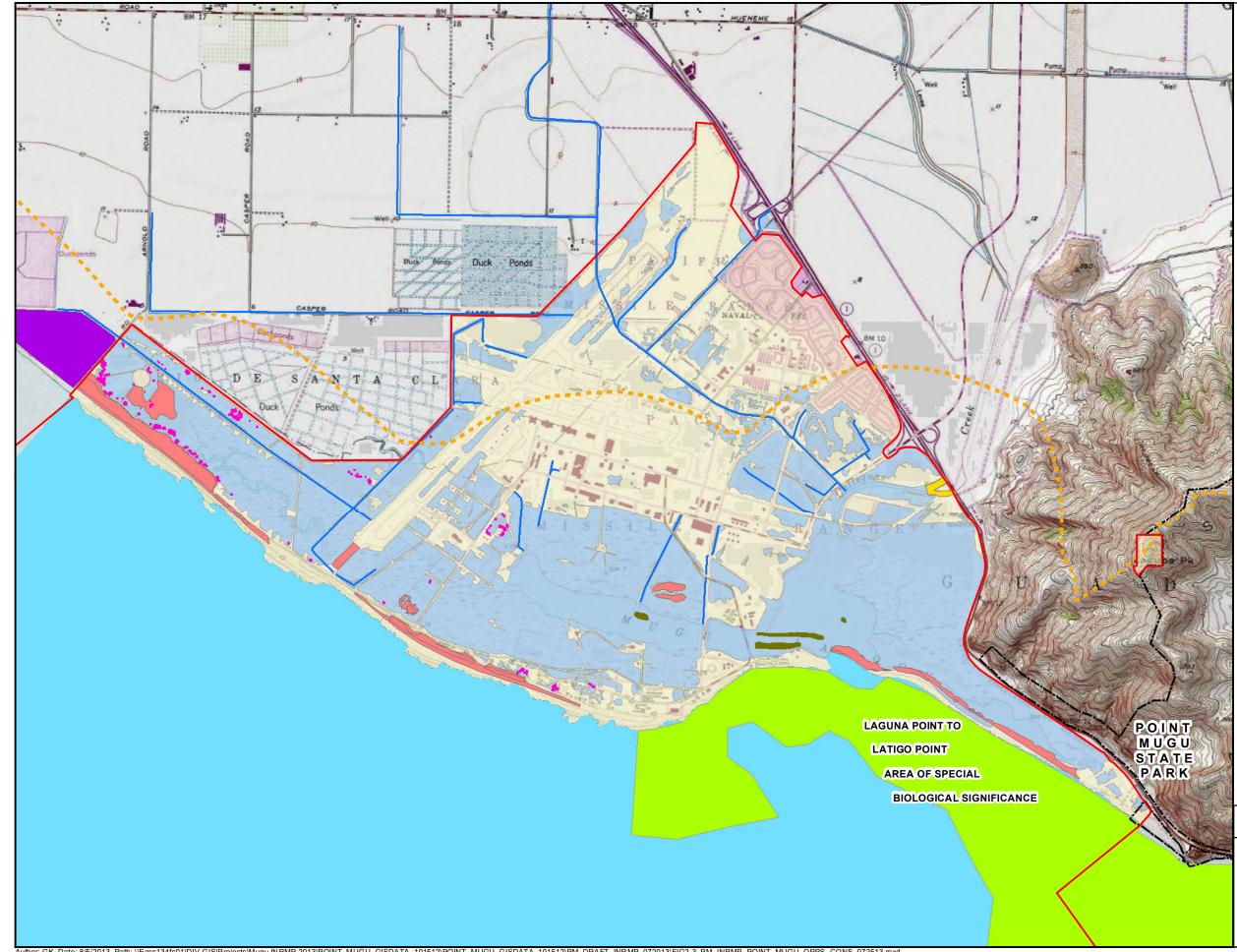
Of the proposed projects that are currently being reviewed through the SA/PRB and NEPA process (Section 6.4 Regulatory Compliance), one involves land development, but no change in land use designation. An "Environmental Assessment Addressing the West Coast Homebasing of the MQ-4C Triton Unmanned Aircraft System" was recently completed. The MQ-4C Triton is a new broad area maritime surveillance unmanned aircraft system that will complement the Navy's Maritime Patrol and Reconnaissance Force family of systems, delivering signal intelligence and maritime strike capabilities. At NBVC Point Mugu, the abandoned golf course adjacent the airfield would be developed to house additional aircraft hangars. The current land use designation is "Air Operations" (Figure 2-1) and would not change with the new development.

2.1.5 Encroachment Opportunities

Encroachment opportunities, in the context of this INRMP and as defined by the AOP (Onyx Group 2006), are areas of NBVC Point Mugu and Special Area Laguna Peak where there are little to no restrictions on military training, testing, and operations. The following sections detail internal and external opportunities at NBVC Point Mugu and Special Area Laguna Peak. Opportunities are displayed on Figure 2-3.

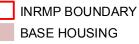
Internal Opportunities

The AOP identified existing opportunities at NBVC Point Mugu, primarily for mission support functions such as additional housing and administrative area development. Opportunities identified in the AOP include infill development, bachelor housing expansion, re-use of Environmental Restoration sites, and re-use of the Point Mugu golf course. According to the AOP, infill development of needed facilities could occur in the housing area bounded by 7th Street, 6th Street, C Street, and 8th Avenue. Infill development in this area would be compatible with surrounding land uses. The demolition of facilities also creates an opportunity to rebuild on land that has previously been developed, thus reducing the need to break new ground (Onyx Group 2006).



Author: GK. Date: 8/5/2013. Path: \\Ecss134fs01\DIV-GIS\Projects\Mugu INRMP 2013\POINT_MUGU_GISDATA_101512\POINT_MUGU_GISDATA_101512\POINT_INRMP_072013\FIG2-3_PM_INRMP_POINT_MUGU_OPPS_CONS_072513.mxd Data Source: TetraTech Databases; NBVC ED GIS database; USACE 2011 Point Mugu Wetland Delineation boundary file; ASBS boundary digitized from State Water Resources Control Board ASBS This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

Legend



AREAS WITH CONSTRAINTS

- - - COASTAL ZONE BOUNDARY " POINT MUGU STATE PARK BOUNDARY DRAINAGE DITCHES SALT MARSH BIRD'S BEAK SEAL HAULOUTS **TIDEWATER GOBY** OCCUPIED HABITAT FEDERALLY LISTED SPECIES **NESTING HABITAT** WESTERN SNOWY PLOVER **CRITICAL HABITAT** AREAS OF SPECIAL **BIOLOGICAL SIGNIFICANCE** PACIFIC OCEAN: ESSENTIAL FISH HABITAT AND USACE WATERS OF THE US USACE JURISDICTIONAL WETLANDS AND NOAA/NMFS ESSENTIAL FISH HABITAT AND HABITAT OF PARTICULAR CONCERN **AREAS WITH OPPORTUNITIES** OPPORTUNITIES 1.000 1.000 2.000 Naval Base Ventura County

California

FIGURE 2-3 POINT MUGU OPPORTUNITIES AND CONSTRAINTS

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN Bachelor housing could expand into adjacent community support and open space lands, given no environmental restrictions (Onyx Group 2006). The re-use of Environmental Restoration sites that have been cleaned and determined to pose little risk to human health may present attractive opportunities for development. The abandoned golf course at Point Mugu offers opportunities to expand operations and administrative land uses adjacent the airfield, given no conflicts with airfield safety and clear zones and no environmental constraints (Onyx Group 2006).

External Opportunities

As a result of the neighboring land ownership surrounding NBVC Point Mugu and Special Area Laguna Peak, few opportunities exist for base growth outside existing boundaries. Opportunities for additional base support functions may exist in neighboring communities, such as that afforded by NBVC Special Area Camarillo Housing, which provides additional family housing (Onyx Group 2006). There may be natural resources opportunities that could alleviate pressure on the base, such as compatible use or buffer parcels and partnering for wetland mitigation or habitat enhancement. These potential encroachment opportunities were not discussed in the 2006 AOP.

2.1.6 Constraints

The Navy AOP defines constraints or encroachment primarily as any action planned or executed that inhibits, curtails, or has the potential to impede the performance of Navy activities. Encroachment challenges can include urban development; environmental constraints such as water quality or endangered species; population growth; competition for air, land, and sea space; competition for resources such as potable and irrigation water; and safety arcs and footprints (Onyx Group 2006). The following sections identify potential internal and external encroachments at NBVC Point Mugu and Special Area Laguna Peak.

Internal Constraints

Environmental constraints can dictate where and when certain types of activities can occur to ensure regulatory compliance and the long-term sustainability of natural resources on the installation. Natural resources at NBVC Point Mugu with the ability to limit activity include USACE jurisdictional wetlands, special status species, marine mammals, migratory birds, and essential fish habitat (EFH). Additionally, the majority of NBVC Point Mugu and Special Area Laguna Peak are within the coastal zone, and ocean waters directly off of Point Mugu are Areas of Special Biological Significance (Figure 2-3). NBVC Special Areas are subject to regulations associated with the Migratory Bird Treaty Act. Additional natural resources drivers are listed in Appendix B. Cultural resource constraints are described in the *Integrated Cultural Resources Management Plan for Point Mugu and Port Hueneme, Naval Base Ventura County, California* (ASM Affiliates, Inc. 2010).

Military training and testing operations at NBVC Point Mugu and Laguna Peak occur in designated areas limited in natural resources, consisting of disturbed open space land. Some

operational activities occur in sensitive resource areas, but have minimal or no impacts to resources. Currently, these activities are not constrained by environmental requirements. If the needs of the military mission or associated resource requirements change, the potential for conflicts with natural resources could occur in the areas discussed above. Areas at NBVC Point Mugu where activity should be limited are shown on Figure 2-3, and the related constraints are discussed below:

- Activities in and around wetlands and shorelines are limited by Clean Water Act regulations that prohibit fill in wetlands. Activities that could result in a Clean Water Act violation include filling, modifying, draining, or construction in USACE delineated wetlands. Any new projects or types of training in or around wetlands and shorelines must be coordinated with NBVC ED staff to ensure they comply with all applicable laws.
- Activities that would result in construction in the Coastal Zone and associated Environmentally Sensitive Habitat Area.
- Constraints created by the presence and new arrivals of special status species may affect operations.
- Constraints posed by migratory birds would relate to any operation that may result in abandonment or destruction of nests from structures and natural areas.
- Constraints from marine mammals would stem from activities conducted near their regular haul-out that could result in harassment or otherwise negatively affect marine mammals. If marine mammals could be affected from mission operations, there would need to be consultation with NMFS.
- Constraints caused by activities that may affect EFH.

External Constraints

NBVC assists the DoD in ensuring the conservation and management of coastal and estuarine environments and works cooperatively with local communities to minimize encroachment and ensure compatible land use on surrounding lands. At NBVC Point Mugu and Special Area Laguna Peak, the NBVC Encroachment Action Plan and AOP identify the following external encroachment pressures: urban development; airborne noise; competition for air, land, and sea space; and conflicting land uses with safety arcs and footprints (Onyx Group 2006; Onyx Group 2008), briefly described below.

- Urban development: Constraints created by potential changes in neighboring land uses to the north of Point Mugu that may conflict with mission operations. The Encroachment Action Plan identifies the expansion plans of California State University Channel Islands as a critical encroachment issue. The expansion needs of the university could result in conversion of neighboring agricultural lands to developed or residential land use. This development could pressure operational training and testing to modify current flight tracks. The Encroachment Action Plan recommends participation in university capital improvement plans to ensure compatibility with mission operations (Onyx Group 2008).
- NBVC Point Mugu's surrounding lands are undeveloped and currently include agricultural lands, a national recreation area, duck hunting clubs, and land owned by conservation non-profit groups. Some areas to the northwest and the northeast, near Camarillo, have been proposed for residential and industrial development. The Navy currently is attempting to partner with the Coastal Conservancy in purchasing a parcel, with the intention to include the area as part of the Ormond Beach Wetland Restoration Project, providing the Navy with protections that the site would not be developed with conflicting residential or urban development. In the past, the adjacent duck hunting clubs have been approached for purchase by the Navy; however, willing sellers and costs associated with purchasing lands have made any attempts to purchase lands futile. NBVC will continue to evaluate the feasibility of acquiring funds to create additional buffers by purchasing or leasing lands around the installation to reduce encroachment.
- Competition for Air, Land, and Sea Space: Constraints created by potential conflicting land uses with the existence and operation of the Ventura County and Point Mugu Game Preserve. Wildlife and recreational activities, as well as the potential for allowable accessory structures on the parcels, are incompatible with air operations. The proximity of the game preserves to the runway poses significant Bird/Animal Aircraft Strict Hazard risks. The Encroachment Action Plan identifies this risk as a critical encroachment issue and recommends land acquisition, either through Encroachment Partnering or establishment of restrictive use easements (Onyx Group 2008).
- Airborne Noise: Increased residential development at California State University Channel Islands and unincorporated areas, or incompatible development in agricultural areas, could result in prohibition or reduced frequency of certain operational training and testing. Recreational activities at the Ventura County and Point Mugu Game Preserves are an incompatible land use within the 75 Community Noise Level Equivalent. The Encroachment Action Plan recommends coordination with the university to incorporate compatible noise levels (60 Community Noise Level Equivalent) into its planning documents.

- Accident Potential Zones, Safety Arcs, and Footprints: The location of the Ventura County Game Preserve within the Explosive Safety Quantity Distance arc and clear zone poses potential safety conflicts for recreational users at the preserve. The Encroachment Action Plan identifies this conflict as a critical encroachment issue and recommends establishment of a cooperative agreement with the game preserve to restrict access to the portions of the areas within the safety arcs and incorporation of the Bird/Animal Aircraft Strike Hazard overlay into local municipal plans (Section 3.4.4.1 Bird/Animal Aircraft Strike Hazard). A mobilehome park is located within an Accident Potential Zone off Navalair Road and poses a potential safety conflicts for residents.
- Degraded water quality flowing into the base from upstream activities in the Calleguas Creek watershed is an external environmental constraint, although not specifically identified as such in the Encroachment Action Plan or AOP.
- Constraints on expansion and conflicting land use caused by land ownership and preservation east of NBVC Point Mugu and Special Area Laguna Peak, may be an external constraint, though it was not identified in the Encroachment Action Plan or the AOP.

2.2 NBVC CHANNEL ISLANDS SPECIAL AREAS

The following sections detail the history and military mission-related functions and operations at NBVC Channel Islands Special Areas. A significant objective of NBVC Channel Islands Special Areas is to support its largest tenant, NAWCWD, whose primary mission is developmental testing and evaluation of naval weapons systems. The mission of the NPS and Channel Islands National Park are detailed below.

In 1916, the Organic Act (16 U.S.C. §1-1a-1) established the NPS, by act of Congress, to:

"Promote and regulate the use of the federal areas known as national parks, monuments and reservations by such means and measures as conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

National Park System General Authorities Act (1970) states:

"The authorization of activities shall be construed and the protection, management, and administration of national park areas shall be conducted in light of high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

On 05 March 1980, President Jimmy Carter signed legislation (PL 96-199) that designated five Channel Islands and their surrounding waters as Channel Islands National Park. The new national park would include Santa Barbara and Anacapa Islands (the former Channel Islands National Monument) and add Santa Rosa, Santa Cruz, San Miguel and Prince Islands, the latter to remain under the ownership of the U. S. Navy but managed by the NPS. The mission of the Channel Islands National Park is detailed in its enabling legislation (16 U.S.C. §410ff), as follows (USDOI 2005):

"...to protect the nationally significant natural, scenic, wildlife, marine, ecological, historical, archaeological, cultural, and scientific values of the Channel Islands in the state of California. These values include, but are not limited to:

- 1) The brown pelican nesting area;
- 2) Undisturbed tide pools providing species diversity unique to the eastern Pacific coast;
- Pinnipeds (marine mammals such as seals and sea lions) which breed and pup almost exclusively on the Channel Islands, including the only breeding colony for northern fur seals south of Alaska;
- 4) Eolian (wind dominated) landforms and caliche;
- 5) The presumed burial place of Juan Rodriquez Cabrillo; and
- 6) Archeological evidence of long-term use by many groups of Native Americans."

Additionally, Congress mandated (16 U.S.C. §410ff-3a and b) that:

- a) "The park shall be administered on a low-intensity, limited-entry basis."
- b) "In recognition of the special fragility and sensitivity of park resources, it is the intent of Congress that visitor use with in the park be limited to assure negligible adverse impact on the park resources. The Secretary shall establish appropriate visitor carrying capacities for the park."

The Channel Islands National Marine Sanctuary was designated in 1980 and consists of an approximate 1,110-square NM portion of the Santa Barbara Channel. The sanctuary extends from the mean high tide line to approximately 6 NM seaward of the following islands and offshore rocks: Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara Islands, and Richardson and Castle Rocks. The creation of Channel Islands National Marine Sanctuary affords special protections to an area of national significance with exceptional natural beauty and resources. The sanctuary's goals are derived from the National Marine Sanctuary Act (16 U.S.C. 1431 *et seq.*), with a primary goal of protecting the natural and cultural resources contained within its boundaries (NOAA 2008).

2.2.1 Historical Overview

The following sections summarize the use of NBVC Channel Islands Special Areas natural resources, pre- and post-Navy ownership.

2.2.1.1 Pre-Navy Land Use

Human occupation is documented on all of the northern Channel Islands. Archaeological sites on San Miguel Island indicate continuous occupation ranging from 8,000 to 11,000 years ago. The earliest known human habitation of the Channel Islands is thought to have occurred 13,000 years ago, based on recent archaeological evidence on Santa Rosa Island (Bischoff 2004). Native populations of the Channel Islands were primarily Chumash. The following discussion presents a brief summation of modern (20th century) land use prior to Navy activities, and for San Miguel and Prince Island, a brief general history from initial Euroamerican contact.

<u>Santa Cruz</u>: At the time of European contact, Santa Cruz Island had the largest population of Chumash, of all the Channel Islands. By the 1820s, the native population was removed to mainland missions. In 1839, the land was granted to Andres Castillero. By the 1850s, ranching was established and the island was stocked with cattle, horses, and sheep. Ranching (mainly sheep) continued through the years and with various transfers of land ownership. In 1978, the western 90 percent of the island was granted as an easement to TNC, which was given ownership of that portion of the island in 1987 (Bischoff 2004). In 1997, the east end of the island was purchased by the National Park Service. In 2000, TNC transferred ownership of the island's isthmus, except for the portion currently leased to the Navy, to the NPS.

Santa Rosa Island: Santa Rosa Island was occupied by the Chumash until 1825, when they were removed to missions on the mainland. After Chumash were removed, land use at Santa Rosa Island was primarily for fishing and extraction of marine resources for approximately 20 years. Otter hunters in temporary encampments were the main occupants during this time (NPS 2010). Around 1843, the island was stocked with sheep and cattle and primarily used for ranching by various land owners, until ranching ceased in 1998. From 1950 to 1960, the U.S. Air Force leased a portion of the island for use as a station for aircraft control and early-warning systems. Up to 200 personnel occupied the station during that time (Bechtel National, Inc. 2000). The NPS has owned Santa Rosa Island since 1986. Limited livestock grazing continued until 1998, when the remaining cattle were removed from the island (NPS 2010).

<u>San Miguel and Prince Island</u>: In October 1542, Spanish explorer Juan Rodriguez Cabrillo became the first European known to visit San Miguel Island. Spanish expeditions passed or visited the island through the late 1700s but never established a settlement or colony there. In the first half of the nineteenth century, Russians and Americans hunted sea otters on and around the island (JRP Historical Consulting 2010).

In 1848, the United States acquired San Miguel Island from Mexico under the Treaty of Guadalupe Hidalgo, and it has remained federal property since that time. Beginning in

approximately 1850 and continuing through the 1940s, the dominant land use on the island was sheep ranching. In the late 1800s, extensive guano harvesting occurred at Prince Island (Carter and others 2008). Since approximately 1909, San Miguel Island and its islets were claimed by the U.S. federal government for lighthouse purposes. In 1934, ownership of San Miguel Island and its islets was transferred from the U.S. Department of Commerce to the Navy. In 1948, the Navy cancelled the last remaining ranching lease; flocks were removed in 1950, although stray sheep remained at large as late as 1966 (JRP Historical Consulting 2010).



PHOTOGRAPH 2-3: SAN MIGUEL ISLAND, NBVC CHANNEL ISLANDS SPECIAL AREA. LOOKING SOUTH TO PRINCE ISLAND AND CUYLER HARBOR. Source: D. Rodriguez, National Park Service, 2013.

2.2.1.2 Historical Navy Land Use

<u>Santa Cruz Island</u>: Beginning in 1949, the Navy has leased land and buildings at Santa Cruz Island for a missile tracking and instrumentation facility. By 1990, Navy activity and facilities at Santa Cruz Island were reduced to those that support the RDAT&E mission of NAWCWD. In 2001, the NAWCWD compound was designated a Special Area under the jurisdiction of NBVC (Tetra Tech 2012d).

<u>Santa Rosa Island:</u> Historical Navy activities at Santa Rosa included offshore use at the northeast side of the island as a practice aerial mine range. Practice mines were placed by aircraft and submarine. The Naval Explosive Ordnance Disposal command maintained transponders at Beechers Bay Pier, Torrey Pines, Windmill Canyon, Sandy Point, and Man Point

along the southeast shoreline. The mines were inert and recovered approximately once a month. The mine area has not been used since the early 1990s and is inactive. The transponders were also removed (Bechtel National, Inc. 2000; Tetra Tech 2012e).

The Navy has been using tracking equipment on the island since the 1970s in an area on Navy Hill designated as the Extended Area Test System Ground Reference Station. Santa Rosa Island was designated a Special Area under NBVC jurisdiction in 2001. The Navy is currently in a license agreement with the NPS for lease of the Extended Area Test System Ground Reference Station, a 0.01-acre repeater and antenna site. Navy use of Santa Rosa is in support of the RDAT&E mission of NAWCWD (Bechtel National, Inc. 2000; Tetra Tech 2012f).

San Miguel and Prince Island: On 07 November 1934, control of San Miguel and its islets, including Prince Island, was transferred from the Department of Commerce to the Navy to better protect coastal California from potential invasion by a foreign enemy. During World War II, the island hosted a lookout station on San Miguel Peak, along with barracks and other structures that no longer exist today. Starting in 1948 and lasting into the 1960s, the military used the San Miguel and Prince Islands, and their offshore waters, primarily as a bombing range, administered by the Naval Air Missile Test Center at Point Mugu. In 1958, the DoD redesignated the Naval Air Missile Test Center as the Pacific Missile Range, with its headquarters at Point Mugu. San Miguel, its islets, and target barges moored in offshore waters, were used as targets for missile testing until the early 1970s. The Pacific Missile Range was the Pacific component of a threepart test range complex that included the U.S. Air Force's Atlantic Missile Range at Cape Canaveral and the U.S. Army's White Sands Missile Range in New Mexico. One of the primary missions of the Pacific Missile Range was to support the testing of ballistic missiles and space programs. Between 1960 and 1963, the Pacific Missile Range supported the missions of the U.S. Army, U.S. Air Force, National Aeronautics and Space Administration, and the Atomic Energy Commission. Military use of San Miguel and Prince Islands, and their offshore waters, at that time was as a target range for air-to-surface and surface-to-surface missile systems (JRP Historical Consulting 2010).

In 1962, the Navy entered into a MOA with the NPS for management of San Miguel and Prince Island, including natural and cultural resources (Appendix P). This agreement has since been supplemented and amended (USDOI and Navy 1991). The agreement retained Navy ownership of San Miguel Island and asserted its priority of use for missile testing and the pursuit of petroleum reserves. As part of the agreement, the Department of the Interior agreed to collect biological inventory data and to promote recovery of rare and locally extinct plants and animals.

By the late 1960s, military use of the island as a bombing and missile range slowed and the Navy allowed regular visits to the island by natural resource and cultural researchers. By the late 1970s, the island was used only for sighting purposes, with fire directed at an offshore target 1 mile south of the island. In April 1975, the Naval Missile Center, Naval Air Station, and Pacific Missile Range were combined under a single command to form the Pacific Missile Test Center at Point Mugu. San Miguel played a minor role in comparison to San Nicolas and Santa Cruz Islands, which remained heavily instrumented with tracking facilities. In 1970, an automatic atomic-powered weather station was installed at San Miguel Island; it was replaced with a solar-

powered facility in 1992. At present, the weather station is the only active Navy-owned facility on the island. Remnants of past military use include the airfield, dirt roads, and barracks. In 1976, the Navy and NPS signed an agreement that gave NPS further responsibility in the day-today management of the island, including controlling visitor access and overseeing resource management and protection. In 1980, San Miguel Island was officially adopted into the NPS with the creation of Channel Islands National Park (JRP Historical Consulting 2010). President Jimmy Carter signed the legislation, Public Law 96-199, on 05 March 1980. The new national park would include Santa Barbara and Anacapa Islands (the former Channel Islands National Monument) and add Santa Rosa, Santa Cruz, and San Miguel Islands, the latter to remain under the ownership of the Navy but managed by the NPS.

2.2.2 Operations and Infrastructure

There is no AOP for NBVC Channel Island Special Areas. Land use and facility classifications described below were provided by the NBVC Planning Department (Tetra Tech 2012f). NBVC Channel Island Special Areas land uses support NAWCWD and, as such, are operational and RDAT&E.

<u>Santa Cruz</u>: Navy use of the island is for communications and tracking, in support of RDAT&E for NAWCWD. The compound has eight facilities, including a radar tower and pad; diesel electric power plant; water pump station and water storage tank; barracks and mess hall; Public Works shed that houses vehicle maintenance and storage; diesel fuel filling station; emergency



generator building; and the Extended Area Test System Ground Reference Station antenna (NBVC 2012; Tetra Tech 2012v).

<u>Santa Rosa</u>: Santa Rosa Island facilities consist of the Extended Area Test System Ground Reference Station, which has a repeater, antenna, and solar power unit.

San Miguel: Navy facilities remaining on San Miguel Island consist of a weather tracking station atop San Miguel Hill (Photograph 2-4). No Navy activities occur at San Miguel or Prince Island.

PHOTOGRAPH 2-4: SAN MIGUEL ISLAND NAVY WEATHER STATION, NBVC CHANNEL ISLANDS SPECIAL AREA. Source: U.S. Navy, 2013.

Mission Critical

Mission critical lands and facilities are those that directly support the installation mission and tenants; NBVC Channel Islands Special Areas include RDAT&E land uses. NBVC Channel Islands Special Areas support NAWCWD activities (Table 2-1). Santa Cruz Island contains eight facilities that support the RDAT&E Weapons Test Range. Santa Rosa Island contains a repeater, antenna, and solar power unit. San Miguel Island has no Navy activities; the island is an inactive bombing range managed by the NPS.

Mission Support

There are no facilities or lands on the NBVC Channel Islands Special Areas classified as Mission Support.

Quality of Life

There are no facilities or lands on the NBVC Channel Islands Special Areas classified as Quality of Life.

2.2.3 Leases and Real Estate Outgrants

In accordance with OPNAVINST 5090.1C CH-1, the Navy is required to identify areas within installation boundaries that may be suitable and available for agricultural outleasing or commercial forestry. At NBVC Channel Islands Special Areas, there are no lands suitable for agricultural or forest timber production because of existing agreements with the NPS and TNC.

The Navy has an in-grant permit for use of 0.01 acre on Santa Rosa Island from the NPS; the current lease agreement is set to expire in 2098.

The Navy leases 8 acres on Santa Cruz Island from TNC, but has no other licenses or real estate outgrants for that property. Navy facilities are located on TNC inholdings on NPS property. The lands immediately surrounding the Navy facilities are owned and managed by the NPS.

On May 7, 1963, the Navy entered into an MOA with the NPS for the "protection and investigation of" the natural and cultural resources of San Miguel and Prince Island. The agreement has since been amended and supplemented to include all five islands within Channel Islands National Park (Appendix P) (USDOI and Navy 1991). San Miguel Island had a history of agricultural outleasing during DoD ownership; the Navy terminated the last ranching lease in 1948 (Section 2.2.1.2). The MOA states "that the paramount use of the islands and their environs shall be for the purpose of the [Point Mugu Sea Range], and all activities conducted by or in behalf of the Department of the Interior on such islands, shall recognize the priority of such use."

The Navy complies with the responsibilities of the MOA, TNC lease requirements on Santa Cruz Island, and NPS in-grant requirements on Santa Rosa Island. Natural resource-related responsibilities of these agreements are in Section 4.0, and the MOA is in Appendix P.

2.2.4 Future Use Patterns and Plans

No change in land use or activity is currently planned for Navy sites on any of the islands (Tetra Tech 2012h).

2.2.5 Encroachment Opportunities

Encroachment opportunities, in the context of this INRMP and defined by the AOP (Onyx Group 2006), are areas of NBVC Channel Islands Special Areas where there are little to no restrictions on military training, testing, and operations. The following sections detail internal and external opportunities at NBVC Channel Islands Special Areas.

Internal Opportunities

Internal encroachment opportunities for Navy activities consist of current land and facility uses within the boundaries of Navy-leased lands on Santa Cruz and Santa Rosa Islands. Additional internal opportunities within Navy boundaries would be at the discretion of the NPS (for Santa Rosa), and TNC (for Santa Cruz). San Miguel and Prince Island activities, as detailed in the Navy and NPS MOA (Appendix P), may continue; new activities or a change in activities would require amending or supplementing the MOA.

External Opportunities

No external encroachment opportunities for Navy activities currently exist at the NBVC Channel Islands Special Areas. Surrounding lands are managed and protected by the NPS and TNC; waters out to 1 NM are managed and protected by Channel Islands National Park Service, with additional protection by the Channel Islands National Marine Sanctuary.

Offshore areas of San Miguel Island, Santa Rosa, and Santa Cruz Islands are part of the Point Mugu Operating Area. The Point Mugu Operating Area is part of the Point Mugu Sea Range and consists of nearshore coastal and open ocean waters overlaid by Special Use Airspace that includes both restricted and warning areas that extend from the ocean surface to an unlimited altitude (DoD 2002).

2.2.6 Constraints

The Navy defines constraints or encroachment primarily as any action planned or executed that inhibits, curtails, or has the potential to impede the performance of Navy activities. Encroachment challenges can include urban development; environmental constraints such as water quality or endangered species; population growth; competition for air, land, and sea space;

competition for resources such as potable and irrigation water; and safety arcs and footprints (Onyx Group 2006). The following sections identify potential internal and external encroachments at NBVC Channel Islands Special Areas.

Internal Constraints

Environmental constraints at NBVC Channel Islands Special Areas can dictate where and when certain types of activities can occur to ensure regulatory compliance and the long-term sustainability of natural resources.

Currently, Navy activities on San Miguel, Santa Rosa, and Santa Cruz islands include operating and maintaining antenna facilities. Navy-leased properties on Santa Cruz and Santa Rosa consist of facilities on disturbed and developed land. Activities are limited to those outlined in the lease agreement, and the facilities within leased boundaries. Facility maintenance, if it happened to involve tree removal, and tree pruning could be in potential conflict with the Migratory Bird Treaty Act. Protection of migratory birds in trees or buildings on Navy properties would require that maintenance activities be scheduled outside the nesting season or only upon confirmation that no nests are present.

The MOA with the NPS outlines the mutual agreement for NPS to manage the property and for the two agencies to cooperatively support research, but the Navy retains ownership and the right to conduct Navy activities as needed (Appendix P; USDOI and Navy 1991). Natural resources at San Miguel with the ability to further limit activity include designation within Channel Islands National Park, USACE jurisdictional wetlands, special status species, marine mammals, migratory birds, EFH, and the offshore protected zones (California State Marine Protected Area and Channel Islands National Marine Sanctuary [Figure 1-1]). If the needs of the military mission and associated resource requirements change, the potential for conflicts with natural resources could occur.

External Constraints

There are no external constraints at San Miguel and Prince Islands; they are islands and there are no external encroachment issues for ensuring compatible land use on surrounding lands. The other NBVC Channel Islands Special Areas also have no external encroachment issues, as the use of the land is defined by the lease agreement and there are no external encroachment pressures from surrounding land uses.

2.3 NBVC FORT HUNTER LIGGETT SPECIAL AREA

The following sections detail the history and military mission-related functions and operations at NBVC Fort Hunter Liggett Special Area. NBVC Fort Hunter Liggett Special Area supports one tenant, the Naval Construction Group 1, whose mission is to train Seabees in preparation for expeditionary warfare and construction (KTU+A 2010).

2.3.1 Historical Overview

The following sections summarize the use of NBVC Special Area Fort Hunter Liggett natural resources, pre- and post-Navy ownership.

2.3.1.1 Pre-Navy Land Use

The U.S. Army installation at Fort Hunter Liggett is located on the ancestral homelands of the Salinan Indians, who occupied the area beginning approximately 10,000 to 12,000 years ago. European occupation of the area began in 1769. At that time, the Salinans, a hunter-gatherer society, occupied almost 3,000 square miles in at least 20 villages. In 1771, the Mission San Antonio de Padua was built by the Spanish, and the land was converted to agriculture. Agricultural practices in the area continued through the Mexican regime of the early 1800s, and into the days of the California gold-rush of the mid-1800s. By the mid-1800s, the land had been divided in homesteads; it was consolidated into cattle ranches in the late 1800s. William Randolph Hearst purchased the land in 1920 (KTU+A 2010).

2.3.1.2 Historical Navy Land Use

During World War II, the War Department sought suitable land for training in realistic combat situations. In 1940, Hearst sold more than 200,000 acres between the Salinas River Valley divide and the Pacific Ocean to the Army. Hunter Liggett Military Reservation was established in 1941, and then became a sub-installation of Fort Ord in 1952. Since the 1950s, the Hunter Liggett Military Reservation has been intensively used to prepare troops for combat operations throughout the world. In 1975, the Hunter Liggett Military Reservation was redesignated Fort Hunter Liggett Military Installation. Personnel from all branches of the armed forces and the Army National Guard continue to train at Fort Hunter Liggett, which in 1993 came under the control of the U.S. Army Reserve Command (KTU+A 2010; Fort Hunter Liggett 2003). The Navy initiated activities at Fort Hunter Liggett in 2003 when the Army transferred ownership of 10.8 acres. Navy land use and facilities at Fort Hunter Liggett include the following areas: Vehicle Maintenance Yard (also referred to in various documents as "Old Tech" or "R36 Compound"), Hunting Lodge (also called "Recreation Center" [KTU+A 2010]), and the Blackjack Compound (also called "Camp Blackjack or "Blackjack Complex") (Figure 1-4). These facilities support the training activities of the Naval Construction Group 1's Construction Battalions, described in the following sections.

2.3.2 Operations and Infrastructure

NBVC Fort Hunter Liggett Special Area is used for expeditionary training operations. The Navy-occupied land at Fort Hunter Liggett is operated by the Naval Construction Group 1 tenant command, which supports construction battalion training. The Naval Construction Group 1 serves as the personnel receiving and processing activity for deployed Pacific Fleet Naval Construction Force units. In addition to training new personnel in transit, the Naval Construction Group 1 also provides support to active duty personnel family member through family support

groups. Approximately 3,000 personnel per year train at NBVC Fort Hunter Liggett Special Area. The Army owns and operates the training ranges at Fort Hunter Liggett. Currently, there are three Navy land holdings within Fort Hunter Liggett: the Blackjack Compound, the Hunting Lodge, and the Vehicle Maintenance Yard (Figure 1-4). A real estate swap with the Army may occur in the near future, involving the trade of the Hunting Lodge and Vehicle Maintenance Yard for an equal amount of land adjacent the Blackjack Compound (KTU+A 2010).

NBVC Fort Hunter Liggett Special Area land uses comprise training, training ranges, supply and storage, maintenance, administration, weapons, bachelor housing, and community support functions. Land use at the Blackjack Compound is dominated by supply and storage in the northern portion; the southern portion contains training, administration, weapons, bachelor housing, and community support facilities. The Vehicle Maintenance Yard is maintenance land use, and the Hunting Lodge is used by the Army for community support (KTU+A 2010) (Figure 2-4).

The NBVC AOP for Fort Hunter Liggett Special Area classifies and assesses land use according to mission criticality and are defined as Mission Critical, Mission Support, or Quality of Life, detailed below (KTU+A 2010). Land uses categorized by the AOP differ slightly from those shown on Figure 2-4, as detailed below.

The Blackjack Compound (Photograph 2-5) contains the Navy's mission support and quality of life facilities, including storage, utilities, weapons, bachelor housing, and a recreation room. Limited utilities support this facility. The Blackjack Compound is near the main gate of Fort Hunter Liggett with easy access to local highways. Lower Blackjack is a disturbed area, prone to flooding, that is used by both the Army and the Navy for open storage and staging and by the Navy for periodic training exercises. The Blackjack Compound is considered an operational range. Uses of the Blackjack Compound include command and control of Naval Construction Group 1 training exercises throughout Fort Hunter Liggett, and the home base of aggressor teams participating in training exercises. The Blackjack Compound is also used for open materials storage and staging. An open gravel surface area at the southern end of the compound is used for mobilizing personnel.



PHOTOGRAPH 2-5: BLACKJACK COMPOUND, NBVC FORT HUNTER LIGGETT SPECIAL AREA. FACING SOUTHEAST FROM THE NORTH ENTRANCE. TAKEN DURING NBVC ED FIELD VISIT ON 20 JUNE 2012

The Vehicle Maintenance Yard (Old Tech) (Photograph 2-6) is isolated from the other Navy facilities and is located in the Army's main cantonment area, in the middle of the Army's headquarters area. Vehicle maintenance support is provided for all vehicles used for training at NBVC Fort Hunter Liggett Special Area.

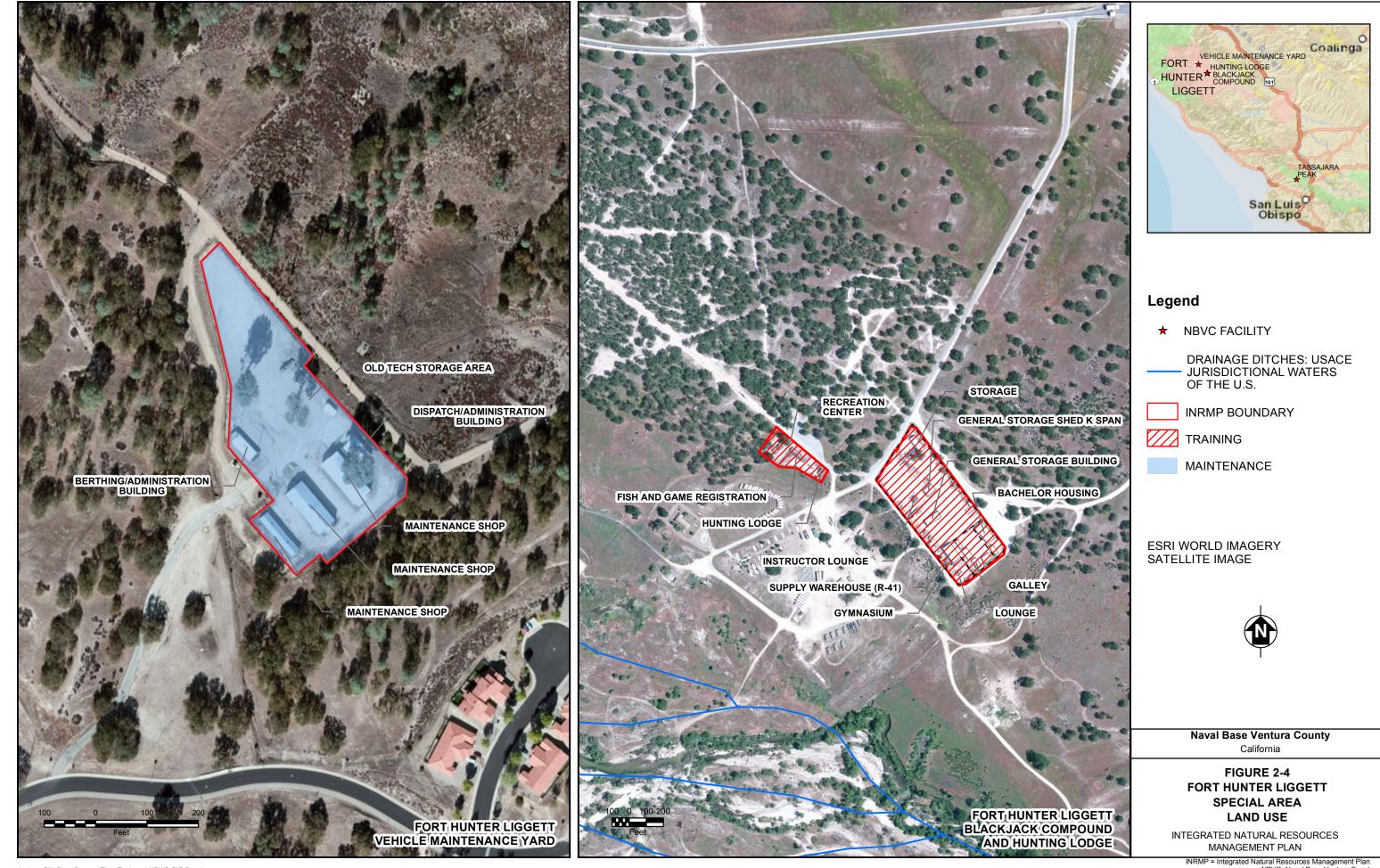


PHOTOGRAPH 2-6: VEHICLE MAINTENANCE YARD, NBVC FORT HUNTER LIGGETT SPECIAL AREA. FACING SOUTHWEST FROM THE NORTHWEST PERIMETER. TAKEN DURING NBVC ED FIELD VISIT ON 20 JUNE 2012

The Hunting Lodge (Photograph 2-7), as it is referred to in the NBVC AOP for Fort Hunter Liggett, is an area that contains three buildings owned by the Navy (KTU+A 2010). One of the three buildings is not used based on safety concerns. It is more than 50 years old and requires consideration under the National Historic Preservation Act. The other two buildings are operated by the Army for managing its hunting program. The Army refers to the Hunting Lodge area as the "Outdoor Recreation Facility" or "Wildlife Check Station." The Army sells and issues hunting licenses and permits and registers users into training areas from the Fish and Game Registration building. An area for skinning and cleaning game is located adjacent the building, on an open, concrete pad with wash facilities.



PHOTOGRAPH 2-7: HUNTING LODGE, NBVC FORT HUNTER LIGGETT SPECIAL AREA. FACING SOUTHEAST; RECREATION FACILITY IN CENTER, GAME PROCESSING FACILITY IS AT THE RIGHT. TAKEN DURING NBVC ED FIELD VISIT ON 20 JUNE 2012



Author: GK. Data Source: TetraTech and NBVC GIS Databases. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division. INRMP = Integrated Natural Resources Management Plan NBVC=Naval Base Ventura Count USACE= U.S. Army Corps of Engineers

Mission Critical

Mission critical facilities and lands at NBVC Fort Hunter Liggett Special Area are those that directly support the installation mission and tenants and include training and training ranges. Training land use is a relatively small portion of the occupied land at Fort Hunter Liggett. Training support for field exercise occurs at Buildings 5, 656, and TR654, within the Blackjack Compound (KTU+A 2010).

Training ranges are lands owned and operated by the Army. The Naval Construction Group 1 conducts training exercises on training ranges. In many cases, field exercises conducted by Naval Construction Group 1 occur in a designated area. Exercises can be accommodated on prepared grounds, but the Navy prefers to start on undisturbed grounds to represent more realistic conditions (KTU+A 2010). These lands are managed under the Army's Fort Hunter Liggett INRMP (Fort Hunter Liggett 2012a) and not under this INRMP.

Mission Support

Mission support lands and facilities are those that indirectly support the installation mission and tenants. The Navy's mission support functions at Fort Hunter Liggett include storage, vehicle maintenance, utilities, and weapons.

Storage facilities and open storage space, including a hazardous materials storage facility, are in the Blackjack Compound. The Vehicle Maintenance Yard in the Fort Hunter Liggett cantonment area is isolated from the rest of the Navy assets in the Blackjack area (Figure 1-4). Utilities are primarily underground, with a few aboveground water tanks in the northwestern corner of the Blackjack Compound. The location of underground facilities has not been identified, but it is anticipated that a leach field associated with the sanitary sewer lines is southwest of Blackjack, which would preclude development (KTU+A 2010).

Quality of Life

The Navy facilities and lands at Fort Hunter Liggett that provide quality of life functions are those that support the well-being of the warfighter and include bachelor housing, community support, and recreation. These functions are in the Blackjack Compound. Bachelor housing consists of pre-fabricated and temporary facilities that house training instructors, aggressors, and vehicle maintenance personnel (KTU+A 2010). The Hunting Lodge also provides the quality of life function of community support.

2.3.3 Leases and Real Estate Outgrants

The Navy has no leases, licenses, or real estate outgrants at Fort Hunter Liggett (Tetra Tech 2012i).

2.3.4 Future Use Patterns and Plans: The NBVC Fort Hunter Liggett Activity Overview Plan and Sustainable Planning and Design

Surrounding land uses outside Fort Hunter Liggett boundaries include Los Padres National Forest to the north and west and smaller areas of private land and Monterey County lands to the east and south. Land uses to the west, north, and east are regulated by Monterey County, and to the south by San Luis Obispo County. Agricultural zoning or other low-density uses are the primary land use designations for the areas surrounding the installation. The eastern portion of Fort Hunter Liggett and adjacent off-installation lands have been designated for wine industry land uses. The Santa Lucia Range mountains border Fort Hunter Liggett to the west (KTU+A 2010).

Surrounding land use outside the NBVC Fort Hunter Liggett Special Area consists of undeveloped hilly wooded land. The Navy's Vehicle Maintenance Yard is within the main cantonment area and is isolated from the Navy's main assets in the Blackjack area about 3.8 miles to the southeast.

Several Navy planning efforts have been coordinated to identify development recommendations for the more efficient consolidation and use of Navy-occupied assets. Most of the Navy's facilities at Fort Hunter Liggett were identified as inadequate to meet mission requirements. The AOP found deficiencies in mission critical and mission support facilities (KTU+A 2010). The Vehicle Maintenance Yard needs paved parking surfaces, drive-through bays, berthing units, and vehicular storage space. Deficiencies in quality of life operations include the lack of recreation facilities and grounds, a substandard dining facility, and insufficient housing accommodations for Navy personnel. The AOP identified that these inadequacies could be mitigated through a land swap with the Army that would allow consolidation and expansion of Navy facilities in the upper Blackjack area in exchange for the Navy's Vehicle Maintenance Yard and Hunting Lodge. The land swap would allow the Navy to construct new training facilities, new vehicle maintenance facilities, a new storage area, a dining facility, and expanded recreation, fitness, and housing facilities. New development in the upper Blackjack area would allow the Navy to double the size of its footprint. However, suspected buried unexploded ordnance was recently discovered in the Blackjack Compound from its use as an operational range. This recent discovery may require that previous expansion plans identified in the AOP be modified. Any expansion of the Blackjack Compound will occur only after the removal of unexploded ordnance (Tetra Tech 2013a).

Implementation of the Preferred Vision will provide ideal functional relationships to increase operational capacity, promote proper circulation, provide adequate levels of community support, and improve efficiencies through implementation of the ideal land use plan. Refer to the AOP, "Table 10-1, Fort Hunter Liggett Recommended Projects", and "Figure 10-1: NBVC Fort Hunter Liggett Implementation Plan" for locations of short-term, mid-term, and long-term actions and how they improve the ideal land use configuration (KTU+A 2010).

Short-term planning actions are those that will occur within 5 years. These actions consist of high-priority construction to meet immediate deficiencies, reuse of facilities with minor to no modification, conversion of Navy-owned land into training ranges, leasing facilities, and minor construction with few development constraints.

Mid-term planning actions are those that will occur within the next 5 to 10 years, including projects that typically require a series of actions. Examples include projects that must be processed through the Installation Integrated Priority List and actions predicated on prior planning actions such as facility demolitions or user relocation.

Long-term planning actions occur beyond 10 years, and by 2030. Long-term planned projects are those that are lower on an installation's Integrated Priority List than other similar projects; are predicated on facilities exceeding their life expectancy prior to 2030; have significant costs that would preclude mid-term implementation; or that depend on implementation of mid-term actions (KTU+A 2010).

Future expansion of the Blackjack Compound would include adaptive reuse, land use expansion and reassignment, and infill development. The actions recommended in the AOP would consolidate Navy operations on Fort Hunter Liggett onto one expanded Blackjack Compound, predicated on a land swap with the Army, to improve operational efficiency. Implementation would convert existing structures to their optimal use and address deficiencies in mission critical, support, and quality of life facilities by constructing new facilities that also provide such elements of sustainability as water and energy use efficiency, improved indoor environmental quality, and use of sustainable building resources and design. The majority of the planned implementation would be considered mid-term. Construction of the new facilities, including a new vehicle maintenance facility, would require additional land northeast of the existing Blackjack Compound that would be obtained from the Army through a land swap arrangement for the Navy's current Vehicle Maintenance Yard and Hunting Lodge (KTU+A 2010).

2.3.5 Encroachment Opportunities

Opportunities in the context of this INRMP, and defined by the AOP, are areas of NBVC Fort Hunter Liggett Special Area where there are little to no restrictions on military training, testing, and operations. These areas may be internal opportunities, within the boundaries of NBVC Fort Hunter Liggett Special Area, or external opportunities, outside Navy boundaries. The following sections detail internal and external opportunities for NBVC Fort Hunter Liggett Special Area.

Internal Opportunities

Internal opportunities for additional facilities or training would occur within existing Navy parcels. Navy land holdings within Fort Hunter Liggett are 10.8 acres of developed property. Infill development in the Navy parcels would be compatible with surrounding Navy land uses (KTU+A 2010). However, the presence of suspected buried unexploded ordnance within the Blackjack Compound is an internal encroachment. Expansion within the complex cannot occur until the unexploded ordnance is removed (Tetra Tech 2013a).

External Opportunities

Encroachment opportunities for NBVC include partnering opportunities with the Army; lands within the Army's boundaries at Fort Hunter Liggett are an opportunity. The Navy currently uses Army lands for training, as shown on Figure 2-4.

As a result of neighboring land ownership surrounding the Fort Hunter Liggett installation, no opportunities exist for base growth outside Army boundaries.

2.3.6 Constraints

The Navy defines constraints or encroachment primarily as any action planned or executed that inhibits, curtails, or has the potential to impede the performance of Navy activities. Encroachment challenges can include urban development; environmental constraints such as water quality or endangered species; population growth; competition for air, land, and sea space; competition for resources such as potable and irrigation water; and safety arcs and footprints (Onyx Group 2006). The following sections identify potential internal and external encroachments at NBVC Fort Hunter Liggett Special Area.

Internal Constraints

There are few internal encroachment issues at NBVC Fort Hunter Liggett Special Area, as Navy property is on disturbed land with few natural resources and no listed species or USACE delineated wetlands. Facility maintenance, if it involves tree removal or tree pruning, could be in potential conflict with the Migratory Bird Treaty Act (MBTA). Protection of migratory birds in trees or buildings on Navy properties would require that maintenance activities be scheduled outside the nesting season or only on confirmation that no nests are present.

External Constraints

There are currently no external environmental constraints to military activities, as training occurs in areas outside Navy properties, in lands designated by the Army for training purposes. Those lands are managed by the Army Environmental Division, in accordance with environmental rules and regulations and the objectives outlined in the Fort Hunter Liggett INRMP. Army land use surrounding the Navy properties is compatible and is not in conflict with Navy activities.

If the needs of the military mission and associated resource requirements change, the potential for conflicts with natural resources could occur. The potential land swap discussed in Section 2.3.4 Future Use Patterns and Plans could be constrained by environmental factors such as federally listed species and USACE jurisdictional wetlands, pending environmental review. Vernal pools and the federally listed vernal pool fairy shrimp (*Branchinecta lynchi*) have been recorded in the vicinity of the land discussed for Navy ownership with the proposed land exchange (Tetra Tech 2012 j).

3.0 CURRENT CONDITION AND MANAGEMENT OF NATURAL RESOURCES AT NBVC POINT MUGU AND SPECIAL AREA LAGUNA PEAK

The following sections detail the natural resources at NBVC Point Mugu and Special Area Laguna Peak, and describe how they are managed by NBVC ED. Most of the discussion below is focused on Point Mugu.

3.1 ECOREGIONAL SETTING

NBVC Point Mugu is in the Oxnard Plain-Santa Paula Valley, Southern California Coast ecoregion (U.S. Department of Agriculture [USDA] 1997). The base lies at the southeast margin of the Oxnard Plain, in the southern portion of the Ventura Basin. The Ventura Basin is a relatively broad and nearly level floodplain and river delta formed by the Santa Clara River. The Ventura Basin is bounded on the north and northwest by the Santa Ynez Mountains, to the south and east by the Santa Monica Mountains, and to the southwest by the Pacific Ocean and the Channel Islands (Mukae and Turner 1975). Elevations in this eco-region range from sea level to approximately 800 feet (244 meters). Climate is typically hot and subhumid, greatly modified by marine air (USDA 1997).

The predominant natural plant communities in the Oxnard Plain-Santa Paula Valley include California sagebrush scrub, Purple sage scrub, and relatively small areas of pickleweed mat, according to *A Manual of California Vegetation* (Sawyer, Keeler-Wolf and Evens 2009). The vegetative community descriptions are based on "alliances" that are floristic units defined by the dominant or characteristic species in the community.

3.1.1 Topography

NBVC Point Mugu is situated in the Ventura Basin in the southern portion of the Oxnard Plain. The Oxnard Plain is generally flat with a slight increase in elevation inland to the north. The Ventura Basin in bounded by the Santa Monica and Santa Ynez Mountains to the east and north. Elevations at NBVC Point Mugu range from sea level to about 11 feet above mean sea level.

Geomorphic features at NBVC Point Mugu include approximately 290 acres of ocean beach and dunes; 46 acres of brackish marsh; 57 acres of drainage ditches; 346 acres of intertidal mudflat and sandflat; 784 acres of intertidal salt marsh; 49 acres of non-tidal salt marsh; 9 acres of sand nest islands; 211 acres of salt marsh and salt panne; 216 acres of tidal creeks; 271 acres of transitional wetlands; and 765 acres of mixed transition disturbed. The remaining acreage consists of flat-lying open space and developed areas. The Mugu Lagoon consists of east and west arms that project from a broader central basin. The boundaries of Mugu Lagoon are heavily influenced daily by tidal levels and seasonally by storm events. Storms in 1992 redistributed sediment within the lagoon so that a barrier sand spit was reduced in size and the eastern arm of the lagoon was lengthened. Winter storms in 1995 also altered the topography of the southern portion of the western area of the lagoon and the configuration of its mouth.

The topography of Mugu Lagoon has been modified since the development of agriculture upstream and the creation of the military base in the 1940s. The 1901 U.S. Geological Survey (USGS) topographic map for the Hueneme Quadrangle shows that Mugu was the largest of several lagoons situated in the flat sandy coast of the Oxnard Plain. In the early 1900s, Mugu Lagoon and associated wetlands paralleled the coast for nearly 4 miles and extended more than 1 mile inland, covering an area of approximately 3,000 acres (MacDonald 1976). The 1857 U.S. Coast Survey Topographic Survey No. T893 shows that saltmarsh fringed Calleguas Creek and emptied into the central basin of the Lagoon (Figure 3-1). More than half of the 3,000 acres was salt marsh, with the balance composed of sand dunes, beach, open water, and tidal creeks (Tetra Tech 2002).

Analysis of the 1932 U.S. Coast Survey Topographic Map revealed the apparent effects of upstream agricultural development on Mugu. Apparently, increased flows through Calleguas Creek introduced higher sediment loads into the Central Basin and lagoon arms. The central basin and fringing salt marsh area was diminished in favor of tidal flat area. The eastern and western arms were also substantially filled in with sediment and converted into tidal flat habitat. The current sewage pond area appeared to be an equal mix of intertidal flats and salt marsh (Tetra Tech 2002).

The central portion of the lagoon originally had shallow tideflats bordering the subtidal channel of Calleguas Creek. In the late 1940s, the central portion of the lagoon was dredged to a depth of about 30 feet to provide fill for military construction on adjacent marsh and uplands to the north and west. The eastern arm of Mugu Lagoon had very little constructed modification, apart from the establishment of a firing range at the east edge of the base. From a baseline on 1857 and 1901 topographic survey maps, approximately half of the original wetlands at Mugu remain today (MacDonald 1976).



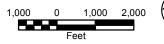
Author: GK. Date: 10/10/2013. Data Source: TetraTech Databases; Historical Habitat Data Source: NBVC GIS Database; U.S. Coast Survey Topogrphic Survey No. T893. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.













Naval Base Ventura County Point Mugu

FIGURE 3-1 POINT MUGU HISTORICAL HABITATS 1857

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

3.1.2 Geology

NBVC Point Mugu lies at the southern end of the Ventura Basin and west of the Santa Monica Mountains. The mountainous terrain adjacent to the Oxnard Plain is tectonically active and is composed of various hard and soft sedimentary deposits, primarily of marine origin, along with some igneous deposits. The Oxnard Plain is in the western Transverse Ranges geomorphic province (PRC Environmental Management Inc. [PRC] 1997). The western Transverse Ranges is a west-trending geomorphic province in southern California bounded on the north by the Santa Ynez fault, on the east by the San Gabriel Mountains, on the south by the Transverse Ranges Frontal Fault Zone, and on the west by the Pacific Ocean. Several geologic faults are located near NBVC Point Mugu, including the McGrath Fault and the Bailey Fault. Major seismic activity has not occurred along either of these faults in recent history.

The Bailey Fault delineates the boundary between the Ventura Basin and the Santa Monica Mountains and is believed to control the location of Calleguas Creek (Fugro-McClelland 1991). The Ventura Basin consists of more than 40,000 feet of sediments, resulting in a broad coastal lowland known as the Oxnard Plain. Unconsolidated alluvial deposits occur in the uppermost 2,000 feet of sediment underlying the Oxnard Plain (ERTC 1991). Major east-trending folds and reverse faults reflect regional north-south compression and are characteristic of the basin (Norris and Webb 1990). The uppermost sedimentary layers of the Oxnard Plain are composed of quaternary alluvium. Additional unconsolidated water-bearing soils and sediments known as the San Pedro and the Santa Barbara Formations underlie the alluvium. The unconsolidated sediments the underlie NBVC Point Mugu range from about 900 to 2,300 feet thick and consist of alluvial clays, silts, sands, and gravels. The deposits occur as both laterally continuous layers and as lenticular beds.

A combination of ongoing tectonic uplift and the prevalence of easily eroded sedimentary deposits in adjacent mountains have resulted in high rates of erosion and sediment yield in coastal watersheds throughout the region, including Calleguas Creek.

The Oxnard Plain, and specifically the Point Mugu area, has undergone geomorphologic change for tens of thousands of years. Throughout the Pleistocene glacial epoch, sediment was transported down valleys in the Calleguas Creek watershed and either delivered at the shoreline to form estuarine and beach environments, or carried off the shelf edge into deep water. During the late Pleistocene, about 18,000 years before present, streams were incised on the delta plain, and it is likely that Calleguas Creek was connected to the Mugu Submarine Canyon. The sea level has risen steadily since that time. By the late 19th Century, surface water is believed to have infiltrated through soil and evaporated before it reached the ocean, recharging the now extensive aquifers that underlie the delta plain, and depositing sediments throughout the delta plain. This combination of tectonic activity and sediment transport and deposition has resulted in the current configuration of the Mugu Lagoon (Tetra Tech 2002).

3.1.3 Climate

The NBVC Point Mugu climate is typically described as "Mediterranean" because of the influence of its coastal setting, moist mild winters, and warm dry summers (WESTEC and Stollar 1988). Regional climate is primarily controlled by the semi-permanent Pacific High pressure system over the ocean to the west, thermal contrasts between the land and adjacent ocean, and geographic factors. Geographic factors include the change in coastline orientation at Point Conception, gradual curvature of the coastline between Santa Barbara and Point Mugu, and the orientation of the coastal mountains.

The annual daily temperature range is about 16 degrees Fahrenheit (°F), with slightly greater ranges in winter than summer. Mean monthly temperatures range from a low of 54.5 °F in January to 66 °F in August. The warmest temperatures usually occur in late summer and early fall; daily maximum temperatures can be in the upper 80s and low 90s. The extreme maximum temperature of 104 °F occurred in October 1971; the extreme minimum temperature of 27 °F occurred in February 1971 and December 1972 (Western Regional Climate Center [WRCC] 2011). Monthly mean temperatures are summarized in Figure 3-2.

The average annual rainfall at NBVC Point Mugu is approximately 15 inches. Mean monthly precipitation totals are in Figure 3-3, and average annual rainfall totals for 1925 through 2003 are in Figure 3-4. About 85 percent of the rain falls between November and March (WRCC 2011). Summer precipitation is usually in the form of early morning drizzle that typically leaves only trace amounts of water. Thunderstorms are uncommon at NBVC Point Mugu.

Surface visibility is often restricted by fog and haze in the early morning hours; however, in the afternoon, smoke or haze transported to the coast from the Los Angeles basin on southeasterly winds frequently restricts visibility, regardless of the season.

Low-level inversions that limit the height of the surface atmospheric mixing layer occur frequently over the Oxnard Plain. Subsiding air associated with the Pacific High helps to maintain a semi-permanent inversion over most of southern California. Nocturnal cooling and the intrusion of drainage and marine air masses over the Oxnard Plain frequently cause inversions to form within 985 feet (300 meters) of the surface.

Wind speeds and directions near NBVC Point Mugu show seasonal variations. From March through September, westerly to northwesterly onshore winds are dominant from mid-morning through early evening. The onshore summer winds are typically 4 to 10 knots but can be significantly stronger in March, April, and May. From October through February, moderate, northeasterly, offshore winds of 4 to 10 knots are typical during the night and morning. These change in the afternoon to somewhat stronger, westerly, onshore winds. Seasonally, in the late summer and early fall, prevailing conditions are occasionally interrupted for a 2-to 3-day period of strong, gusty, and dry northeasterly winds known as the "Santa Anas." During periods of Santa Anas, relative humidity drops to less than 20 percent and fire danger in nearby brush-covered hillsides rises to extreme levels.

The most potentially damaging winds in the NBVC Point Mugu area are prefrontal southeasters. These winds typically occur for 15 to 20 days between October and April. Wind speeds are usually less than 35 miles per hour (15 meters per second); however, on an average of once every 2 years, winds of 55 miles per hour (25 meters per second) may be expected in coastal areas. The duration of southeasters is typically 6 to 9 hours; under certain conditions; when a low pressure center lies to the west, or a quasistationary front is present, a southeaster may persist for up to 3 days.

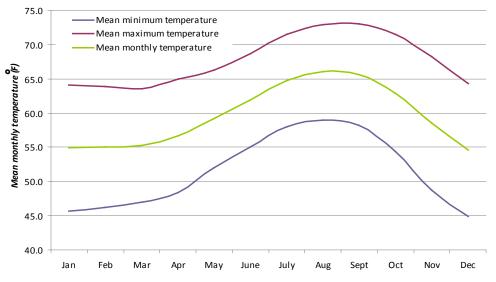


FIGURE 3-2: MONTHLY TEMPERATURE REGIME POINT MUGU, 1960-2010 (DATA FOR POINT MUGU, CA; WRCC 2011; NOAA 2011A)

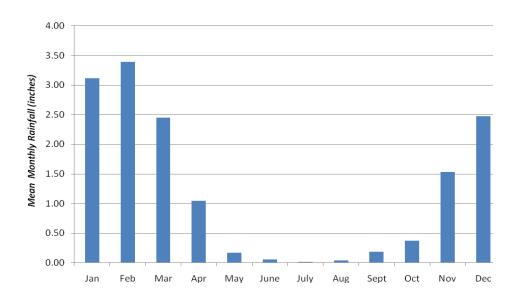


FIGURE 3-3: MEAN MONTHLY RAINFALL AT POINT MUGU, 1923-2003 (DATA FOR OXNARD, CA; WRCC 2011)

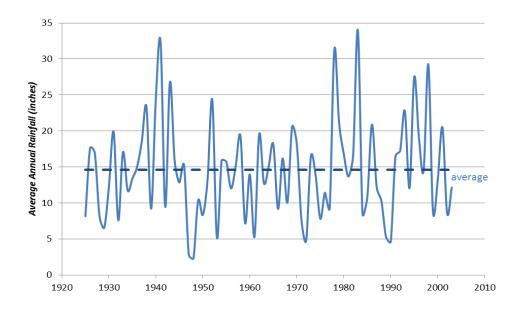


FIGURE 3-4: AVERAGE ANNUAL RAINFALL TOTAL FOR POINT MUGU, 1925-2003 (DATA FOR OXNARD, CA; WRCC 2011)

3.1.4 Air Quality

The federal Clean Air Act, as amended, requires each state to develop, adopt, and implement a State Implementation Plan to achieve, maintain, and enforce federal air quality standards throughout the state. The State Implementation Plan documents are developed on a pollutant-by-pollutant basis whenever one or more air quality standards is being violated. Areas that violate a federal air quality standard are designated as nonattainment; areas that comply with federal air quality standards are designated as attainment areas; areas that have been reclassified from nonattainment to attainment are designated as attainment status are designated as unclassified areas and are treated as attainment areas for various regulatory purposes.

Section 176(c) of the Clean Air Act, U.S.C. § 7506(c), requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. The U.S. Environmental Protection Agency (EPA) has promulgated separate rules that establish conformity analysis procedures for transportation-related actions and for other (general) federal agency actions. The EPA general conformity rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds.

The Clean Air Act conformity guidelines apply to NBVC Point Mugu because it is in a nonattainment part of Ventura County. The EPA and the State of California have designated Ventura County as a serious nonattainment area for ozone. This designation means any federal action that results in emissions greater than 50 tons per year for ozone precursors (oxides of nitrogen and reactive organic compounds) will be subject to a Conformity Determination per

EPA guidelines. Any project emissions less than the 50 tons per year threshold are considered *de minimis* and a Record of Non-Applicability of Federal Conformity requirements must be prepared.

The federal Clean Air Act authorizes the EPA to establish national ambient air quality standards to protect public health and welfare. National ambient air quality standards have been adopted for the criteria pollutants nitrogen oxides, ozone, carbon monoxide, sulfur oxides, particulate matter (less than 10 microns in diameter and less than 2.5 microns in diameter), and lead.

The NBVC Air Quality program is managed by the NBVC ED for all of NBVC including Point Mugu, Port Hueneme, and San Nicolas Island (SNI). NBVC has been issued three Title V federal operating permits by the Ventura County Air Pollution Control District, one each for Point Mugu, Port Hueneme, and San Nicolas Island. Each permit lists various equipment or operations that result in emissions of criteria pollutants. NBVC is required to provide an Annual Compliance Certification for each of the three Title V permits. For permitting new equipment, emission offsets must be provided because of Ventura County's nonattainment status for ozone. In lieu of emission offsets to permit a new piece of equipment.

3.2 PHYSICAL CONDITIONS AND MANAGING THE PHYSICAL AND CHEMICAL ENVIRONMENT

The management of soil and water resources is discussed in the following sections.

3.2.1 Climate Change

Climate change and sea level rise have potential to impact NBVC Point Mugu facilities, infrastructure, and natural resources. The Navy has partnered with TNC's Coastal Resiliency Project to develop a model to determine vulnerability of NBVC Point Mugu and the Ventura County coastline to projected sea level rise. The model will show potential impacts to facilities, as well as how habitats may change as a result of sea level rise. Numerous scientific models have been created that focus on the effects of climate change and sea level rise in various scenarios. Based on historical trends, there is general agreement that temperatures and climatic variability will increase, but there is less agreement on projections of precipitation trends (Lawson and others 2010). Under medium- to medium-high greenhouse gas emissions conditions, models predict mean sea level will rise 1.0 to 1.4 meters by the year 2100 (Heberger and others 2009).

Based on modeling conducted by the Pacific Institute's California Climate Change Center, at a 1.0 and 1.4 meter sea level rise, the entirety of NBVC Point Mugu would be at risk of flooding (http://www.pacinst.org/reports/sea_level_rise/gmap.html). The 100-year flood zone at NBVC Point Mugu is shown on Figure 2-3. If climate change results in increased storm intensity coupled with predicted sea level rise, NBVC Point Mugu infrastructure and resource areas may be threatened by flooding and erosion. When applying various models (from the

Intergovernmental Panel on Climate Change and California Climate Change Center) of projected sea level rise at NBVC Point Mugu, the resultant estimates of associated landward shift of the shoreline range from 5 to 40 feet by 2050, and from 20 to 130 feet by 2100 (Brady G2 2012a). Shoreline erosion is discussed further in Section 3.2.2.1 Shoreline Sediment.

Based on various projections of greenhouse gas emissions and different scenarios of rainfall and temperature, models predict that the NBVC Point Mugu region will likely experience a decrease in plant diversity, with regional reductions in endemic species' geographic ranges (Loarie and others 2008). Mediterranean ecosystems are among the highest in species richness and endemism globally and also among the most sensitive to climate and land-use change. The effects of climate change on the natural areas at Point Mugu may result in a reduction in the quantity or quality of habitat, or in habitat conversion such as the inland migration of the marsh. The natural areas at NBVC Point Mugu support special status plants and animals that rely on specific habitat elements of Mugu Lagoon. Species adaptation and dispersal may be challenging for those species with smaller habitat ranges, given the distance between Mugu Lagoon and other coastal wetland complexes.

Specific Concerns

- Studies specific to NBVC Point Mugu infrastructure and resources show that the installation is at great risk of flooding and shoreline erosion, based on predictions of sea level rise.
- Shifts in species distributions may occur, based on current models. The developed nature of the northern and central portions of NBVC Point Mugu limits the available space for the marsh to retreat inland. If the salt marsh can retreat inland, or accretion rates offset effects of sea level rise, then the salt marsh plant community may not change, compared with the potential changes in terrestrial communities. Salt marsh-dependent species would likely have limited ability to adapt and disperse on a local scale if the marsh cannot retreat inland.
- To the north of the base are Highway 1 and agricultural land. Additionally, two private duck hunting clubs are adjacent to the the base at the northwest, greatly reducing the area where the base may retreat if needed.
- On a larger geographic scale, shifts that occur at NBVC Point Mugu may result in impacts on the survivorship of regional populations of salt marsh bird's-beak (*Chloropyron maritimum* subsp.*maritimum*), Belding's savannah sparrows (*Passerculus sandwichensis beldingi*), and light-footed clapper rails at NBVC Point Mugu. The proposed Ormond Beach Wetland Restoration Project is incorporating sea level rise into the restoration, which may provide habitat for species retreating from Point Mugu.
- Increasing frequency and intensity of storms may require hard armoring to protect the remaining assets along the NBVC shoreline, which will require support from the regulatory agencies.

Current Management

Executive Order (EO) 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," outlines policies intended to ensure that federal agencies evaluate climate change risks and vulnerabilities and manage the short- and long-term effects of climate change on their operations and mission. The EO specifically requires the Navy to measure, report, and reduce its greenhouse gas emissions from direct and indirect activities. The DoD committed to reduce greenhouse gas emissions from noncombat activities 34 percent by 2020 (DoD 2010).

Recently, Naval Facilities Engineering Command (NAVFAC) conducted an assessment of the vulnerability of NBVC Point Mugu to climate change and shoreline erosion, presented in the *Shoreline Protection Study Report* (Brady G2 2012a). The study found that the coastline along Point Mugu has experienced retreat. The report assessed short- and long-term vulnerabilities of mission-critical and ecological assets at the base and presented strategies to reduce or eliminate those vulnerabilities (Section 3.2.2.1 Shoreline Sediment).

If the opportunity arises, NBVC would participate in any applicable Landscape Conservation Cooperative projects or Population Vulnerability Assessments. Vulnerability assessments evaluate the exposure and sensitivity of a species, population, or ecosystem to adapt to climate change. Results enable resource managers to identify the most vulnerable resources and prioritize conservation decisions and strategies. NBVC would also stay involved in TNC's Coastal Resiliency project's development of climate change strategies (Section 1.7 Integrating Other Plans and Documents). The data obtained from this model could help inform base staff on locations for "prestoration" projects – projects that would extend existing channels further upland to accommodate storm surges, flooding, and other effects from sea level rise. Landscape Conservation Cooperatives Information on be found can at: http://www.fws.gov/science/shc/. Information on the Coastal Resiliency project can be found at: http://coastalresilience.org/.

Assessment of Current Management

The Navy's current management in preparation of climate change is adequate. Based on the models and predictions of various climate change studies, and locally, on the recommendations made in the *Shoreline Protection Study Report*, the Navy should develop and plan for budgets to implement adaptation strategies, as facilities will likely require protection, alteration, or relocation.

The Navy should stay informed of ongoing monitoring and science conducted by other agencies and research institutions. Sea level rise models and evaluation should consider the potential impacts to Environmental Restoration Program sites and water quality. Areas within base boundaries where storm and ocean waters could be absorbed need evaluation. NBVC Point Mugu should collaborate with researchers and agencies such as TNC's Coastal Resiliency project in developing ecosystem-based adaptation strategies. Adaptation strategies developed in response to sea level rise should take into account the value and function of wetlands in mitigating flood waters and improving water quality. A primary function of wetlands is their ability to absorb and store flood waters, for groundwater recharge or evaporation. Open spaces, natural areas, existing drainage channels, and unused hardscape should be examined for potential creation of suitable areas for surface water storage and percolation, or drainage. Existing drainage channels and site hydrology should be examined for areas where improvements could be made to accommodate greater drainage.

Land acquisition would be required to accommodate the marsh moving inland (in currently developed areas) and infrastructure moving farther inland. Highway 101 is a limiting factor for expansion of the base inland. It is unknown whether NBVC provides enough mission support to warrant land acquisition, development, and relocating costs, or if NBVC may be subject to Base Realignment and Closure in the future, when sea level rise begins to have severe impacts to base facilities. At this time, the Navy is pursuing partnering with neighboring landowners through the DoD's Readiness and Environmental Protection Integration Program to protect the NBVC mission. The Readiness and Environmental Protection Integration Program supports costsharing partnerships authorized by Congress (10 U.S.C. 2684a), to protect military test and training capabilities, and conserve land. The Office of the Secretary of Defense created the Readiness and Environmental Protection Integration Program to organize and administer congressional funding for authorized projects that facilitate partnerships between the military, private conservation groups, and state and local governments. The program protects military readiness by preventing incompatible development and preserving habitats through buffer projects, supportive education, engagement, and regional planning. Through the Readiness and Environmental Protection Integration Program, NBVC is pursuing acquisition of easements for wetlands restoration

The USGS and University of California, Los Angeles (UCLA), are conducting research at Point Mugu from 2012 to 2014, to project sea level rise effects on tidal marshes along the Pacific coast. Field data collected will be synthesized and built into a predictive model of marsh elevation response to sea level rise. It is expected that future research by universities or other agencies will be requested to occur at Point Mugu, with NBVC supporting their interest and providing access.

Management Strategy

Objective: Minimize impacts of climate change and sea level rise to NBVC Point Mugu natural areas and infrastructure.

- *I.* Collaborate with regulatory agencies, Oxnard Harbor District, NBVC Installation Restoration program (in regards to Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] issues), NBVC Water Quality Division, Planning, Public Works, and other relevant regional planning entities such as Landscape Conservation Cooperatives or a Population Vulnerability Assessment to develop strategies to conserve and adaptively manage base resources in a manner consistent with regional coastal plans.
 - *A.* Align adaptation strategies with the natural resources management goals described in this INRMP and satisfy state and federal regulatory requirements.

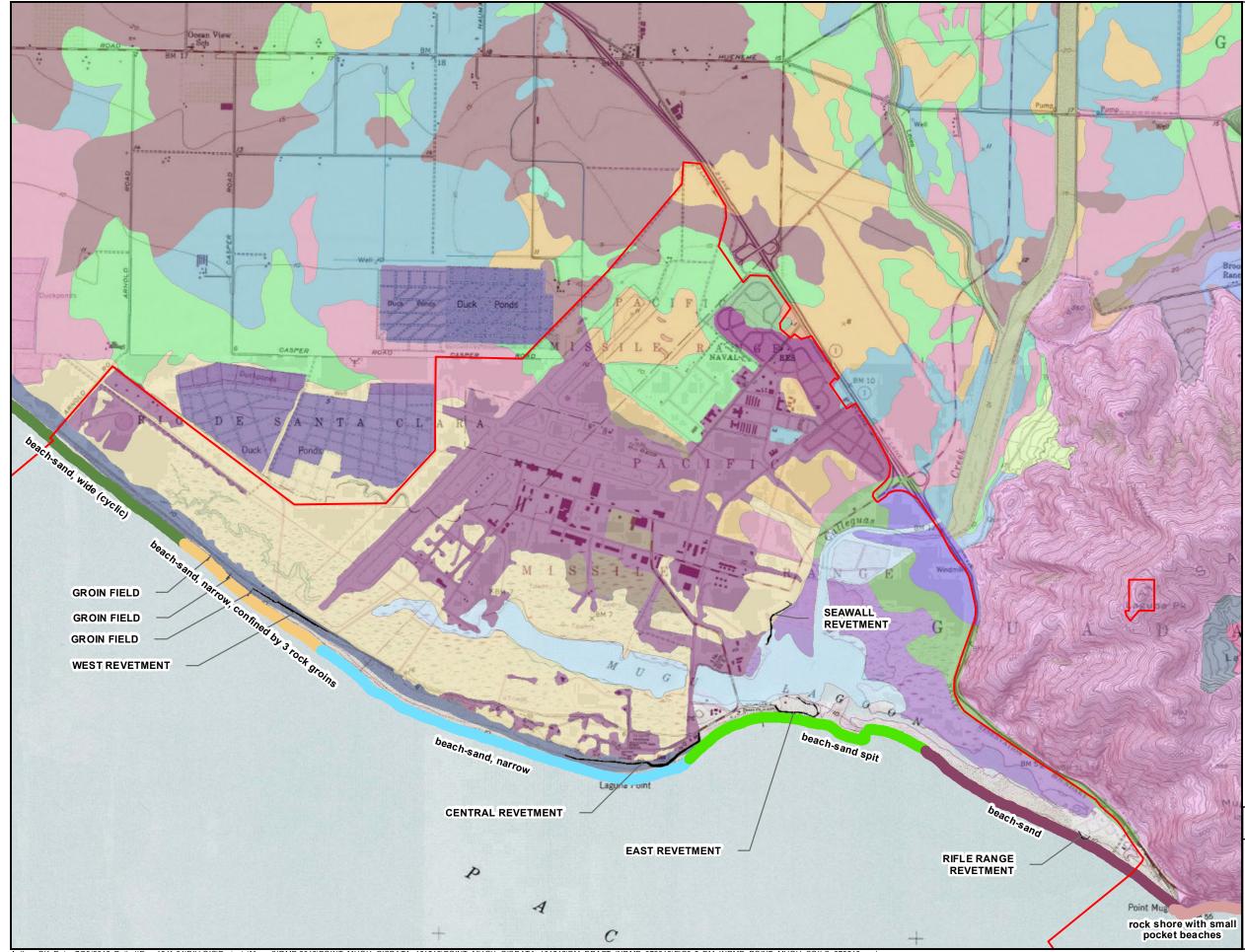
- *B.* Remain informed of sea level rise predictions and current management tools developed by state or federal agencies, or research institutions.
- *C.* Support research that examines how sea level rise would affect Mugu Lagoon, and how those changes may potentially extirpate species dependent on salt marsh such as the federally endangered salt marsh bird's-beak and light-footed clapper rail.
- D. Plan wetland restoration projects based on current and projected sea levels.
- *E.* Work with NBVC Asset Management to relocate various infrastructure to reduce the requirement for hard armoring along the coast.
- *F.* Develop planning strategies that include mapping remaining NBVC areas to determine areas for "prestoration" (creation of habitat for organisms migrating due to sea level rise) that might convert to wetlands as sea levels rise.

3.2.2 Soils and Soil Conservation

Currently, a diverse array of soil and sediment types is present at NBVC Point Mugu. Shallow soils and sediments have been deposited in stream and tidal lagoon environments. Historical depositional areas have shifted numerous times, and soils and sediments from different depositional environments are intermingled throughout NBVC Point Mugu. Native soils at NBVC Point Mugu and the Oxnard Plain are primarily alluvial and are easily eroded by surface water flows (Steffen 1982). The distribution of surficial soils is illustrated on Figure 3-5. The development of NBVC Point Mugu required the import or dredge of fill material that was mechanically compacted to make it suitable as a building site. Fill material underlies the majority of the developed areas within the base at varying thicknesses.

The soils at NBVC Point Mugu are represented in large part by the following soils series, listed in descending order according to their approximate percent acreage: Fill land (22 percent); Tidal flats (21 percent); Camarillo loam (8 percent), Pacheco silty clay loam (5 percent); Coastal beaches (3 percent) (Natural Resources Conservation Service 2012). Fill land soils are in the northern and central portions, and scattered throughout the installation. In areas of fill that supports infrastructure, the material was mechanically compacted. Imported material consists of dredge material, but may also contain boulders, concrete, asphalt, demolition debris, and soil from local borrow sources. Although permeability and infiltration rates may vary, drainage of fill material is generally poor (The Earth Resources Corporation 1987).

Tidal flats soils are relatively level, deep, very poorly drained silty clay found in the salt marsh. The Camarillo and Pacheco series are in the northern portion of the base. Camarillo series soils are found in alluvial fans and typified by poorly drained sandy loams approximately 5 feet (1.5 meters) thick or thicker. Pacheco Series soils are found in flood plains and consist of poorly drained silty clay loam, and are similar in thickness and topographic settings to that of Camarillo series soils. Coastal beaches soils are sand dunes and beaches along the coastline and are somewhat excessively drained (Natural Resource Conservation Service 2012).



Author: GK. Date: 7/26/2013. Path: \\Ecss134fs01\DIV-GIS\Projects\Mugu INRMP 2013\POINT_MUGU_GISDATA_101512\POINT_MUGU_GISDATA_101512\PM_DRAFT_INRMP_072013\FIG3-5_PM_INRMP_POINT_MUGU_SOILS_072513.mxd Data Source: TetraTech Databases. Soils Data Source: U.S. Department of Agriculture, Natural Resources Conservation Service 2009. Groins and Seawalls Data Source: Navy GIS Database. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

Legend

	INRMP BOUNDARY
	GROINS AND SEAWALL
	SERIES
	Camarillo Ioam
	Camarillo loam, coastal, 0 to 2 percent slopes
	Camarillo loam, sandy substratum
	Camarillo sandy loam
	Chumash-Boades-Malibu association, 30 to 75 percent slopes
	Coastal beaches Cotharin Ioam, 30 to 75 percent slopes, dry
	Cropley clay, calcareous variant
	Fill land
	Garretson gravelly loam, 2 to 9 percent slopes Garretson loam, 0 to 2 percent
	slopes
	Garretson loam, 2 to 9 percent slopes
	Hueneme loamy sand, loamy substratum
	Hueneme sandy loam
	Kayiwish association, 0 to 9 percent slopes
	Malibu loam, 15 to 30 percent slopes, eroded
	Mipolomol-Topanga association, 30 to 75 percent slopes
	Miscellaneous water
	Mocho clay loam, 2 to 5 percent slopes
	Pacheco silty clay loam
	Pacheco silty clay loam, 0 to 2 percent slopes
	Pits and dumps
	Riverwash
	Sulfic Fluvaquents, frequently flooded, 0 to 1 percent slopes
	Tidal flats
	Water
SHORELINE	
	beach-sand
_	beach-sand spit beach-sand, narrow
	peach-sand, narrow, confined by 3 rock groins
	beach-sand, wide
Ł	beach-sand, wide (cyclic)
r	ock shore with small pocket beaches
(N 1,000 0 1,000 2,000
	Feet
	Naval Base Ventura County
	California
	FIGURE 3-5
	POINT MUGU SOILS
	INTEGRATED NATURAL RESOURCES
	MANAGEMENT PLAN

Specific Concerns

- Erosion from roadsides, caused by runoff, could threaten the integrity of adjacent natural wetland habitat.
- Maintenance activities in drainage channels for flood control may cause unnecessary soil loss.
- Erosion control measures may be eliminated from projects as a cost-cutting measure.

Current Management

Federal agencies must manage lands to control and prevent soil erosion and conserve natural resources by conducting surveys and implementing soil conservation measures. The Sikes Act, the Clean Water Act, DoDINST 4715.03, and OPNAVINST 5090.1C CH-1 require best management practices (BMPs) for soil and water resources on federal lands. The Clean Air Act also restricts particulate matter emissions that result from soil disturbance.

Any project that may disturb the soil must go through the SA/PRB screening process for NEPA compliance, to receive a site approval from local and regional Navy. These projects include any soil disturbing activities such as digging, grading, stockpiling, dumping, staging, or establishing a laydown area. As necessary, BMPs are required to protect the soil from erosion by wind and water. This project screening process is a streamlined means for project sponsors to comply with NEPA and the laws, regulations, and guidelines described above. NBVC ED staff inspects project sites to ensure that the required BMPs are in place.

BMPs implemented in the drainage channels are described in the "Stormwater Pollution Prevention Plan" (SWPPP) for NBVC Point Mugu (Tri-Eco Tt JV 2012). In 2009, NBVC ED conducted an assessment of drainage channels and other areas throughout the base that may be prone to soil erosion. Site-specific BMPs were recommended as part of the survey report, and NBVC Public Works has initiated some of those recommendations. In drainage channels or road shoulders where heavy rain storms produce erosion of soil into the channel, erosion control blankets should be installed to reduce sediment entering the channels and to improve slope stability. Hydroseeding and the installation of plants are used to stabilize severely eroded channel banks. These measures have been undertaken at a few locations on the installation to protect wetlands. Some channel banks may be graded to improve slope stability. Additionally, the drainage channels and culverts are frequently inspected to ensure that all BMPs in the facility SWPPP are implemented.

The maintenance of roadsides is sometimes at odds with the goals of erosion control. Roadside erosion into adjacent wetlands is exacerbated when grounds maintenance crews spray herbicide on plants alongside the roads. Even weedy roadside plants serve to stabilize the sandy shoulder fill material and reduce erosion.

2013

The drainage channels are listed as IRP Site 11 under CERCLA. The Navy is the lead agency responsible for responding to releases of CERCLA hazardous substances at NBVC Point Mugu and responds to releases of CERCLA hazardous substances under its Environmental Restoration Program, established under the Defense Environmental Restoration Program. No disturbance or reconstruction of the ditches is allowed until the CERCLA process is completed. Details regarding Site 11 are discussed in Section 6.5, Environmental Restoration Program.

Coastal beaches and dunes are geomorphically dynamic. Beach sand regularly blows and accumulates on Beach Road, in the vicinity of the magazines. This sand is routinely removed by NBVC Public Works and placed in various upland spaces including along Donald Road, farther east on Beach Road, and 18th Street where there have been recent overwash issues during storm events coupled with high tides. NBVC ED is currently seeking regulatory approvals for re-using this sand for local beach replenishment. This issue is further addressed in Section 3.2.2.1 Shoreline Sediment.

Assessment of Current Management

Soil conservation is needed to provide the ecological structure necessary for terrestrial habitats and communities to function and provide the ecosystem services that support the Navy's current use of NBVC Point Mugu. The threshold beyond which an area loses its capability to sustain its original training load is loosely termed the carrying capacity. Protection of soil and water resources will in turn increase the capacity of the ecosystem to recover from disturbance and sustain its natural carrying capacity to support plants and animals and provide a realistic training environment. Soil surface stabilization is needed to minimize erosion and maximize opportunities for soils to self-stabilize after disturbance. Water supply, natural hydrologic processes, and water quality are essential to most ecological functions, including recoverability from disturbance.

The Navy's current management of projects for soil conservation is adequate. Implementation of NBVC Instruction 11010.1 has been necessary and sufficient to avoid and minimize impacts to soil resources from activities related to the military mission at NBVC Point Mugu. The site-specific erosion control provisions and guidelines for site re-vegetation requirements provide the means to control and manage site-specific erosion at NBVC Point Mugu. Military construction projects and construction training activities that include soil movement (grading and digging) necessitate BMPs to control soil loss and better oversight and review to ensure that adequate soil conservation measures are included in the project.

NBVC Point Mugu should continue to implement erosion control measures recommended in the "Erosion Survey and Recommended Best Management Practices" report (Tetra Tech 2009a). The funding and implementation of these measures will ensure the protection and maintenance of soil resources along drainageways and other wetland areas identified in the report as vulnerable to soil erosion. Oxnard drainage ditches should be assessed for potential areas that could be graded to gentler slopes and revegetated with native plants to reduce erosion.

Coordination should occur with grounds maintenance crews to identify areas on base where roadside treatment with herbicide should be avoided or weedy species hand-pulled to avoid affecting native vegetation.

Management Strategy

Objective: Minimize soil erosion through implementing best management practices.

- *I.* Ensure enforcement of the SA/PRB requirements to prevent erosion and repair any damage from construction or maintenance activities.
- II. Use the specific guidance for selecting BMPs presented in the *California Stormwater Best Management Practices Handbook*, including project planning and design guides, SWPPPs, Water Pollution Control Programs preparation manuals, Construction Site BMPs Manual (Caltrans 2000), other specifications in use on island projects, and other proven techniques, with the following strategy:
 - *A.* Minimize site disturbance;
 - *B.* Stabilize site disturbance;
 - *C.* Protect slopes and channels;
 - D. Control site perimeter;
 - E. Control internal erosion;
 - F. Add source-control BMPs and treatment control BMPs after construction; and,
 - *G.* Require by appropriate staff at NBVC ED to review BMPs that involve revegetation of slopes to ensure no non-native species are used. The NBVC Landscape Plant Selection Guide-Approved Plant List is the initial guideline for identifying the appropriate landscaping to be used at NBVC Point Mugu.
- *III*. Minimize disturbance by continuing to locate staging areas and construction training activities in disturbed areas only.
- *IV.* Work collaboratively with NBVC Public Works to develop maintenance practices and BMPs that reduce soil loss and improve habitat in drainage channels, without reducing or impeding channel flow.
- *V.* Any wetland restoration project should include measures to ensure the soil stability of the area surrounding the project site.
- *VI.* Continue to monitor for sites on base where erosion threatens wetland habitats and remedy if funds are available.

3.2.2.1 Shoreline Sediment

NBVC Point Mugu is situated along a dynamic stretch of coastline, within the Santa Barbara littoral cell. The Santa Barbara littoral cell is a 94-mile length of California coastline that extends from the mouth of the Santa Maria River, passes around Point Conception, and terminates at Point Mugu, where sediment drops off into the Mugu Submarine Canyon. Coastline along this stretch is largely composed of bluff-backed beaches perched on bedrock shore platforms. There are a few dune-backed beaches that formed near ephemeral creeks and sloughs, typically controlled by the complex faulting in the Western Transverse Ranges (Barnard and others 2008).

The beaches of the Santa Barbara littoral cell are naturally narrow, and studies have shown that they may be narrowing further in response to human activities. Sandy beaches of Ventura County are fed by littoral transport of sediments originating from river mouths in the Santa Barbara littoral cell, and locally, largely from the Santa Clara River. The Santa Clara River is the largest source of sediment in the area and discharges the greatest suspended sediment load in Southern California (RJR Engineering Group 2007). Sediment loads of dammed rivers in the Santa Barbara littoral cell have decreased by 40 percent when compared with historical sediment loads prior to the construction of dams. Net littoral drift along this section of California coastline is essentially unidirectional, with sand movement travelling southeast and down-coast (Patsch and Griggs 2007).

The construction of Ventura Harbor, Channel Islands Harbor, and Port Hueneme Harbor, and private development on the beaches has influenced shoreline position in the area of Point Mugu. The harbors and their associated jetties intercept sediment along the shoreline, acting as huge sand sinks and depriving surrounding beaches of sand (Patsch and Griggs 2007). To compensate for losses of sand along beaches east of Port Hueneme Harbor, the USACE implemented the Channel Islands Harbor Sand Bypassing Program in 1960. Under this program, the USACE transfers dredged sand from Channel Islands Harbor to the beaches southeast of Port Hueneme Harbor (USACE 1997).

A recent study was conducted on the effects of coastal processes at NBVC Point Mugu to support development of a Shoreline Protection Plan for NBVC Point Mugu (*Shoreline Protection Study Report for NBVC Point Mugu* [Brady G2 2012a]). The study assessed present conditions and the historical rate of erosion along the Point Mugu coastline. Several sections of the NBVC Point Mugu coastline were identified as immediately threatened with coastal flooding and erosion, including mission-critical infrastructure and natural resources. The study identified four principal factors influencing the shoreline at NBVC Point Mugu: Channel Islands Harbor sand bypass changes; Mugu Submarine capture rate changes; shoreline protection structures; and groin field wave climate change (Brady G2 2012a). Additional information regarding shoreline erosion and these factors can be found in the report, in Appendix Q.

Specific Concerns

- A reduction in shoreline sediment transport, or increased landward erosion of the beaches, may reduce roosting and foraging habitat for shorebirds and nesting habitat for federal and state endangered California least terns (*Sterna antillarum browni*) and federally threatened western snowy plovers (*Charadrius nivosus nivosus*) at NBVC Point Mugu.
- Erosion of beach would remove coastal strand and dune habitat and those species that depend on it if beach habitat does not migrate landward.
- The installation and maintenance of shoreline protection infrastructure designed to reduce shoreline erosion could degrade the beach habitat at NBVC Point Mugu.
- Adequate sand supply and replenishment along the NBVC Point Mugu coastline is a concern for the protection of mission-critical infrastructure and natural resources.
- Beach replenishment activities can adversely affect nesting migratory bird species unless scheduled outside of nesting seasons.
- Activities up coast of NBVC Point Mugu could accelerate erosion of the Point Mugu coastline.

Current Management

Shoreline sediment and erosion are not currently managed by NBVC ED. Infrastructure installation projects that could adversely affect natural resources are reviewed through the SA/PRB process.

The USACE conducts sand bypass activities every other year at NBVC Port Hueneme. The USACE conducts maintenance dredging of Port Hueneme Harbor on an as-needed basis.

A *Shoreline Protection Plan* (Brady G2 2012b)was developed for NBVC Point Mugu, based on the results of the *Shoreline Protection Study Report for NBVC Point Mugu* (Brady G2 2012a). At the time of writing, the plan is in the NEPA review process, with a scoping environmental assessment in development (Tetra Tech 2012g). The study report recommended beach nourishment and revetment armoring; both projects are in the planning phase. NBVC ED is seeking regulatory approvals for a beach nourishment program at NBVC Point Mugu. Additionally, plans are under way for extending the West Revetment approximately 200 feet to the east to protect Building 812, a mission-critical infrastructure.

Regionally, the Beach Erosion Authority for Clean Oceans and Nourishment (BEACON) was established in 1992 to address coastal erosion, beach nourishment and clean oceans within the Central California Coast, from Point Conception to Point Mugu. Member agencies include representatives from local county and city governments. Projects include development of the

Coastal Regional Sediment Management Plan, initiated in 2008 and presently ongoing. The goal of the plan is to formulate consensus-driven regional sediment management guidance and policy, under the direction of BEACON, for the area from Point Conception to Point Mugu. The intended outcome of the effort is to restore and maintain beaches and other critical areas of sediment deficit or excess; reduce the proliferation of protective shoreline structures; sustain tourism and recreation; enhance public safety and access; and restore coastal sandy habitats. A Coastal Sediment Working Group was formed to develop the plan, which is expected to present a 20-year blueprint for BEACON projects. Information about BEACON and the Coastal Sediment Working Group is available at: http://www.beacon.ca.gov/.

Assessment of Current Management

The SA/PRB process is effective at addressing natural resources management in the context of activities associated with shoreline sediment and erosion. On a regional level, management of shoreline erosion at and near NBVC Point Mugu remains a critical issue for the base and must be conducted from a regional perspective. The factors that influence movement of the coastline landward, and the erosion of the headwall of the submarine canyon, include activities that occur off base that must be addressed using a regional ecosystem approach. Key considerations for future management of shoreline erosion at NBVC Point Mugu should include analysis of potential impacts on sensitive coastal and estuarine habitats on base, as well as exploring options to mitigate these impacts.

Coordination with the USACE and the Oxnard Harbor District and involvement with regional initiatives such as the Beach Erosion Authority for Clean Oceans and Nourishment are critical components of managing shoreline resources at NBVC Point Mugu. Coordination with the USACE and the Oxnard Harbor District should continue to support implementation of the Channel Islands Harbor Sand Bypassing Program, a critical element for sustaining the sand budget at NBVC Point Mugu. Projects initiated by BEACON have the potential to affect the sand supply delivered downcoast of Port Hueneme via the Channel Islands Harbor Sand Bypassing Program. NBVC ED should continue to be aware of and participate in the planning process for regional projects that could affect the sand budget at Point Mugu.

The movement of the canyon and the potential effects of headwall breakthrough on the ecosystem of the Mugu Lagoon and surrounding habitats would be significant. Research and monitoring should be supported and encouraged. The potential effects of a headwall breach on lagoon habitat necessitate mitigation actions that are selected based on a sound technical understanding of the relationship between the canyon and the shoreline of NBVC Point Mugu.

Management Strategy

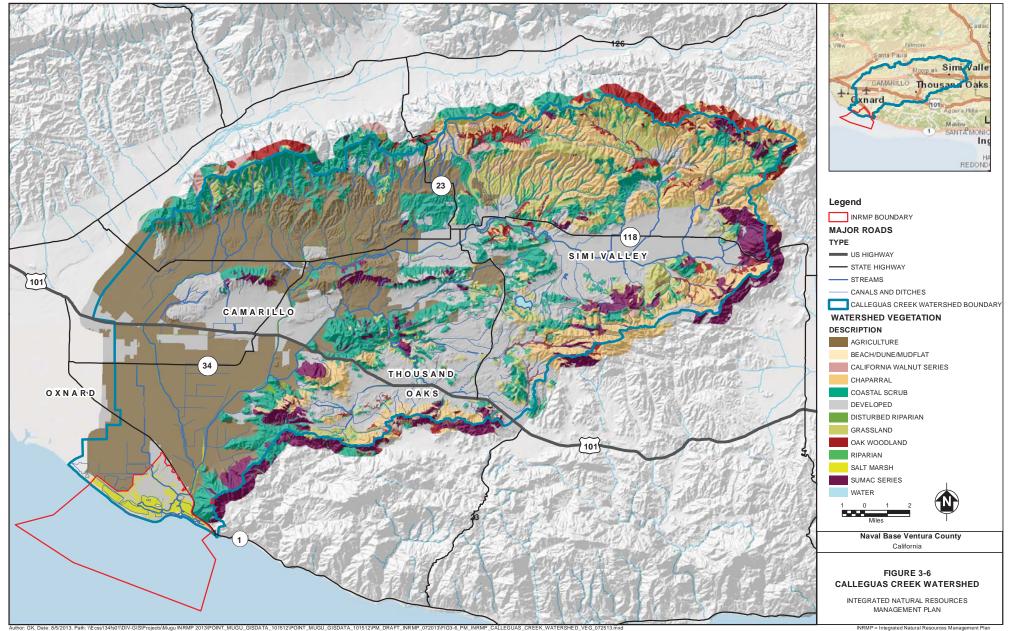
Objective: Minimize loss of infrastructure and sensitive species and habitats to shoreline erosion.

- *I.* Work collaboratively with NBVC Public Works, NBVC Planning, NBVC Port Operations, regulatory agencies, BEACON, and the Oxnard Harbor District to address shoreline erosion concerns on a local and regional level.
- *II.* Work with the USACE to create a beach replenishment program that uses the beach sand that accumulates on base for replenishment on Mugu beaches.
- *III.* Promote awareness of, support, and participate in research on coastal processes.
- *IV.* Participate in the planning of projects upcoast from Mugu that may affect the Mugu sand budget.

3.2.2.2 Calleguas Creek Watershed Sediment

Calleguas Creek, which flows through the eastern section of NBVC Point Mugu, is the main drainage course of the Calleguas Creek Watershed. The watershed drains an area of approximately 341 square miles, including Conejo Creek, Arroyo Santa Rosa, Arroyo Simi, Arroyo Las Posas, Calleguas Creek, Revolon Slough, and Mugu Lagoon. The Santa Susana Mountains, South Mountain, and Oak Ridge form the northern boundary of the watershed; the Simi Hills and Santa Monica Mountains form the southern boundary. NBVC Point Mugu is at the southern end of this watershed (Figure 3-6). The primary suppliers of sediment for Mugu Lagoon are Calleguas Creek and Revolon Slough (Chang 2004).

In 1992, the U.S. Department of Agriculture (USDA) Soil Conservation Service (now Natural Resource Conservation Service) identified sediment from Calleguas Creek drainage as a major threat to the Mugu Lagoon (USDA 1992). In the *Mugu Lagoon Watershed Local Implementation Plan of Work for Ventura and Los Angeles Counties, California,* USDA predicted that Mugu Lagoon would "have little open water in 50 years and would be farmable in 100 years" under historical sediment deposition rates. USDA also noted that the "value of Mugu Lagoon to water-associated wildlife will eventually be destroyed if this deposition process is allowed to progress" (USDA 1992). As a result of concern over sedimentation of the Mugu Lagoon, the Ventura County Resource Conservation District and the California State Coastal Conservancy requested that Natural Resource Conservation Service assist with the development of a local implementation plan to reduce sediment load delivered to the lagoon. Sediment mitigation management practices were developed and described in the Mugu Lagoon Implementation Plan of Work (USDA 1992).



Author: GK. Date: 8/5/2013. Path: VE.css13/4/s01/DIV-GISProjects/Mugu INRMP 2013/POINT_MUGU_GISDATA_101512/POINT_MUGU_GISDATA_101512/PM_DRAFT_INRMP_072013/FIG3-6_PM_INRMP_CALLEGUAS_CREEK_WATERSHED_VEG_072513.mxd Data Source: TerraTech. TetraTech. NBVC, and California Cosstal Conservancy GIS Databases. This map is government properly, not be the produced or distributed without concurrence from the Navai Base Ventura County Environmental Division.

In 1996, a cooperative coalition of property owners, water and wastewater agencies, environmental groups, agricultural parties, government entities (including the Navy), and private interests joined together to form the Calleguas Creek Watershed Committee. The committee began the task of identifying water quality issues and formed technical subcommittees to develop guidelines for preparing a comprehensive watershed plan (California Wetlands Information System 2012). The Calleguas Creek Watershed Committee developed the *Integrated Regional Water Management Plan (Volumes I and II)* with specific goals and strategies for the following focus areas: water resources and water quality; habitat, natural resources, and recreation; flood protection and sedimentation; and public outreach and education (Calleguas Creek Watershed Committee 2004, 2005). Further discussion of the Calleguas Creek Watershed Management Plan is in Section 3.2.3.2 Surface Water Hydrology and Stormwater Management.

In 1998, Mugu Lagoon was included on the Clean Water Act Section 303(d) Impaired Waters List for sedimentation/siltation. The Clean Water Act requires development of Total Maximum Daily Loads (TMDLs) to restore Section 303(d) listed waterbodies. The *Siltation TMDL Technical Document* (Los Angeles Regional Water Quality Control Board [LARWQCB] 2005) noted that the listing was based on the results of two previous studies, described below. A report developed in 1995 by the U.S. Department of Agricultural Services, "*Calleguas Creek Watershed Erosion and Sediment Control Plan for Mugu Lagoon*," concluded that 430 acres of the lagoon intertidal salt marsh would be converted to upland habitat by the year 2030, based on sedimentation records at that time. A 1998 study conducted by the State Water Resources Control Board Bay Protection and Toxic Cleanup Program also found limited species quality and diversity among benthic species in Mugu Lagoon. The study indicated that sedimentation rates, along with other factors, influence benthic community structure (Walker and Associates 2007).

The lower reach of Calleguas Creek was historically situated in a broad floodplain, where sediment spread out across the landscape. The present confinement of the channel from development along the floodplain has limited the spread of sediment to the alluvial fan. The result is increased sediment deposition in the lower reach and in Mugu Lagoon. Studies indicate that preservation of the lower Calleguas Creek channel and Mugu Lagoon will require regular maintenance dredging unless the channel is restored to the natural floodplain (Chang 2006).

Mugu Lagoon has three distinct coverage areas. The central branch is located just south of the sewage ponds. Laguna Road runs north-south and separates the west branch from the central branch. According to the USACE, the west branch has remained essentially the same through recorded history (USACE 2003). The lagoon's western arm is connected to the central basin, and ultimately to the ocean, through several 36-inch steel culverts and two main 8-foot concrete box culverts under Laguna Road (Figure 3-7). These culverts restrict flow under Laguna Road, limiting the hydrologic flushing rate of the western arm and the exchange of sediment with the central basin (Tetra Tech 2002). Laguna Road acts as an effective control that prevents major sediment loads from entering the west branch. The east branch is east of the estuary mouth. Sedimentation in the east branch has caused scattered smaller ponding areas (USACE 2003).

The configuration of the central basin of the lagoon is greatly affected by surface water and sediment input from Calleguas Creek, Revolon Slough, and the Oxnard drainage ditches. Most

sediment is deposited in the central basin during the rainy season (winter). Estimates of sediment delivery and deposition in Mugu Lagoon vary (Armstrong 2005). As such, one goal of the Calleguas Creek Watershed Committee's *Integrated Regional Water Management Plan* (*Volumes I and II*) is the comprehensive understanding of sediment dynamics along each reach of the watershed, including Mugu Lagoon (Calleguas Creek Watershed Committee 2004, 2005). The *TMDL for Organochlorine Pesticides, Polychlorinated Biphenyls, and Siltation in Calleguas Creek, Its Tributaries, and Mugu Lagoon* was adopted by the LARWQCB and put into effect March 2006. A major task of the TMDL is the quantification and evaluation of sedimentation and transport throughout the watershed, including Mugu Lagoon (Walker and Associates 2007).

A USACE study included an analysis of aerial photographs taken between 1945 and 1999. Mugu Lagoon experienced high rates of deposition after the lagoon was excavated in the 1950s. However, as the distribution of sediment in the lagoon achieved equilibrium and regained its historical configuration, the rate of sediment deposition slowed. The USACE study concluded that "natural in-filling slowed or stopped by 1985 and since that time, the Lagoon has changed very little. Most major floods, after 1985, have flushed their sediment load into the ocean" (Resource Management Associates, Inc. 2003). Comparison of bathymetry conducted between 1994 and 2002 indicates that the main channel in the western arm of the lagoon had some deposition (generally less than 1 foot) on the north side; elevations on the south side varied within 0.5 foot. Depths in the central lagoon showed no significant change between the years 1994 and 2002. A comparison of 1988 and 2002 bathymetry indicates the lower half of the central basin's channel shifted to the west (Resource Management Associates, Inc. 2003).

At present, there are no estimates of how sediment load is distributed between the lagoon and the ocean over a significant period of time (Armstrong 2005; Tetra Tech 2002). Sediment plays a crucial role in the function of the salt marsh estuarine ecosystem. Sedimentation not only plays a role in the physical dynamics of an estuarine ecosystem, but also influences the movement of contaminants, such as pesticides, associated with sediment. Contaminant loads and remediation of sediments in Mugu Lagoon are being addressed by the Environmental Restoration Program at NBVC Point Mugu; however, sediment transport is not (Tetra Tech 2002).

The Calleguas Creek Watershed Organochlorine Pesticides and Polychlorinated Biphenyls TMDL Special Study #1 Work Plan: Sediment Transport and Effects includes strategies for quantification of sedimentation in Mugu Lagoon and sediment transport throughout the Calleguas Creek watershed, as well as the evaluation of sedimentation effects (Walker and Associates 2007). The work plan details additional tasks, including the evaluation of the following numeric targets for siltation reduction within Mugu Lagoon: an annual average reduction in the import of silt of 5,200 tons per year, to be measured at NBVC Point Mugu's total suspended sediment gauge at the entrance to Mugu Lagoon; and the maintenance of the existing 1,400 acres of aquatic habitat in Mugu Lagoon (Walker and Associates 2007).

Specific Concerns

• High sediment loads to Mugu Lagoon could alter the estuarine habitat and adversely affect listed species.

- Sediment deposited into Mugu Lagoon carries pollutants harmful to wildlife species that rely on the lagoon for forage and reproduction.
- Sedimentation (accretion) may help reduce the effects of sea level rise; therefore, reduction in sedimentation load may be detrimental, increasing future subtidal habitat and reducing intertidal marsh habitat.
- Riverine sediment is critical to nutrient balance in coastal fisheries, mineral requirements by shell producing organisms, and beach development down coast.

Current Management

Regionally, several studies focused on reducing flooding and sedimentation with the Calleguas Creek watershed have led to installation of sediment control structures, stream bank stabilization projects, on-farm sediment basins, and adoption of range management practices. Local communities have also adopted grading and hillside erosion control ordinances (Tetra Tech 2002).

NBVC Point Mugu is a stakeholder in the Calleguas Creek Watershed Committee and supported the collaborative development of the *Integrated Regional Water Management Plan (Volumes I and II)*. Additionally, the base is a stakeholder in the development of TMDL work plans and currently supports implementation of TMDLs for Mugu Lagoon (Section 6.5 Environmental Restoration Program).

Although NBVC ED supports the monitoring of TMDLs within the lagoon, it does not actively manage sedimentation within the lagoon. NBVC ED supports research conducted within the Mugu Lagoon reach of Calleguas Creek such as California State University Channel Islands, which mapped the depth of the main estuary in 2012 and can be used to determine changes caused by sedimentation. The USGS is conducting a long-term study in coastal wetlands (including Mugu Lagoon) to determine potential impacts to coastal wetlands caused by sea level rise. NBVC ED stays informed on new initiatives and studies.

NBVC ED coordinates with the USACE, other agencies, and regional entities on any project that includes activities within Mugu Lagoon. Projects that occur at NBVC Point Mugu go through the SA/PRB process to ensure compliance with federal and state water regulations that protect water quality and threatened and endangered species.

Assessment of Current Management

The SA/PRB process project review process, combined with the NBVC Point Mugu Stormwater Pollution Prevention Program (Section 3.2.3.2 Surface Water Hydrology and Stormwater Management), adequately ensures that base projects do not contribute to overall sediment delivery to the lagoon.

NBVC ED should continue to support research within the lagoon that leads to better understanding of sedimentation dynamics and actively participate in planning strategies that affect sediment delivery to the lagoon.

Management Strategy

Objective: Manage sedimentation to preserve current hydrological connection of the lagoon and conserve sensitive species and habitats.

- *I.* Work collaboratively with NBVC Public Works, NBVC Planning, regulatory agencies, and the Calleguas Creek Watershed Management Plan to address sedimentation concerns on a local and regional level.
- *II.* Continue to support monitoring TMDLs within Mugu Lagoon.
- *III.* Support regular bathymetric mapping of the lagoon to reveal changes in lagoon depth.
- *IV.* Support research to determine required accretion rates to counteract sea level rise and determine how Calleguas Creek sedimentation rates compare.

3.2.3 Water Resources and Water Management

Groundwater and surface water hydrology are discussed in the following two sections. Objectives and management strategies are addressed together for groundwater and surface water and detailed at the end of Section 3.2.3.2 Surface Water Hydrology and Stormwater Management.

3.2.3.1 Groundwater Hydrology

NBVC Point Mugu is in the Oxnard Plain, a sub-basin of the Santa Clara River Valley Basin. Underlying the Oxnard Plain is a substantial aquifer system that is the primary source of water for urban and agricultural purposes in the region. Groundwater in the Oxnard Plain is primarily managed by the United Water Conservation District, which oversees groundwater pumping, facilitates recharge efforts, and provides drinking water to cities and urban areas in the Oxnard Plain (United Water Conservation District 2008).

The aquifers beneath the Oxnard Plain are contained within unconsolidated late Pleistocene to Holocene age sand and gravel deposits. The aquifers have maximum depths of 3,000 feet or more and include five major units. In order of increasing depth, these aquifers are the Semi-Perched, Oxnard, Mugu, Hueneme, Grimes Canyon, and Fox Canyon aquifers. The Oxnard and the Fox Canyon aquifers are considered the two primary freshwater-bearing units (CA Water Resources 2003).

The aquifers underlying NBVC Point Mugu can be divided into three systems. The uppermost system consists of the Semi-Perched aquifer. The Oxnard and Mugu aquifers are referred to as the upper aquifer system. The Hueneme and Fox Canyon aquifers are referred to as the lower aquifer system. The aquifers are separated from one another by aquitards (barriers to water flow) of continuous layers of silt or clay (City of Port Hueneme 1977). Water in the Semi-Perched aquifer is unconfined and of poor quality (California Water Resources Division 2003). Groundwater from the Semi-Perched aquifer at NBVC Point Mugu contains concentrations of total dissolved solids that exceed 3,000 milligrams per liter (mg/L); it is not used as a source of drinking water. The water table of the Semi-Perched aquifer is approximately 5 to 10 feet (1.5 to 3 meters) below ground surface (PRC 1995a).

Current data indicate that the Semi-Perched aquifer underlying NBVC Point Mugu discharges to Calleguas Creek, Mugu Lagoon, drainage ditches within the base, and the Pacific Ocean, as well as to the Santa Clara River and Revolon Slough (PRC 1997). Site-specific groundwater flow patterns vary spatially and temporally throughout the base as a result of tidal and surface water influences and from groundwater extraction from the Oxnard Aquifer. Monitoring well pairs installed in the semi-perched aquifer indicate a slight downward vertical gradient in the aquifer (PRC 1995b).

The upper and lower aquifer systems are classified as confined to semi-confined. The Oxnard aquifer is a major producer of groundwater and is considered the principal aquifer beneath the Oxnard Plain. Except for areas where seawater intrusion has occurred, the Oxnard aquifer contains high-quality groundwater. Freshwater recharge to the aquifers beneath the Oxnard Plain and NBVC Point Mugu occurs naturally from precipitation during above-average rainfall periods, infiltration through the Calleguas Creek and Santa Clara riverbeds, and artificial seepage areas in Saticoy and El Rio operated by United Water Conservation District northwest of the installation (Ventura County Public Works Agency 1981). The point of recharge is called the Oxnard forebay, an area of the Oxnard subbasin where the aquifer units intersect and confining clays are absent, allowing for direct recharge to the permeable gravel deposits (CA Water Resources Division 2003, United Water Conservation District 2008). High groundwater levels in the forebay exert a positive pressure on confined aquifers of the Oxnard Plain, resulting in regional groundwater flow from the recharge areas toward the ocean.

Groundwater from the Oxnard aquifer and underlying Mugu aquifer has historically been extracted at increasingly greater rates to supply water for municipal, commercial, and agricultural uses throughout the Oxnard Plain. As the rate of groundwater extraction exceeded the rate of recharge, the groundwater gradient within the aquifers began to change and became lower near areas of highest extraction relative to sea level. The reversal in groundwater flow resulted in seawater intrusion, which is the inland flow of water from the Pacific Ocean to the Oxnard aquifer and the underlying Mugu aquifer. Seawater intrusion into the Oxnard aquifer has extended from 1 to 2.5 miles inland from the coast (Stamos and others 1992; Izbicki 1991). The effect of seawater intrusion on groundwater of the Semi-Perched and Oxnard aquifers at NBVC Point Mugu has been to raise concentrations of total dissolved solids and change major anion and cation chemistry of the groundwater to a composition similar to seawater (Tetra Tech 2002).

Water districts within the Oxnard Basin such as Calleguas Municipal Water District and the United Water Conservation District for Ventura County worked with users to restore historical groundwater gradients in the Oxnard aquifer through artificial recharge, new water management facilities, and improved water management practices throughout the Oxnard Plain. As a result, seawater intrusion has been repelled in the Oxnard aquifer, and direction of groundwater flow is once again toward the ocean (United Water Conservation District 1996, 1998). The Oxnard aquifer is considered to have beneficial use as a municipal water supply.

3.2.3.2 Surface Water Hydrology and Stormwater Management

The primary surface water features at NBVC Point Mugu include Mugu Lagoon, seven primary drainage ditches, intertidal salt marsh, mud, sand, and tidal flats, and Calleguas Creek. Mugu Lagoon is a marine-dominated system, receiving tidal flow from the Pacific Ocean as well as fresh water from Calleguas Creek and irrigation channels that flow into NBVC Point Mugu.

Aside from the Pacific Ocean, Mugu Lagoon is the most significant surface water body at NBVC Point Mugu. The lagoon hydrology is a function of freshwater inputs to the lagoon, tidal influence and flushing, and physical modifications to surface water flow. Mugu Lagoon is divided into three distinct areas: the western arm, the eastern arm, and the central basin, each of which responds in a different manner to water circulation and sedimentation. Hydrologically, Mugu Lagoon has three distinct segments. The entire eastern marsh to Laguna Road has an unrestricted tidal prism. The complexity of the western arm hydrology is even more diverse, as the tidal prism is significantly reduced by culvert restriction as tidal waters travel farther west. The first significant reduction in tidal prism occurs from Laguna Road to the runway. The marsh west of the runway has a significant reduction in tidal prism caused by restriction from runway fill; tidal connection is through a set of three culverts underneath the runway that partially fill with heavy sediment loads.

Impermeable building and pavement surfaces characterize about half of the base, resulting in a large volume of surface runoff during storms that is conveyed through a network of catch basins and outfalls that empty into the drainage channels or directly into Mugu Lagoon. Surface water flow at the installation is in response to intermittent seasonal precipitation. In addition, several of the drainage ditches as well as Calleguas Creek originate in irrigated and industrial lands upstream of NBVC Point Mugu; off-base storm water and irrigation water discharge into Mugu Lagoon.

Seawater Influence on Mugu Lagoon

Mugu Lagoon is connected to the Pacific Ocean via an opening, which currently remains open year-round, through a barrier beach that is heavily influenced by tidal action. The tidal range in the central basin is greatest because of its direct connection to the ocean. The maximum highest tide measured within Mugu Lagoon is 6.9 feet and the lowest tide measured is -1.9 feet; however, the tidal range in the western arm is smaller because of man-made constrictions such as the causeway, culverts, and fills. The muted tidal range in the western arm is 4.0 to 6.0 feet; the maximum tidal range in the central and eastern arm measures 8.8 feet (Tetra Tech 2002).

Existing information indicates that the tidal prism — the volume of water moved in and out of the lagoon by the tides — is large in comparison to the water retained in the lagoon during low tide (Onuf 1987).

Tidal action is primarily responsible for flushing water and sediment into and out of Mugu Lagoon. The degree of flushing varies considerably with the lunar tidal cycle and storm surges in the lagoon. Predominant longshore currents that flow southeast ensure that very little of the water and material that leave the lagoon during ebb tides reenter the lagoon on the following flood tide (Onuf 1987). The relatively large exchange of water from Mugu Lagoon with the tides creates rapid currents at the narrow opening to the Pacific Ocean, where water velocities have been measured at about 8.8 feet per second at the opening (Tetra Tech 2002).

Seawater intrusion through the submarine canyon at Mugu Lagoon has been shown to extend 2 to 4 miles up the aquifer and into the inland valleys. Seawater intrusion impairs the quality of groundwater as well as the Mugu Lagoon by affecting the ratio of salt water to fresh water.

Freshwater Influence

Perennial freshwater streams in the Oxnard Plain consist of Calleguas Creek and its tributaries, Revolon Slough, and Conejo Creek, located in the upper reaches of the watershed. According to the topographic map (Figure 3-6), these streams drain an area of 380 square miles, including mountainous areas and level floodplains in the southern portion of the Oxnard Plain. These streams ultimately discharge to and serve as the primary source of freshwater input to Mugu Lagoon. The fitness of the resources at Mugu Lagoon depends in part on the freshwater inflows from the Calleguas Creek watershed. The watershed has been largely converted to agriculture, and more recently, to urban development. Along with these changes have come flood control structures, sedimentation, non-native plant species, contaminants such as pesticides, fertilizers, and heavy metals, and changes in the hydrologic regimes. Calleguas Creek perennial flows are largely from discharges permitted through the EPA's National Pollutant Discharge Elimination System, including agricultural and urban runoff and irrigation return flows. Mugu Lagoon is included on the EPA's Section 303(d) list of impaired water bodies because a number of constituent concentrations are exceeded (California State Water Resources Control Board 2012; Calleguas Creek Watershed Management Plan 2012). The most significant sources of impairment are generally considered to be nonpoint sources of toxic pollutants and nitrogen compounds. As a result of listing, and in accordance with Clean Water Act regulations, the Los Angeles Regional Water Quality Control Board was tasked with developing technical TMDLs that will result in the achievement of water quality standards. The Calleguas Creek watershed has TMDLs for nutrients, salts, metals, trash, and legacy pesticides; sediment toxicity and siltation are also identified as impairments. Benchmark conditions for nitrogen, temperature, and dissolved oxygen must also be met.

At present, multiple Calleguas Creek watershed management projects seek to improve the quality of the water flowing into Mugu Lagoon. The Calleguas Creek Watershed Committee works to develop comprehensive solutions to habitat, water quality, erosion, sedimentation, and flooding problems within the watershed. The Calleguas Creek Watershed Management Plan

addresses strategies for resource management and protection, with the following land use and water quality focus areas: water resources and water quality; habitat, natural resources, and recreation; flood protection and sedimentation; and public outreach and education. Projects consist of implementing land treatment programs, working with local farmers, and improvements on the streambeds and streambanks (Calleguas Creek Watershed Management Plan 2012).

The majority of NBVC Point Mugu is located within the Calleguas Creek 100-year flood zone (Figure 2-3). NBVC has taken measures to prevent flooding, including installation of flood barriers surrounding the base (Onyx Group, Inc. 2006).

Drainage ditches also contribute fresh water to the lagoon. The ditches that drain nearby agricultural land and portions of the base are subject to tidal influence. Three tide gates installed in Oxnard Drainage Ditch 2 and Oxnard Drainage Ditch 3, control saltwater intrusion that may flood the ditches and upstream farmland. Because mild slopes characterize most of the base, the velocity of surface water flow is slow except during major storms. Large duck ponds are located north of the western portion of the base, which provide fresh water through culverts and subsurface flow.

The western arm of Mugu Lagoon receives the majority of surface water runoff from storm water at NBVC Point Mugu and an Oxnard drainage ditch. The drainage ditch transports agricultural and storm water runoff from off-base sources. The gradual slope and slow currents in the drainage ditches that empty into the western arm generally limit the carrying capacity for the sediment load. However, the volume of sediment transported to the lagoon and ocean from drainage ditches is unknown.

The eastern arm of Mugu Lagoon receives limited freshwater input from the adjoining Laguna Peak and Point Mugu State Park to the north. Runoff from those areas flows through a series of culverts south of Highway 1. The eastern arm of the lagoon connects to the central basin via tidal channels and flats that are constantly changing with tides, storm flows, and location of the inlet. During floods, especially those associated with high tides, the marshes on the eastern side of the lagoon are inundated with fresh water. The volume of sediment carried into the lagoon from these runoff sources is unknown.

Interaction of Sea Water and Fresh Water in the Mugu Lagoon

Mugu Lagoon is relatively shallow (generally less than 10 feet deep at high tide). Circulation patterns within the lagoon are characterized by slow rates of mixing and flushing in the extreme western portion of the lagoon and moderate to fast rates of mixing and flushing in the eastern and central sections of the lagoon. The rate of flushing is determined by tidal influence and the quantity of fresh water that enters the lagoon from Calleguas Creek, Revolon Slough, and the Oxnard drainage ditches.

The local wave environment and varying rates of freshwater discharge from Revolon Slough and Calleguas Creek formerly resulted in seasonal migration of the inlet. Historically, the inlet

migrated eastward along the coast under low flow conditions from a position directly opposite the mouth of Calleguas Creek. The migration was the result primarily of longshore transport of beach sands. Periodic floods and discharge from the creek would reestablish the original position of the mouth of Calleguas Creek (Warme 1971). The periodic migration of the mouth of Calleguas Creek maintained flushing in the eastern arm of the lagoon and ensured the presence of a sandy substratum. Since the western side of the mouth was fortified with riprap in the mid-1990s, the inlet has remained stable at that location.

Physiochemical Characteristics

Physiochemical characteristics can affect the habitats within the salt marsh estuarine ecosystem at NBVC Point Mugu, including the plant and animal species that use Mugu Lagoon. The following sections present information on the physiochemical characteristics important to the ecosystem at NBVC Point Mugu, including water temperature, salinity, dissolved oxygen, bottom sediments, and solar radiation.

Water Temperature

The physicochemical environment of Mugu Lagoon is strongly influenced by the hydrological regime. The moderate temperatures of the ocean at the mouth of the lagoon govern the temperature in the lagoon. Surface water temperatures measured at Zuma Beach, approximately 25 kilometers southeast, range from 13°C to 18°C (monthly means), 12°C to 21°C (mean monthly minima and maxima), and 9°C to 22°C (absolute minimum and maximum) (California Water Resources Control Board 1979). Because of the rapid tidal flushing of the lagoon, factors that operate within the lagoon are of secondary importance. However, air temperature and insolation become increasingly important in the shallower and more landward subtidal areas. These factors dominate during low tide at the surface in the intertidal zone and influence the emergent vascular plants of the salt marsh the majority of the time.

Water temperature within the lagoon has not been measured systematically to evaluate the influence of air temperature, insolation, and depth; however, two data sets suggest that the modifying effect of shallow depths can be substantial. Wilson (1980, as cited in Onuf 1987) measured water temperature hourly in the middle of the sand channel that leads from the mouth of the lagoon into the eastern arm and 45 meters away in the middle of a subtidal flat. At low tide, the sand channel was covered by 50 centimeters of water and the subtidal flat by 15 centimeters. On the 6 measurement days (all during summer), mid-water temperatures at the deeper station always exceeded the shallower station at night (12 a.m. to 5 a.m.); during the day (10 a.m. to 3 p.m.), the shallow station was considerably warmer than the deeper station. The differences in temperature are striking given the rapid flow of water through the sand channel.

DuBois (1981, as cited in Onuf 1987) compared water temperatures in the inner, broad, open water part of the eastern arm of the lagoon (termed subtidal pond by Warme [1971, as cited in Onuf 1987]) with ocean temperatures near the mouth of the lagoon. Even early on a summer morning when waters in the lagoon should have cooled to their greatest extent, temperatures were higher in the lagoon. According to Onuf (Onuf 1987), in the winter, when days are short

and insolation is reduced, water temperature in the lagoon at night would be expected to be lower than offshore.

<u>Salinity</u>

Salinity has not been systematically measured in Mugu Lagoon. Given the virtual absence of surface flows of fresh water except during storms, dilution by fresh water should be minimal. The abundance of long-lived stenohaline marine organisms suggests that even brief dilutions substantially below 34 percent are rare (Warme 1971); however, dilution by fresh water was implicated in die-offs of the sand dollar (*Dendraster excentricus*) and the bubble shell (*Bulla gouldiana*) in 1969, 1978, and 1980 (Onuf 1987). Still, salinity has not been measured at the height of the storms, when the reductions were greatest. According to Onuf, the only relevant measurements were 19 parts per trillion one day and 28 parts per trillion two days after a 2-centimeter rainfall, culminating a 16-day rainy spell when 15 centimeters of precipitation had fallen (Onuf 1987). No information on tides and season is available for these measurements. Apparently, the lagoon rapidly returns to estuarine conditions.

Although the salinity in Mugu Lagoon is marine (34 parts per trillion) most of the time, the three major areas of the lagoon (west arm, central basin, and east arm) differ in their degree of salinity. Salinity in the eastern arm is the most marine of the three areas of the lagoon. It lacks a major watershed, is flanked by a narrow sandspit on one side and a steep mountain on the other (a 440-meter peak within 1.5 kilometers of the edge of the lagoon), and is closest to the opening to the ocean (Onuf 1987). The central basin receives the major inlet stream, but the stream is largely confined to a deep channel that transports water directly through the lagoon into the ocean. Only in the western extremity of the western arm does a longer-lasting salinity gradient exist. This part of the lagoon is partly under the influence of the coastal plain. Because of the low relief of the plain, water runs off slowly. Freshwater inputs include Oxnard Drainage Ditch 3 and the ponding and impoundment of rainwater. Culvert restrictions underneath the runway further limit drainage from the western arm. As a result, freshwater inputs are more persistent in the western arm because of the limited drainage to Mugu lagoon. The western part of the lagoon consists mainly of emergent marsh, natural tidal creeks, and long, shallow channels that are confined by artificial levees.

Dissolved Oxygen

Dissolved oxygen generally is high in the lagoon because of high rates of tidal exchange and shallow water that is easily mixed by winds. In some cases, however, reducing conditions develop beneath senescent mats of green algae (*Enteromorpha* and *Ulva*). These algal mats are found in the deepest parts of the lagoon and in a wrack line at the edge of the marsh in late summer. The mats affect the underlying sediments but apparently not the overlying water. UCLA has conducted research on the effects of the algal mats on micro-organisms (Krug and Zimmer 2000).

Bottom Sediments

Warme (1971, as cited in Onuf 1987) and Biddle (1976, as cited in Onuf 1987) described the characteristics of sediment in the eastern arm of Mugu Lagoon. The rest of the lagoon has not been systematically described. At the time of these reports, two sediment gradients existed within the eastern arm. Generally, sediments became finer-grained from west to east (increasing distances from the mouth) and south to north (from the sand spit, across the subtidal "ponds," and across the salt marsh). The west-east gradient was a function of the reduced velocities of tidally generated currents at greater distances from the mouth.

The south-north gradient was the result of several factors. The south shore of the lagoon is enriched in sand by occasional overwash of material from the ocean beach. Overwash occurs when exceptionally high surf coincides with spring tides. Initially, the input of new sand is restricted to a small delta that projects into the lagoon. Subsequently, longshore tidal currents distribute sand along the entire south side. Even in the deepest parts of the subtidal ponds, sand (particles larger than 63 microns in diameter) predominated over mud (Warme 1971). The predominance of sand suggests that movement of water is strong enough to keep fine particles in suspension or to remobilize them. The other possible explanation is that the source of fine particles is small compared with the source of sand. Aeolian deposition of sand by wind may explain further the prevalence of sand in the middle of the subtidal ponds.

Silts and clays predominated only in the salt marsh or in bare areas and depressions within the salt marsh (Warme 1971). Here, tidal currents are weak, because relatively small volumes of water pass over any given point in a tidal cycle. Furthermore, the vegetation acts as a baffle to currents and reduces the turbulence associated with waves that otherwise might suspend and move fine particles.

Solar Radiation

In addition to its considerable influence on the temperature regime of the Mugu Lagoon, solar radiation is important as a major determinant of primary productivity. Average daily incident solar radiation in the photosynthetically active region (PAR, approximately half of the total incident energy in the visible spectrum) ranged from 18 Einsteins (E) per meter squared (m^2) per day ($Em^{-2}d^{-1}$) in December to 56 $Em^{-2}d^{-1}$ in May (Onuf 1987). The difference in length of day, from 10 to 14 hours, accounts for 20 percent of the increase, and the higher intensity of solar radiation caused by the higher angle of incidence during the summer accounts for most of the rest. Cloud cover and its attendant effects on solar radiation varies little during the year, even though most precipitation occurs in the winter. This small variation occurs because fog is common in the summer. Turbidity further attenuates the light, in proportion to the concentration of suspended matter and depth, for organisms in the water column and on the bottom. The effect is greatest over unconsolidated muddy bottoms and least over sand (Onuf 1987).

Flood Control

NBVC Point Mugu does not typically experience significant flooding during average rainfall. Many of the major drainage ditches and some outfalls contain tide flaps or gates that prevent tidal water from backing into the storm drain system. The effectiveness of the tide gates is unclear, as they may not be functioning because of sedimentation or mechanical failure. During high-volume rain events, tidal water may move through poorly functioning tide flaps or gates into the storm drains, causing some flooding above the culverts. Flood areas may also occur at the upstream side of the small culverts that cross under the runways. The USACE predicts minor flooding at NBVC Point Mugu from storm events with a frequency return interval of every 6 years (Tetra Tech 2002).

Specific Concerns

- Mugu Lagoon is vulnerable to potential degradation or contamination from activities that occur throughout the base when stormwater runoff is conveyed through the drainage ditches and storm drainage system.
- Stormwater runoff and influx of sediment from erosion has the potential to degrade nearshore water quality. Stormwater management practices that maintain water quality are most important in the interface between terrestrial and aquatic resources.
- Groundwater may be contaminated by past Navy practices.
- The habitats of the western portion of Mugu Lagoon may change if the flooding regime of the adjacent duck clubs is modified.
- Culverts and tide gates and their maintenance will modify hydrology by changing the tidal prism, potentially affecting native species.
- Federally endangered salt marsh bird's-beak likely requires a reliable seasonal supply of freshwater to promote seed germination and sustain early growth.

Current Management

NBVC Point Mugu is required to comply with federal and state stormwater regulations under the Clean Water Act, as amended in 1987 (Section 402 [p]), the Coastal Zone Act Reauthorization Amendments of 1990 (Section 6217). These regulations address nonpoint source pollution from urban and stormwater runoff. EO 11988 "Floodplain Management" outlines policies to ensure that federal agencies evaluate flood risks and vulnerabilities for activities or development within floodplains, and "take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains" (42 Federal Register 26951).

Stormwater discharge to navigable waters is prohibited unless a National Pollutant Discharge Elimination System permit is obtained from the LARWQCB. The Navy has coverage under two general stormwater permits: the statewide General Industrial Activities Stormwater Permit No. CAS000001, and California General Permit No. CAS000002 for Stormwater Discharges Associated with Construction and Land Disturbance Activities. It is anticipated that NBVC Point Mugu will be subject to the Small Municipal Separate Storm Sewer Systems (MS4s)

General Permit in the future. No industrial activities occur at NBVC Special Area Laguna Peak, so it is not managed under the NBVC Water Quality program.

The three main objectives of the National Pollutant Discharge Elimination System permit program are (1) to identify and correct the sources of pollution that affect the quality of stormwater discharges, (2) to identify and monitor the sources of potential pollution that may affect the quality of stormwater discharges, and (3) to identify and implement BMPs to reduce potential pollution of stormwater discharges associated with industrial activity.

The General Permit for Industrial Activities requires development and implementation of an SWPPP. The SWPPP is intended to identify and evaluate potential sources of stormwater pollutants and to specify BMPs to control these sources and prevent or reduce pollutants in stormwater discharges and authorized non-stormwater discharges (Jonas 2010).

Ocean waters offshore Point Mugu are designated by the State Regional Water Quality Control Board as Areas of Special Biological Significance (ASBS). The Calleguas Creek watershed flows into the northernmost portion of the "Laguna Point to Latigo Point" ASBS, the largest mainland ASBS in Southern California, with 24 miles of coastline and 11,824 acres of marine habitat. ASBS waters are regulated by the state under the purview of the California Ocean Plan and afforded special protections; the State Water Resources Control Board is charged with monitoring and maintaining ASBS water quality.

Impacts to water resources are minimized through the SA/PRB process. Through the SA/PRB process, NBVC ED would consider potential impacts to ASBS. Impacts to ASBS are addressed under the NBVC Water Quality Program. NBVC ED ensures project BMPs, such as erosion control plans, are planned and implemented for all projects.

Groundwater contamination by past Navy practices is addressed under the Navy's Environmental Restoration Program (Section 6.5 Environmental Restoration Program). Management of contamination by hazardous substances is addressed in Section 6.6 Oil Spill Response and Hazardous Substance Prevention and Cleanup.

Assessment of Current Management

Under the stormwater National Pollutant Discharge Elimination System General Permits for industrial sites and construction sites, the Navy adequately maintains the drainage channels for stormwater conveyance and to meet water quality requirements stated in the General Permits. The Navy has a SWPPP, updated yearly, as required for the General Permit for industrial sites. As part of the Monitoring and Reporting Program Plan, stormwater samples are collected and analyzed to ensure contaminants are not entering harbors and the ocean. Dry and wet season observations are conducted, as mandated by the SWPPP, to verify that non-stormwater discharges are eliminated and to ensure BMPs are being implemented.

Proposed construction sites are required to be reviewed by the SA/PRB to assess whether the construction site meets the requirements of the General Construction Permit and Phase II Rule and to ensure that construction is not occurring on an Environmental Restoration Program site.

NBVC Point Mugu would benefit by forming partnerships to study the causes and effects of seawater intrusion and its impacts on the ecosystem of Mugu Lagoon. This study would require evaluating the entire watershed and the associated land uses that affect the groundwater resource.

The Environmental Restoration Program effectively addresses CERCLA groundwater contamination issues caused by past Navy practices, as discussed in Section 6.5 Environmental Restoration Program. Management of contamination caused by a release of hazardous substances is sufficient, as addressed in Section 6.6 Oil Spill Response and Hazardous Substance Prevention and Cleanup.

Management Strategy

Objective: Improve the quality of water entering the lagoon.

- *I.* Coordinate with NBVC Water Quality program to ensure projects remain in compliance with federal regulations to reduce impacts to natural resources.
 - *A.* Continue to use the SA/PRB process to ensure compliance with federal and state water regulations to ensure water quality is not impacted by project activities.
 - *B.* Ensure the implementation of BMPs and water quality improvement goals developed under the NBVC Point Mugu SWPPP and Environmental Restoration Program (see Section 6.5, Environmental Restoration Program).
 - C. Support the activities of the Environmental Restoration Program to restore contaminated sites.

- *D.* Collaborate with the NBVC Water Program Manager to ensure the stormwater program helps protect and/or benefits sensitive habitats.
- E. Incorporate the creation of bioswales into project designs where feasible.
- *II.* Support projects that may recharge or protect aquifers from salt intrusion.
- *III*. Participate with outside agencies and groups that are involved in groundwater issues.

Objective: Increase the tidal prism in areas where culverts restrict flow to prevent flooding.

- *IV.* Coordinate with NBVC Public Works to identify clogged culverts and determine whether sediment removal would benefit natural resources.
- *V.* Identify opportunities on base where new culverts could be installed to enhance the tidal prism or restore connections.

3.3 ECOSYSTEMS AND ECOSYSTEM MANAGEMENT

NBVC Point Mugu is home to the largest remaining salt marsh estuary in Southern California. The salt marsh and associated communities support a variety of plant and wildlife, including federally listed special status species. The following sections present a description of natural habitats and species in the marine and terrestrial communities at NBVC Point Mugu and Special Area Laguna Peak.

Species and habitats are managed using an ecosystem approach, as described in Section 1.6. Full species lists compiled from biological inventories are in Appendix G. Plant taxa are described using *Jepson Manual: Higher Plants of California* (Hickman 1996), though it is recognized that the classification of flora based on DNA evidence has resulted in the re-organization and renaming of some species specific to Point Mugu. This INRMP was initiated during the transition to the second edition of the Jepson Manual (Baldwin and others 2012). Names presented in this report follow the naming convention used in the first edition of the *Jepson Manual* (Hickman 1996), with the exception of special status species, which are described using current nomenclature. In cases where outside input was received (such as references, studies, plans, and floras), plant names are according to how they were provided.

Special status species documented or having the potential to occur at NBVC Point Mugu are listed in Appendix G. Sources for this information include the CDFW California Statewide Wildlife Habitat Relationships System (Mayer and Laudenslayer 1988 Zeiner and others 1988, 1990a, 1990b), CDFW's California Natural Diversity Database, California Native Plant Society's online version of *Inventory of Rare and Endangered Plants of California, A Natural History of California* (Schoenherr 1992), various field guides (Eschmeyer and Herald 1991, Hickman 1996, Page and Burr 1991, Robbins and others 1983, Stebbins 1985, Whitaker 1997),

and numerous surveys conducted by private consultants, researchers, as well as ongoing biological surveys conducted by NBVC ED. The survey reports are listed in Appendix Q.

Discussion of ecosystems and ecosystem management is focused largely on vegetation communities and abiotic characteristics of these communities. The following section is divided into "Marine and Wetland Communities" and "Terrestrial Communities."

3.3.1 Marine and Wetland Communities

Marine and wetland communities at NBVC Point Mugu are described below. Numerous surveys conducted in Mugu Lagoon by the Navy, other agencies, and research institutions are provided in Appendix D Natural Resources Bibliography. Marine communities described in this INRMP do not conform to the Coastal and Marine Ecological Classification Standard. The vegetation communities within the wetland section are derived from the "Vegetation Classification and Mapping" report (HDR 2013), which is based on *A Manual of California Vegetation* (Sawyer, Keeler-Wolf and Evens 2009) in accordance with the National Vegetation Classification System and in coordination with CDFW's Vegetation Classification and Mapping Program. Vegetation community details and maps are in Appendix Q (HDR 2013). Intertidal mud and sandflat and salt pannes were not mapped in the recent vegetation mapping effort because of the absence of vegetation.

Wetlands play a valuable role in the environment both ecologically and physically. Wetlands are ecologically important in that they provide food, spawning and nursing grounds, and habitat for many species. Physically, wetlands not only help absorb floodwater runoff, but also act as

natural water treatment centers, filtering out large amounts of nutrients and waterborne pollutants and protecting the quality of the water in the area (Miller 1994). There are 2,139 acres of wetlands on NBVC Point Mugu, 48 percent of its total area (4,490 acres). NBVC Point Mugu contains a variety of relatively undisturbed wetlands, ranging from salt marsh estuary and freshwater marshes to creeks. Major wetland areas on the base include Mugu Lagoon and



Calleguas Creek.

PHOTOGRAPH 3-1: MUGU LAGOON Source: U.S. Navy 2013

Calleguas Creek provides wetland habitat that supports

a variety of wildlife, including several federal and state listed birds. Mugu Lagoon is a salt marsh estuary at the mouth of Calleguas Creek. Many species of shorebirds, fish, and marine mammals use this estuary. Freshwater marshes have developed in areas where tidal influence is insufficient for salt marsh development. Perched water in dune swales forms small wetlands in an otherwise arid environment. These small wetlands are usually dominated by the emergent aquatic plant spiny rush (*Juncus acutus*). Several drainage ditches on the base support freshwater wetlands. The extensive marsh complex of Mugu Lagoon is one of the largest such areas remaining in this coastal strand environment. The habitats within this ecosystem are described below.

Management strategies for wetland communities are discussed at the end of the wetland sections, in Section 3.3.1.5 Jurisdictional Waters-Wetlands Management. Management strategies for the marine nearshore habitat are discussed below, in Section 3.3.1.1 Marine Nearshore Habitat.

3.3.1.1 Marine Nearshore

The marine nearshore habitat of NBVC Point Mugu described in this report is from the Pacific Coast shoreline to 3 NM seaward. Intertidal and estuarine areas are discussed later in this document. The majority of natural resource surveys and management at NBVC Point Mugu are focused on the lagoon environment, described in Section 3.3.1.2 below. Few surveys have been conducted in the marine nearshore habitat at NBVC Point Mugu. Nearshore habitat and species information below is taken largely from the Point Mugu Sea Range "Final Environmental Impact Statement/Overseas Environmental Impact Statement, Point Mugu Sea Range" (DoD 2002).

The Mugu Submarine Canyon is just offshore of Family Beach. The canyon rim lies along the entire 2,200-foot length of Family Beach and is within tens of feet of the mean sea level shoreline. Beyond the shelf, the terrain drops off rapidly into Mugu Canyon. Mugu Lagoon is less than 200 feet landward of the shoreline (Brady G2 2012a).

The marine nearshore environment of NBVC Point Mugu is situated within the Southern California Bight, a broad ocean embayment along the California coastline that extends south of Point Conception to Mexico. The Southern California Bight is influenced by two major ocean currents: the southward flowing, cold-water California Current, and the northward flowing, warm-water California Countercurrent. These currents mix in the Southern California Bight and strongly affect marine species assemblages and distributions; species composition and diversity differ greatly in the regions north and south of the Southern California Bight (DoD 2002).

Habitats typical along the Point Mugu stretch of shoreline include vegetated and unvegetated soft substrate shelves and slopes and kelp forests. In the continental shelf region, (approximately 100-foot depth, beyond the depths suitable for kelp beds), sand and gravel substrate are interspersed with rubble and rocky outcrops. Rocky outcrops make up approximately 3 percent of the sea floor and provide attachment strata for a variety of marine invertebrate assemblages (DoD 2002). Shoreline features such as riprap and revetment also provide habitat and contribute to species diversity by providing attachment locales and structure for a variety of organisms.

Marine flora in the nearshore environment includes phytoplankton throughout the water column and algae, including kelp species. Phytoplankton form the basis of the aquatic food chain, feeding larger zooplankton, which are a food source for invertebrates, fish, and whales. There are no kelp beds offshore of NBVC Point Mugu. However, kelp beds, which are found in the region, provide habitat for other algal species, invertebrates, and fish. Kelp beds are among the most diverse marine communities, providing food and cover for many species of fish and invertebrates. Nearly all of the 150 species of fishes known from the California coast occur at one time or another in kelp beds. Within the surf zone at Point Mugu, marine invertebrates include species common to sandy beaches: clams, sand crabs (*Emerita analoga*), and polychaete worms. Two common clams include the Pismo clam (*Tivela stultorum*) and the bean clam (*Donax gouldii*). The Pismo is the larger of the two and the subject of sport fishing. Marine invertebrates of the nearshore continental shelf include several clam species (genera *Tellina, Macoma, and Spisula*), sand dollars, tubicolous polychaetes (genera *Diopatra, Nothria, Onuphis, Owenia, and Pista*), sea cucumbers, and small bivalves. Common predatory and opportunistic scavengers include crabs, hermit crabs, starfish, and snails. The mainland shelf, with depths from 100 to 492 feet deep, has high species abundance and diversity relative to other deep benthic areas and similar to that found on offshore shelves. Species composition and abundance decrease with increasing water depth and vary according to changes in substrate relief.

Fish of the marine nearshore environment off of Point Mugu include the grunion (Leuresthes tenuis), which spawns on the sandy beaches of Point Mugu. It spawns during nighttime spring (as opposed to neap) high tides in spring and summer. This species supports a minor recreational fishery along sandy beaches in Southern California. Offshore, in areas of soft substrate within the inner shelf, the following species have been recorded at depths up to 60 feet: turbot (Pleuronichthys spp.), northern anchovy (Engraulis mordax), queenfish (Seriphus politus), round stingray (Urobatis halleri), shovelnose guitarfish (Rhinobatos productus), shiner, walleye (Hyperprosopon argentteum), white surfperch (Phanerdon furcatus), California halibut (Paralichthys californicus), speckled sanddab (Citharichthys stigmaeus), and white croaker. Fishes of the outer shelf include calico (Sebastes dalli) and stripetail (S. saxicola) rockfish, California scorpionfish (Scorpaena guttanta), bigmouth sole (Hippoglossina stomata), California lizardfish (Synodus lucioceps), California tonguefish (Sympharus atricauda), curlfin turbot (Pleuronichthys decurrens), English sole (Pleuronectes vetulus), northern anchovy, and Pacific (Citharichthys sordidus) and speckled sanddab. The most common commercially harvested species in the waters off Point Mugu between 1991 and 1995 included Pacific mackerel and Pacific sardines (Sardinops sagax), with smaller catches of jack mackerel (Trachurus symmetricus), yellowfin tuna (Thunus albacares), and northern anchovy, among others. Of note, on a per unit area basis, the recorded catch from waters off Point Mugu was significantly higher than recorded from any area within or adjacent to the Point Mugu Sea Range (DoD 2002). More information on fish species recorded in offshore waters of NBVC Point Mugu can be found in the Point Mugu Sea Range final environmental impact statement (DoD 2002).

Sea turtles are not known to nest at NBVC Point Mugu and have not been documented visiting the beaches. Summer is the most likely season of sea turtle occurrence in nearshore waters off NBVC Point Mugu. Species that could occur include juvenile loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), and green/black (*Chelonia mydas*) sea turtles. Olive ridley (*Lepidochelys olivacea*) turtles are present in the Southern California Bight, but rarely encountered as they are more common to tropical waters.

Marine mammals typically occur in deep waters and are expected to occur offshore of NBVC Point Mugu. During studies conducted for the Point Mugu Sea Range final environmental impact statement, five species of cetaceans, one species of pinniped, and the sea otter were recorded within 3 NM of NBVC Point Mugu (DoD 2002). Four toothed whales (odontocetes) were sighted: Dall's porpoise (*Phocoenoides dalli*), bottlenose dolphin (*Tursiops* sp.), common

dolphin (*Delphinus* sp.), pilot whale (*Globicephala* sp.) and gray whale (*Eschrichtius robustus*). The gray whale was the only baleen (mysticete) species regularly observed during the 2002 study. Other baleen species observed by Navy staff (outside the 2002 study) include the blue whale (*Balaenoptera musculus*) and fin whale (*Balaenoptera physalus*).

The only pinniped commonly seen in large numbers near NBVC Point Mugu is the harbor seal (*Phoca vitulina*), which hauls out at the entrance to Mugu Lagoon. Small numbers of California sea lions (*Zalophus californianus*) feed and haul out on occasion at NBVC Point Mugu; northern elephant seal (*Mirounga angustirostris*) pups, post-dispersal from breeding rookeries, are occasionally found hauled out and resting on Point Mugu, with more encounters documented since 2009.

Bird species that forage in the nearshore habitat are detailed in Section 3.4.4 Birds. Common species observed offshore of NBVC Point Mugu include surf scoter (*Melanitta perspicillata*), western grebe (*Aechmophorus occidentalis*), eared grebe (*Podiceps nigricollis*), Brandt's cormorant (*Phalacrocorax penicillatus*), common loon (*Gavia immer*), red-throated loon (*Gavia stellata*), and Pacific loon (*Gavia pacifica*).

There are no rocks or islands within 3 NM off the coast of NBVC Point Mugu that fall under California Coastal National Monument jurisdiction (BLM 2005).

Specific Issues

- Limited qualitative and quantitative data are available on the extent and type of marine nearshore habitats off the coast of Point Mugu.
- Studies indicate that a reduction of sand supply to the nearshore environment of NBVC Point Mugu may increase erosion of the Mugu Submarine Canyon headwall. A breach of the headwall through Family Beach could significantly change the Mugu Lagoon hydrology and habitat.
- Threats to the integrity and biodiversity of the marine nearshore community include revetment construction along the shoreline, pollution, invasive species, and potential contaminant impacts. This revetment may affect the distribution, abundance, and diversity of marine flora and fauna.

Current Management

Projects that occur in, or have the potential to affect, marine nearshore habitat are managed through use of the SA/PRB. This process and implementation of this INRMP ensure that impacts to this habitat are minimized or avoided. The nearshore environment is under regulatory authority of the following federal and state agencies: USACE, National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS), U.S. Environmental Protection Agency (EPA), USFWS, LARWQCB and California Coastal

Commission. The USACE is the primary permitting authority, implementing requirements of Section 10 of the Rivers and Harbors Act. Any project that has potential impacts to EFH requires consultation with NMFS. The Navy must incorporate into project plans NMFS recommendations for conservation practices that minimize, offset, or avoid impacts to EFH (Section 6.4 Regulatory Compliance and Appendix B). Ocean waters offshore Point Mugu are designated by the state as ASBS (Figure 2-3). ASBS waters are regulated by the state under the purview of the California Ocean Plan, and afforded special protections; the State Water Resources Control Board is charged with monitoring and maintaining ASBS water quality. Through the SA/PRB process, NBVC ED would consider potential impacts to ASBS. Impacts to ASBS are addressed under the NBVC Water Quality Program.

Assessment of Current Management

The SA/PRB process is effective at managing natural resources in the context of activities in the nearshore environment of NBVC Point Mugu. Relatively few projects occur within the nearshore environment; however, military testing activities occur in the airspace above the nearshore environment. The airspace over the Point Mugu airfield, beach, and to 3 NM offshore is a Naval Restricted Area, within which weapons and aircraft testing occurs. Within the Naval Restricted Area are areas of close-in weapons systems testing that can result in falling debris between the firing point and offshore waters (NAWCWD 2012).

Although aquatic invasives can be detrimental to the marine subtidal ecosystem, nearshore waters are currently not regularly monitored for aquatic invasive species. Artificial substrate such as revetments should be regularly monitored for aquatic invasives. For additional information on management objectives and strategies for aquatic invasives, see Section 3.7, Invasive Species Management.

Management Strategy

Objective: Maintain the ecological integrity of the marine nearshore habitat of NBVC Point Mugu.

- *I.* Continue to use the SA/PRB to avoid and minimize potential impacts to marine nearshore habitat.
- *II.* Support and remain aware of research in the nearshore habitat of NBVC Point Mugu, including a habitat classification based on the Coastal and Marine Ecological Classification Standard.

3.3.1.2 Estuarine Deepwater (Subtidal): Estuarine Channels and Tidal Creeks

The estuarine deepwater (subtidal) community at NBVC Point Mugu consists of species associated with sand, mud, and rock substrates. This habitat as discussed herein includes the submerged aquatic habitat of the main lagoon, tidal creeks, and channels. Shoreline features in

the estuary, such as riprap and revetment, also provide habitat and contribute to species diversity by providing attachment locales for invertebrates.

The biota of Mugu Lagoon is rich with plants, invertebrates, fish, birds, reptiles, amphibians, and mammals. All of these biotic components have important associations and interactions with each other and with the physical environment. These relationships play an important role in the function and value of the existing estuarine ecosystem. Unfortunately, they have not all been equally or thoroughly studied. Submerged aquatic habitat at Mugu Lagoon is important but not well understood, due to challenges in researching this habitat type. This habitat supports many species at the base of the food chain, including benthic invertebrates and fish that are an essential food source for birds and other predators.

Tidal channels and tidal creeks are important for macroalgae, phytoplankton, invertebrates, fishes, and birds. Fish-eating birds, including the federal and state endangered California least tern, feed at the surface over deepwater habitats; at low tide, shorebirds probe the intertidal sediments of channels and creeks.

Channels are subjected to a wide range of environmental conditions. Tidal flushing decreases with distance from the mouth; this general gradient in turn influences water movement, salinity, temperature, nutrients, and dissolved gases. Finer sediments are removed by higher-velocity currents, which results in substrates with coarser sediments near the mouth than in tidal creeks. Nutrients brought into the estuary by tidal flushing are more readily available to organisms near the mouth. Temperature, salinity, and dissolved oxygen are less variable in areas of deep water than in tidal creeks. These environmental factors influence the composition, distribution, and population dynamics of the channel organisms.

Phytoplankton is also variable in species composition and density. Dinoflagellates (for example, *Gymnodinium* spp.), diatoms, filamentous blue-green algae (cyanophytes), and unidentified unicells or "monads" are all present in the water column (Zedler and others 1992). Although most of these algae are typical planktonic species, the diatoms are all pennate forms with bilateral symmetry and longitudinal grooves that allow locomotion on substrates (Zedler and others 1992). Some investigators believe that most diatoms are resuspended from sediments (Fong 2001). The size of monads (about 1-2 microns diameter) makes identification challenging; they appear to belong to the Cyanophyta (Fong 2001). Many phytoplankton species also occur in nearshore habitats, where their densities are lower. From March to June, there may be phytoplankton blooms in the estuary, with cell counts higher than in marine waters by one to two orders of magnitude (Zedler and others 1992).

Both Rudnicki (1986, as cited in Onuf 1987) and Fong (1986, as cited in Zedler and others 1992) associated algal blooms with reduced tidal flushing. Infrared aerial images of Mugu Lagoon illustrate a biomass of macroalgae in tidal creeks as well as along the shores of the lagoon. Channel waters were green with phytoplankton during the summer of 1998 at Mugu Lagoon. At the Tijuana River Estuary during the 1985 monthly census of channel algae, Rudnicki and Fong found the highest biomass of both macroalgae and phytoplankton in small tidal creeks where currents were low.

Macroalgae dominate in intertidal and subtidal areas. Large populations of *Enteromorpha* spp. or sea lettuce (*Ulva* spp.) develop on the channel bottoms and later float to the water surface in some localized areas. Seasonal distribution patterns are highly variable, but their abundance is usually greatest in spring.

Eelgrass (*Zostera marina*), a vascular aquatic plant, was historically present in Mugu Lagoon. Severe storms in 1978 and 1980 resulted in deposition of sediments that led to eelgrass losses and a 38 percent reduction in low-tide water volume (Zedler and others 1992). Major storm events also occurred in subsequent years after the Onuf and Quanmen study, with rainfall in 1983 exceeding that in 1978 and 1980. It may be that any remaining eelgrass was smothered with sediment deposition in 1983. The 2002 INRMP postulated that eelgrass may be absent because the area of shallow water is too small or too dynamic for rooted plants to become established (Tetra Tech 2002).

In September 2010, eelgrass was transplanted along transects at five locations within Mugu Lagoon. Material was sourced from dredging at the Bolsa Chica Lowlands in Huntington Beach, California (Figure 3-7). A total of 550 eelgrass bundles were installed. Monitoring was planned to occur 12 months and 36 months after the transplanting effort. Results from the first monitoring effort (October 2012) indicate the only surviving transplanted population is east of the Laguna Road causeway. This remaining population has not increased and may disappear in the near future. This project was done solely to increase the biological resources on base rather than as mitigation for anthropogenic disturbance; as such, no success criteria are tied to this project (Merkel and Associates 2010).

Oyster bed restoration in Mugu Lagoon has recently been initiated to enhance the native Olympia oyster (*Ostrea lurida*) population (McCormick 2011). Locations of artificial settling substrate for oyster restoration are detailed in Figure 3-7 and the project is discussed in Section 3.4.1 Invertebrates.

Wildlife that inhabit the estuarine deepwater habitat are detailed in Section 3.4 Fish and Wildlife Management.

Specific Concerns

- Aquatic non-native species introductions may adversely affect native species.
- Sedimentation and pollutants from the Calleguas Creek Watershed compromise estuarine waters.
- Climate change and sea level rise could impact estuarine habitat and species assemblages. Data gaps on species habitat requirements limit the understanding of how the Mugu Lagoon habitat and species would respond to climate change.



Author: GK. Date: 86/2013. Path: VE.css134/s011DIV-GISProjectsMugu INRMP 2013/POINT_MUGU_GISDATA_101512/POINT_MUGU_GISDATA_101512/PM_DRAFT_INRMP_072013/FIG3-7_PM_INRMP_POINT_MUGU_MARINE_RESOURCE 52_072613.mxd Data Source: Terla Tech Databases; US Navy GIS Database 2012. This map is government property not be to reprodued or distributed without concurrence from the Naval Base Ventura County Environmental Division.

INRMP = Integrated Natural Resources Management Plan NBVC = Naval Base Ventura County

Current Management

Estuarine deepwater habitat is regulated by the USACE as Waters of the U.S. under Section 10 of the Rivers and Harbors Act. Impacts are avoided and managed through coordination with NBVC ED and the USACE (see Section 3.3.1.5 Jurisdictional Waters-Wetlands Management).

NBVC ED staff annually survey the estuarine fishery community by trapping and seining selected areas in the estuary. Other researchers also conduct fisheries surveys and provide data on species encountered to NBVC ED to help identify any changes in species assemblages.

Projects in areas surrounding estuarine deepwater habitat are managed through the SA/PRB process (NBVC Instruction 11010.0) to minimize potential impacts. Roadway improvements or other projects that could result in conveyance of sediment or pollutants to this habitat are managed with implementation of BMPs, in accordance with the NBVC Point Mugu SWPPP, and regionally with the implementation of TMDLs and the Calleguas Creek Watershed Management Plan (Section 3.2.2.2 Calleguas Creek Watershed Sediment). See Section 6.5 for discussion of the Environmental Restoration Program at NBVC Point Mugu.

Assessment of Current Management

Management of estuarine deepwater at NBVC Point Mugu is successful by protecting habitat from direct disturbance, monitoring any possible indirect impacts, and with implementation of this INRMP. The SA/PRB addresses and minimizes potential project impacts to the estuarine deepwater habitat, and the CERCLA and Water Quality Program adequately address pollutants. The relationships between the biotic components and physical environment have not all been equally or thoroughly studied. NBVC ED should continue to support research conducted in this habitat, and continue to monitor eelgrass and oyster bed restoration.

Management Strategy

Objective: Conserve and enhance the ecological integrity of the estuarine deepwater habitat at NBVC Point Mugu.

- *I.* Continue to use the SA/PRB to minimize potential impacts to the estuarine deepwater habitat.
 - *A.* Use species-level information gathered from surveys to guide development of project-specific BMPs for these habitats.
 - *B.* Continue to comply with water regulations as outlined in the NBVC Point Mugu SWPPP to ensure the lagoon is not at risk of pollution.
 - *C.* Monitor project activities near the lagoon or tidal channels to ensure implementation of BMPs that prevent soil erosion and pollutant transport.

- *II.* Continue to support CERCLA issues under the Environmental Restoration Program and coordinate with regional entities to implement TMDLs.
- III. Increase native species diversity and abundance.
 - A. Continue to support restoration and monitoring.
 - *B.* Identify and remedy any limiting factors if feasible.
- *IV.* Regularly conduct and support outside groups conducting quantitative surveys of the lagoon to determine changes in species diversity and abundances.
- *V.* Use available landscape level surveys (aerial imagery) to detect changes in tidal channel density and distribution.
- *VI*. Remove litter from the banks of the lagoon and tidal channels on a regular basis or after major storms.

3.3.1.3 Coastal Salt Marsh

Vegetation assemblages within the salt marsh occur according to tolerances for inundation and soil salinity. These factors, in addition to sedimentation and nutrient accumulation, vary along the gradient from low to high marsh. The following zones are used throughout this section to describe habitat and species assemblages throughout the vertical profile of the tidal marsh. "Intertidal Mud and Sandflat" occupy the area closest to subtidal areas and are typically found between the mean lower low water and mean tide level; "Intertidal Salt Marsh" described herein includes discussion of low, middle, and high marsh areas. "Low Marsh" starts at the mean tide level and extends to the mean high water; "Middle Marsh" (also called the "marsh plain") is situated between mean high water and mean higher high water; salt pannes are located in the zone of mean higher high water, and usually in or near areas of high marsh; and "High Marsh" is located between mean higher high water and the line of maximum tide, with inundation occurring only once or twice a month, or even with only the highest tides (Phillip Williams and Associates, Inc. and P.M. Faber 2004). Also discussed is "Non-Tidal Marsh," which is outside surface tidal flows, but contains salt marsh vegetation.

3.3.1.3.1 Intertidal Mudflat and Sandflat

Intertidal mud and sandflats are the lowest areas of the marsh closest to subtidal areas (between mean lower low water and mean tide level), exposed at low tides, and typically unvegetated. Mudflats are also associated with newly restored sites open to tidal action, not yet colonized by vegetation (Section 3.3.1.5 Jurisdictional Waters–Wetlands Management). High light availability in these areas supports abundant micro- and macroalgae that provide an abundant food source for deposit-feeding invertebrates. Highly productive intertidal mud and sandflat habitat supports benthic invertebrates and fishes that provide forage for shorebirds, waterfowl, and wading birds. The conspicuous species of intertidal flats are resident and migratory shorebirds that feed and rest during low tide. Many of the prey animals are distributed from the

2013

subtidal channels to the lower limit of the salt marsh, including crabs and the California horn snail (*Cerithidea californica*). Inconspicuous benthic infauna include oligochaetes, polycheates, amphipods, filter-feeding bivalve mollusks, and thalassinidean shrimp. Fish forage in these areas at high tide; burrowing gobiids such as the arrow goby (*Clevelandia ios*) can remain in intertidal areas throughout the tidal cycle (Zedler 2001).

In salt marsh habitat, macrofaunal densities can be negatively or positively correlated with vegetative cover (Talley and Levin 1999). Exceptions to this finding occur temporally and spatially among different species. The California horn snail exhibits a preference for unvegetated areas, except in winter months, with warm season densities reaching 1000 individuals per square meter in intertidal flats. Coffee bean snails (*Melampus bidentatus*) are typically found more frequently in areas with vegetative cover (Zedler 2001).

Intertidal mudflat and sandflat habitats of Southern California estuaries have suffered greater losses than vegetated tidal salt marsh due to anthropogenic disturbances such as dredging, filling, and sedimentation. Salt marsh restoration most often focuses on vegetating intertidal salt marsh with species such as cordgrass (*Spartina foliosa*), valued for supporting the federally endangered light-footed clapper rails, and pickleweed, the preferred nesting habitat for state endangered Belding's Savannah sparrow. Zedler (2001) recommends that mudflat restoration be given a higher priority in restoration planning (Zedler 2001).

3.3.1.3.2 Intertidal Salt Marsh

The vegetation macrogroups at NBVC Point Mugu, as mapped in 2012, are "North American Pacific Coastal Salt Marsh" and "Semi-Desert Mediterranean Alkali-saline Wetlands" ("Temperate Pacific Tidal Salt and Brackish Meadow" group) (HDR 2013). Vegetation in the salt marsh changes gradually with elevation, with each species exhibiting its peak occurrence at a specific elevation belt. In the intertidal salt marsh, communities are described as low, medium and high elevation marsh: low marsh starts at mean tide level and extends to mean high water; middle marsh (marsh plain) is between mean high water and mean higher high water; high marsh is between mean higher high water and the line of maximum tide, with high marsh areas receiving less regular and only partial inundation, usually only with extreme high or spring tides (Phillip Williams and Associates, Inc. and P.M. Faber 2004). Unlike the drought-deciduous coastal scrub species, the plants of the salt marsh grow through the summer and early fall, with studies showing that pickleweed, the dominant plant of the intertidal salt marsh, has twice the amount of growth in summer than winter (Boyer and others 2001).

Cordgrass occurs in the lowest elevation areas of the marsh. Other species found in areas dominated by cordgrass include saltwort (*Batis maritima*), dwarf saltwort (*Salicornia bigelovii*), Viginia glasswort (*S. depressa*), and algae (HDR 2013).

Over the years, distribution of cordgrass has varied at NBVC Point Mugu. This species was sparse in the years immediately following the heavy floods of 2005, but has increased in cover over the past few years (since 2008), with the largest populations occurring in the central lagoon, east of Laguna Road. A pioneer population of cordgrass was observed in a side channel at the

South J restoration site in 2010. Restoration work in the area required moving some of the cordgrass to other locations up channel. Most of these newly planted populations are still viable.

Cordgrass is a dispersal-limited species, with most reproduction occurring underground. Rhizomatous roots of cordgrass extend to depths of 25 centimeters, compared with the roots of other common marsh species that are densest in the top 10 centimeters. Its rhizomatous growth helps stabilize eroding banks and offers potential nesting or refuge areas to light-footed clapper rails (Zedler 2001). Studies have also shown that fish and invertebrate richness and biomass are usually greater in or near vegetated habitats. Vegetation affects aquatic community composition, providing refuge and food for fish and invertebrates. Sites occupied with dense stands of cordgrass provide spawning sites and predation refugia. The below-ground biomass of cordgrass also offers structural support and refuge for tube-building polychaetes. In other Southern California marshes, polychaetes have been recorded in higher densities in sediments vegetated by cordgrass (Zedler 2001). It is not known how prevalent cordgrass was in the past, before Mugu Lagoon was modified by development and Calleguas Creek channelized.

In the mid-marsh (also referred to as the "marsh plain"), where ponded water remains at low tides, dwarf saltwort, saltwort, and estuary sea-blite (*Suaeda esteroa*) occur. Estuary sea-blite also frequently occurs in pickleweed mat at Point Mugu. Higher tolerance for inundation is required of both the plants and infauna at low and mid-marsh elevations.

The marsh plain of Point Mugu is at an intermediate elevation that is daily inundated and drained with the tides. The marsh plain is dominated by monotypic stands of perennial pickleweed (*Salicornia virginica* [current name *Sarcornia pacifica*]), interspersed with Virginia glasswort, an annual species. Perennial pickleweed exhibits the widest range in elevation of all the salt marsh species. This species has a broad tolerance for varying inundation schemes and is also found in low and high marsh areas. It is also a species of broad geographic range, occurring on the Pacific Coast from Puget Sound, Washington, to the southern tip of Baja California, Mexico (Onuf 1987), and on the Atlantic Coast.

Although pickleweed forms monotypic canopies at Mugu Lagoon, similarly to other lagoon habitats in the region, MacDonald postulated (1976) that arrow-grass (*Triglochin concinna*) and estuary sea-blite were historically more common cohabitants at Point Mugu, and that saltwort and dwarf saltwort dominated areas that were poorly drained. The latter two species are most abundant around intertidal pools of the middle marsh. Composition in this part of the marsh has changed greatly.

Other, often co-dominant species of the marsh plain include jaumea (*Jaumea carnosa*), alkali heath (*Frankenia salina*), sea lavender (*Limonium californicum*), and saltgrass (*Distichlis spicata*). These species also occur in the high salt marsh, with saltgrass and alkali heath increasing in frequency and percent cover with increasing elevation. Alkali heath and saltgrass can also occur in upland areas that lack other wetland vegetation.

The high marsh contains wetland-upland transitional plants such as Parish's glasswort (Salicornia subterminalis), shoregrass (Monanthochloe littoralis), alkali heath, sea lavender,

saltgrass, and salt bush (*Atriplex watsonii*). All of these species are perennials that reproduce vegetatively. The federal and California state endangered salt marsh bird's-beak (*Chloropyron maritimum* subsp. *maritimum* [Baldwin and others 2012] [previously *Cordylanthus maritimus* ssp. *maritimus*] {Hickman 1996}) occurs in the high marsh and, more dominantly, in areas of freshwater input and reduced tidal flow, described as growing along the bath-tub ring of the marsh. This small annual species is evident for only a short time during the summer and fall growing season; it is easiest to spot when in bloom (May – October). Salt marsh bird's-beak is described in Section 3.5.1 Federally Listed Species and Critical Habitat. The greatest populations occur in areas with greater presence of fresh water, the western arm of the lagoon and along the southern beach boundary.

In the western arm of the lagoon (Figure 3-1), the high marsh is hydrologically complex as a result of substantial hydrologic manipulation from the development of roads, culverts, ditches, and berms. The areas around Perimeter Road receive muted tidal flushing, are intersected with drainage ditches, and are likely influenced by the adjacent freshwater duck ponds to the north. Tidal inundation in the far western arm is significantly reduced because the runway intercepts flows. Infilling of sediments in the runway culverts further reduces tidal linkage to this area. In the far western arm, soil saturation comes as a result of extreme tide events, storm-event runoff, precipitation, or rise in groundwater associated with high tides.

Although the salt marsh is defined as a plant-dominated community, it provides habitat for a diverse assemblage of migratory and resident birds including the California endangered Belding's savannah sparrow and the federal endangered light-footed clapper rail. Large shorebirds and waders forage and rest in the marsh, while smaller shorebirds use the marsh as a nocturnal roosting site. Small mammals are also presentand attract raptors that hunt the high marsh. Insects and benthic invertebrates are likewise abundant in the intertidal salt marsh. The structure of intertidal salt marsh supports a complex food web.

Higher salt marsh is a complex wetland community for a number of reasons: (1) it is subject to alternating environmental extremes of drought and inundation, (2) disturbance is potentially more frequent, and (3) its topography is sometimes mounded. In 1985, Cox and Zedler (1986, as cited in Zedler and others 1992) recorded 86 mounds, which ranged in height from 9 to 57 centimeters and 5.6 to 18.6 meters in diameter, in the Tijuana River Estuary. They surmised that each "island" of higher topography allows species of the higher marsh to extend farther into the wetland. The periphery of the marsh is thus patchy and diverse; the larger the mound, the longer the list of plant species (Zedler and others 1992). In addition, the mounds provide habitat for several herbivorous mammals, which in turn influence mound and intermound vegetation (Zedler and others 1992).

It has been postulated at least some of the mounds were created by ground squirrels *(Spermophilus beechyii)* and other burrowing mammals that use the high ground. Cox and Zedler (1986, as cited in Zedler and others 1992) suggest that, over centuries, burrowing mammals gradually transport soils toward a central burrow opening until a pattern of mounds and intermound areas is created. Whether the concentration of squirrels on mounds is cause or effect, however, is hard to demonstrate in short-term studies. What is clear, according to Zedler

(1992), is that the mounds of high ground, which are surrounded by wetter marsh, add diversity in the small-scale habitat to the wetland. Where adjacent areas have been filled or developed, these islands provide the only clue to the communities in the higher elevations that might have occurred in the transition zone.

3.3.1.3.3 Salt Pannes

The salt pannes are unvegetated, exposed, or water-filled depressions, located in the zone of mean higher high water, and usually in or near areas of high marsh. At NBVC Point Mugu, these appear more frequently in the higher reaches of the marsh, or in areas restricted from tidal flow, where inundation occurs only at the highest tides. Salt pannes form where evaporation concentrates salts in the soil such that vegetation cannot survive. In winter, salt pannes accumulate rainfall, pond water from the adjacent duck clubs, and saline water from high spring tides occurring in December through February. In summer, they are covered by a salt crust that forms with evaporation of salt spray and tidal water from high spring tides in May through July. Soil salinities of 200 parts per trillion are common at the end of the dry season. Two contrasting communities can thus be found (Zedler 2001). During the winter aquatic phase, algae flourish and aquatic insects become abundant. Waterfowl and shorebirds and, in particular, the western snowy plover, use the shallow water for feeding and resting. During the summer dry season, the habitat appears barren because most of the resident insects and other arthropods live in the soil. Furthermore, the western snowy plover and California least tern locally nests in specific salt pannes at Mugu Lagoon. Belding's savannah sparrows also use salt pannes (Zedler 2001).

Because the dry season is longer than the winter inundation period, barren conditions prevail; hence, the habitat is called a salt panne rather than a temporary tidal pond (Zedler and others 1992). The ephemeral nature of the aquatic phase makes it difficult to appreciate the productivity and complexity of these communities. It was previously recommended in mitigation proposals that salt pannes be converted to some other use because their wetland values were assumed to be of low ecological function and value (Zedler and others 1992; Tetra Tech 2002). Very little research has been done in salt pannes, so their habitat values have not been quantified (Zedler 2001). However, research has shown that salt pannes support ground nesting bees, which are important pollinators of federally listed salt marsh bird's-beak (USFWS 2009b; Tetra Tech 2009b). UCLA has also been doing research at Point Mugu to determine factors involved in the reduction of salt pannes in the central and western arm. Research includes investigating the growth and spread of plants that occupy the edges of salt pannes.

Special adaptations have evolved for species that are characteristics of salt pannes as a result of the extremes of prolonged inundation and high salt accumulation. Many soil-dwelling insects use air traps, which allow them to respire when the water or soil is anaerobic (Zedler and others 1992). Moreover, many have developed waterproof integuments and mechanisms for secreting hypertonic rectal fluids to regulate osmotic and ionic balance (Zedler and others 1992). Section 3.4.1 details the insects recorded in salt pannes at NBVC Point Mugu.

3.3.1.3.4 Non-Tidal Salt Marsh

Vegetation types within seasonally tidal and non-tidal salt marsh at NBVC Point Mugu are classified by National Vegetation Classification System as "Warm Semi-Desert/Mediterranean Alkali-Saline Wetland Macrogroup" (HDR 2013). Physiognomically, the non-tidal salt marsh appears to be similar in structure to a tidal salt marsh, except that there is no direct conveyance system of tidal waters. Most of the non-tidal areas may have been previously tidal but became isolated or significantly reduced due to base development. Some areas with lower elevations and close enough proximity to existing wetlands may remain from the minimal sub-surface flow, while others may slowly convert to upland habitats as soil salinity decreases. Vegetation within the Warm Semi-Desert/Mediterranean Alkali-Saline Wetland Macrogroup includes alkali heath, Parish's glasswort, saltgrass, shoregrass, and at the higher margins and in transitional areas, saltbush (*Atriplex lentiformis*). Weeds such as mustards (*Brassica* spp.) and weedy grasses (*Bromus* spp. and *Avena* spp.) are known to invade non-tidal marsh areas at Mugu, in particular the northern edge of the central basin. Salt marsh bird's-beak, a federal and state listed endangered species, can be prevalent since all of its host plant species are present (Section 3.5.1.1 Salt marsh bird's-beak).

Non-tidal salt marsh at NBVC Point Mugu provides habitat for resident and migratory birds. Large shorebirds may feed and rest in non-tidal salt marsh, although smaller shorebirds are usually absent or rare. Insects appear to be abundant, but little is known about the benthic invertebrates in this habitat.

The hydrodynamics of non-tidal areas at Point Mugu are not well understood; however, there appears to be a great influx from freshwater sources, such as the two adjacent duck clubs on the western arm, and ponding of water from berms or roads. Additionally, during extreme high tides, these areas can be inundated, and may flood during winter rains.

This vegetation community also encompasses the transitional areas that border the intertidal salt marsh. Transitions are areas where one community type (for example, an upland) shifts to another (for example, a wetland). Transitional areas contain elements of both wetland and terrestrial communities. The exact upper boundary of salt marsh is difficult to discern because the salt marsh vegetation blends slowly into the upland vegetation.

The boundary between upland and wetland plants at Mugu Lagoon in most cases is not well defined in areas closer to the lagoon proper; however, the boundary can be abrupt away from the lagoon due to base development of road and the airfield. Although many exotic plants have invaded the coastal scrub, few are sufficiently tolerant of inundation and salt stress to invade the coastal wetlands. One weedy species, Australian saltbush (*Atriplex semibaccata*), exhibits an extremely wide salinity tolerance. It occurs in small amounts throughout the transition zone and well into the upper salt marsh. It withstands the dry saline upland as well as occasional inundation by seawater. This species was historically promoted for horticultural uses, but is now rated by the California Invasive Plant Council (CAL-IPC) as a moderately invasive plant (CAL-IPC 2012). Of more concern is perennial pepperweed (*Lepidium latifolium*), which was first observed at Point Mugu in 2009 and has spread rapidly within the drainage ditches and has the

potential to spread throughout the upper marsh and non-tidal marsh areas. Invasive species are discussed in Section 3.7.1 and addressed in the NBVC invasive plant management plan (NBVC 2010).

Most of the peripheral upland acreage has been disturbed at Mugu Lagoon. The best information on the natural state of this area comes from studies in Baja California, Mexico (Neuenschwander 1972). At Bahia de San Quintin, Zedler and Cox (1984, as cited in Zedler and others 1992) analyzed the transitional vegetation in detail to identify the shift between the upland and the wetland. The wetland plants that occurred highest along the slope were alkali heath, sea lavender, and estuary sea-blite. The marsh species that grow highest up the slope are saltgrass, alkali heath, and sometimes small patches of pickleweed, depending on the type of human-induced disturbances. The first occurrences of alkali weed (*Cressa truxillensis*) and alkali heath are additional indicators of the transition from the upland down into the wetland.

Throughout the high marsh and upland-wetland transition zones are patches of invasive iceplant *(Carpobrotus edulis)* (also called "sea fig"), and crystalline iceplant *(Mesembryanthemum crystallinum)*, mapped in 2012 as Vancouverian Coastal Dune and Bluff Macrogroup (Section 3.3.2.1) (HDR 2013). These species form monotypic covers that preclude establishment of native species. The growth habit of iceplant accumulates thick mats of detritus; the resultant mats are at an increased elevation in areas of its dominance. As a result, localized hydrology can be altered by this species.

Specific Concerns

- Tidal connection has been modified or lost, which may lead to eventual loss or changes to historic and current wetland habitats.
- Non-native species degrade native habitat quality.
- Sedimentation and pollutants from the Calleguas Creek Watershed or past Navy activates compromise estuarine waters and threaten estuarine biota.
- Climate change and sea level rise could impact salt marsh habitat and species; salt marshdependent species have limited space at NBVC Point Mugu, to disperse to.
- Impacts to more sensitive upper marsh due to pest control activities that may lead to increased invasion by weedy species and habitat degradation.

Current Management

The NBVC Point Mugu coastal salt marsh community is regulated by the USACE as wetlands and Waters of the U.S. under Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act. Impacts are avoided and managed through coordination with NBVC ED and the USACE (see Section 3.3.1.5, Jurisdictional Waters-Wetlands Management).

Projects in areas surrounding salt marsh habitat are managed through the SA/PRB process (NBVC Instruction 11010.0) to minimize potential impacts. Roadway improvements or other projects that could result in conveyance of sediment or pollutants to this habitat are managed with implementation of BMPs, in accordance with the NBVC Point Mugu SWPPP, and regionally with the implementation of TMDLs and the Calleguas Creek Watershed Management Plan (Section 3.2.2.2 Calleguas Creek Watershed Sediment). See Section 6.5, Environmental Restoration Program, for discussion of the CERCLA-related issues under the Environmental Restoration Program at NBVC Point Mugu. NBVC ED regularly conducts invasive plant control throughout the salt marsh (Section 3.7 Invasive Species Management).

Historic wetland habitats are proactively and opportunistically restored to wetlands, incorporating a variety of wetland types within the restoration site. In addition, wetland enhancement activities include removal of invasive species, which allows for natural revegetation of native species, and restoration or enhancement of tidal connections where feasible.

Assessment of Current Management

Wetland communities are protected sufficiently at Point Mugu, with intensive efforts in place to protect, restore, and enhance wetlands. The SA/PRB addresses and minimizes potential project impacts to the salt marsh community, and the CERCLA and Water Quality programs adequately address pollutants. NBVC ED should continue to support and fund research and restoration in this habitat. Wetland buffers should be created or enhanced to improve surface water quality that flows into the marsh from hardscape surfaces. The creation of transitional buffers around wetlands would also allow for shifts in communities that may occur in response to climate change and sea level rise.

Management Strategy

Objective: Conserve and enhance the ecological integrity of the coastal salt marsh habitats at NBVC Point Mugu.

- *I.* Continue to use the SA/PRB to minimize potential impacts to the coastal salt marsh habitat.
 - A. Use species-level information gathered from surveys to guide development of project-specific BMPs for these habitats.
 - *B.* Continue to comply with water regulations as outlined in the NBVC Point Mugu SWPPP to ensure the lagoon is not at risk of pollution.
 - *C.* Monitor project activities near the lagoon or tidal channels to ensure implementation of BMPs that prevent soil erosion and pollutant transport.
- *II.* Protect and enhance water quality throughout coastal salt marsh habitats.

- A. Continue to address CERCLA issues under the Environmental Restoration Program and participate in regional entities to implement TMDLs.
- B. Continue to support the NBVC Storm Water program.
 - *1.* Investigate and develop new protective strategies for oil spill and hazardous response.
 - 2. Support the development of secondary containments around fuel storage facilities.
 - *3.* Identify additional areas on base where containment or other strategies could reduce potential for spills.
- *III*. Increase native species diversity and abundance.
 - A. Continue to support wetland restoration, enhancement, and monitoring.
 - 1. Identify potential new areas for restoration, where not in conflict with operational needs.
 - 2. Create and enhance native buffers around wetlands.
 - 3. Regularly conduct invasive plant control.
- *IV.* Continue to coordinate with NBVC Pest Management to determine methods to search for and treat mosquito larvae while reducing impacts from vehicles and other transportation to wetlands.
- *V.* Remove litter from the banks of the lagoon and tidal channels on a regular basis or after major storms.

Objective: Increase knowledge base of the dynamics of the coastal salt marsh at NBVC Point Mugu.

- *VI.* Regularly monitor the salt marsh for changes in coverage or habitat type conversion.
 - *A.* Regularly conduct or support quantitative surveys of the lagoon to determine community- and species-level changes in diversity, abundance, and distribution;
 - *B.* Conduct regular qualitative landscape level surveys (aerial imagery) to detect changes in salt panne coverage and tidal channel density and distribution.
 - *C.* Map the salt marsh habitats a minimum of every 10 years to identify community shifts.

3.3.1.4 Brackish/Freshwater Marsh

Brackish and freshwater habitat are described together in this section, as NBVC Point Mugu contains characteristics of both freshwater and brackish salinity regimes; however, there is no clear distinction or set boundary where brackish ends and freshwater begins.

Areas of the marsh that have water salinities between 0.5 and 30 parts per trillion are considered brackish or mixohaline (Cowardin and others 1979). In southern California, these usually occur near seepages or where rainfall or runoff is impounded. Water levels fluctuate widely but irregularly, resulting in high rates of evaporation and higher levels of salinity compared with areas of regular freshwater input.

At Mugu Lagoon, the description for brackish marsh and freshwater marsh are used interchangeably. Even though Mugu Lagoon and coastal environs were "mapped" in 1857 by the U.S. Geodetic Coast Survey, it is difficult to discern the historical distribution of brackish/freshwater marsh areas. The 1857 map illustrates a large tract of land as "freshwater marsh" juxtaposed to "salt marsh." It is highly unlikely that areas adjacent to the intertidal regime would not be influenced by the salt conditions. Analysis of the recent vegetation community mapping effort done at Point Mugu may shed light on historical versus current habitat types and extent (Appendix Q; HDR 2013). The most recent mapping categorized these areas as "Southwestern North American Riparian/Wash Scrub," "Southwestern North American Riparian Evergreen and Deciduous Woodland," "Southwestern North American Introduced Riparian Scrub," "Arid West Freshwater Emergent Marsh," "Introduced North American Mediterranean Woodland Forest," and "Naturalized Warm-Temperate Riparian and Wetland Groups" (HDR 2013). The current interpretation is that areas of brackish marsh were formed artificially after hydrologic and topographic modifications. The 1857 map (Figure 3-1 herein, and Figure A-1 of the 2002 INRMP [Tetra Tech 2002]) indicates that natural brackish marsh and freshwater marsh may have been present at the lagoon prior to development. The area would have supported brackish marsh if sufficient rainwater accumulated or if seepages were present. In the absence of continual brackish water or freshwater inputs, the depression would probably have been an alkali sink colonized by brackish species during periods when freshwater was present.

Brackish marshes are currently found adjacent to roads and typically higher in elevation than the surrounding marsh (Tetra Tech 2002). Some of the brackish and freshwater marshes have formed near the Oxnard Drainage Ditch system. These areas have developed into various small patches of brackish, freshwater marsh, or riparian habitat.

The function of these brackish habitats relative to the estuarine ecosystem is under debate. To the west at the Ormond Beach wetlands, and to the east at Malibu Creek Lagoon, there is evidence that springs were frequent around the intertidal wetlands. Various restoration plans have called for the creation of large areas of fresh-to-brackish marshes. Much of the presumed value of brackish marsh habitats is based on studies of Upper Newport Bay (Zedler and others 1992), where the state's largest population of light-footed clapper rails persists. Light-footed clapper rails use both brackish and freshwater marshes and salt marsh habitats at Upper Newport

Bay as well as San Elijo Lagoon, and the non-tidal brackish marshes are a likely refuge for the birds during high water (Tetra Tech 2002). Thus, the proximity of several small brackish marshes along the periphery of saline marshes may improve conditions for the light-footed clapper rail (Section 3.5.1 Federally Listed Species and Critical Habitat).

Most of the understanding of the relation of brackish marsh vegetation to saline conditions is derived from studies at the San Diego River marsh (Zedler and others 1992). When flood flows were prolonged by reservoir discharge at the San Diego River in 1980, intertidal marsh soils were oligohaline (under 10 parts per trillion) for 2 to 3 months. Cattails and several other species common to fresh inland wetlands invaded and become dominant in intertidal marshes. As has been shown experimentally by Beare (1984, as cited by Zedler and others 1992; Beare and Zedler 1987, as cited in Zedler and others 1992), adult cattails (*Typha spp.*) readily tolerate saline conditions. Some individuals in experimental treatments survived a year in 45 parts per trillion water; above ground biomass died, but rhizomes were able to resprout when fresh water was resupplied. Thus, cattail invasion of intertidal areas may be limited by low seed germination, which declines to near-zero at 20 parts per trillion, and reduced period of fresh water conditions; it takes 2 to 3 months for cattails to grow salt-tolerant rhizomes.

Brackish species that have invaded an intertidal area are likely to persist. With continuously augmented stream flows, as would occur with upstream wastewater discharges, species with salt-tolerant, vegetatively reproducing adults might never die out. At the San Diego River marsh, for example, the cattail population that invaded in 1980 expanded its range in 1983, when rainfall and stream flow continued late into spring. The population declined with drier conditions in 1984 and 1985 (Zedler and others 1992).

The plants and animals of the salt marsh are generally not found in the brackish/freshwater community type, due to differences in salinity and water levels. Freshwater or brackish water plants may grow at the edges of the salt marsh, in transitional areas between salt marsh and upland habitat, as a result of previous land disturbances and precipitation runoff patterns. At Mugu Lagoon, these plants include mule fat (*Baccharis salicifolia*) at the highest slopes, and yerba mansa (*Anemopsis californica*) at middle to lower elevations.

The brackish/freshwater community at Point Mugu occurs largely in relation to drainage ditches on base. The drainage channels at Point Mugu are generally more saline the closer they are to the estuary and are a mix of brackish and freshwater or riparian habitat, depending on proximity to the estuary. The vegetation community composition along drainage channels changes in response to soil and water salinity. Freshwater native species include Arroyo willow (*Salix lasiolepis*), narrowleaf willow (*Salix exigua*), California bulrush (*Scirpus californicus*), American bulrush (*Scirpus americanus*), tule (*Scirpus acutus*), and broad-leaved cattail (*Typha latifolia*). Tolerance to salinity varies among these species, with tule occurring commonly at the salt marsh edge. Submergent ditchgrass (*Ruppia maritima*) is abundant seasonally. Non-native species found on many of the drainage channel slopes include iceplant (*Carpobrotus spp.*), Ngaio tree ("myoporum") (*Myoporum laetum*), eucalyptus (*Eucalyptus spp.*), and the state listed noxious perennial pepperweed (Tetra Tech 2009a). Myoporum also occasionally emerges in areas of high marsh and along areas of brackish or freshwater influence. Brazilian pepper tree (*Schinus terebinthifolius*) also occur. Native species in saline soils include saltgrass, perennial pickleweed and seaside heliotrope (*Heliotropium curassavicum*).

Fresh and brackish marshes may function as a general refuge for animals during high tides in the salt marsh. Black-crowned night herons (*Nycticorax nycticorax*), black-necked stilts (*Himantopus mexicanus*), great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), redwinged blackbirds (*Agelaius phoeniceus*), and various waterfowl including American coots (*Fulica americana*) and mallards (*Anas platyrhynchos*) are conspicuous among fresh and brackish marsh. Light-footed clapper rails nest in bulrush habitat in Oxnard drainage ditch 3 and Pacific pond turtles (*Actinemys marmorata*), a state listed species of concern (Section 3.5.2 Other Special Status Species) also inhabit the brackish habitat at NBVC Point Mugu.

The Baja California treefrog (*Pseudacris hypochondriaca hypochondriaca*) is ubiquitous in the region and uses freshwater habitat on base. A variety of immature and adult aquatic invertebrates occur in freshwater habitat at NBVC Point Mugu including amphipods (*Gammarus* sp., *Hyalella azteca*), isopods (Cirolanidae), midges (Chironomidae), damselflies (*Enallagma* sp.), mayflies (*Callibaetis* sp.), skimmers (*Libelulla* sp.), backswimmers (*Notonecta* sp.), and dragonflies (Odonata: Anisoptera). Non-native crayfish (*Pacifasticus* sp.) have also been recorded in the drainage channels.

The California killifish (*Fundulus parvipinnis*) is a common native fish of drainage channels at NBVC Point Mugu. The non-native western mosquitofish (*Gambusia affinis*) has been recorded in brackish and freshwater habitats. A dominant fish in the muted drainage ditches on the western side of the installation are mullet (Mugilidae).

Large- to medium-sized mammals in the freshwater habitat at NBVC Point Mugu include the coyote (*Canis latrans*), opossum (*Didelphis virginianus*), raccoon (*Procyon lotor*), and non-native muskrat (*Odontra zibethica*). Small mammals include the deer mouse (*Peromyscus maniculatus*) and western harvest mouse (*Reithrodontomys megalotis*). Fish and wildlife are discussed in Section 3.4 Fish and Wildlife Management.

The drainage channels at NBVC Point Mugu are designated part of IRP Site 11 due to contamination of sediments by nonpoint source pollution, storm water runoff, and runoff from other IRP sites on base. A Remedial Investigation ecological risk assessment for IRP Site 11 (Mugu Lagoon and associated drainage ditches) indicated the potential for negative impacts to ecological receptors due to exposure to contaminants in the drainage channels (Tetra Tech 2005). See Section 6.5, Environmental Restoration Program, for details on CERCLA issues under the Environmental Restoration Program at NBVC Point Mugu.

Specific Concerns

• The area of willow and freshwater habitat is limited at NBVC Point Mugu.

- Most freshwater marsh occurs in areas of the base where vegetation height restrictions won't allow for growth of mature willow canopy or cattail stands due to proximity to the airfield.
- The attraction of birds to brackish and freshwater habitats is in conflict with air operations safety objectives.
- Habitat may be degraded by non-native species.

Current Management

NBVC ED surveys the ditches for species utilizing habitat, including conducting Pacific pond turtle trapping, bird surveys, and fisheries surveys.

NBVC Public Works Department uses EPA-approved herbicides and mechanical methods to clear vegetation and conducts periodic flood control maintenance in the smaller drainage channels. The larger Oxnard drainage ditches receive no regular maintenance other than occasional clearing in or near the culverts. Water quality in brackish/freshwater habitat and the drainage channels is currently managed under the NBVC Point Mugu SWPPP (see Section 3.2.3.2, Surface Water Hydrology and Stormwater Management), and Environmental Restoration Program (see Section 6.5, Environmental Restoration Program).

Projects in areas surrounding brackish and freshwater marsh and drainage channels are managed through the SA/PRB process (NBVC Instruction 11010.0) to minimize potential impacts. Roadway improvements or other projects that could result in conveyance of sediment to these habitats are managed with implementation of BMPs, in accordance with the NBVC Point Mugu SWPPP. NBVC ED regularly conducts invasive plant control throughout this habitat type (Section 3.7 Invasive Species Management).

Sites adjacent to the airfield that pose a safety hazard to air operations are managed under public works and air operations, and at times, are driven by the BASH program, detailed in Section 3.4.4.1. Approximately half of the freshwater marsh vegetated habitat has been modified due to airfield clearance regulations (Tetra Tech 2012k).

Assessment of Current Management

Areas away from airfield are maintained and managed appropriately to maintain and enhance habitat. Sites requiring maintenance are done in coordination with NBVC ED to reduce impacts to natural resources, such as conducting vegetation removal during the non-nesting season. Opportunities for enhancement and restoration that would improve wetland function and habitat values in current brackish/freshwater wetlands include removing non-native species and increasing the size and diversity of native vegetative buffers. Increasing the size and quality of the buffers would further protect wetlands from surface runoff and human disturbance, enhancing water and habitat quality.

Management Strategy

Objective: Conserve and enhance the ecological integrity of brackish and freshwater habitat at NBVC Point Mugu that are not in conflict with airfield operations.

- *I.* Continue to use the SA/PRB to minimize potential impacts to habitat.
 - *A.* Use species-level information gathered from surveys to guide development of project-specific BMPs for these habitats.
 - *B.* Continue to comply with water regulations as outlined in the NBVC Point Mugu SWPPP to ensure brackish/freshwater habitat is not at risk of pollution.
 - *C.* Monitor project activities that occur near brackish and freshwater habitats to ensure implementation of BMPs that prevent soil erosion and pollutant transport.
- *II.* Continue to address CERCLA issues under the Environmental Restoration Program and coordinate with regional entities to implement TMDLs.
- *III*. Increase native species diversity and abundance in brackish and freshwater habitats.
 - *A.* Identify restoration opportunities on base where willow habitat would not be in conflict with the Navy mission.
 - *B.* Identify native vegetation species that meet height requirements and BASH and airfield operations objectives for sites adjacent the airfield.
 - C. Regularly conduct invasive species control.
 - *D.* Increase buffers to brackish and freshwater habitats by installing native plants where not in conflict with the Navy mission.
- *IV.* Identify other freshwater sources on base that could serve to enhance hydrology of existing freshwater marsh.
- *V.* Continue to conduct surveys of brackish and freshwater habitats to determine changes in species diversity and abundances and incursions of invasive species.
- *VI.* Remove litter from the banks of drainage channels on a regular basis, or after major storms.
- *VII.* Recontour slopes of banks that are significantly eroding to reduce rilling and other erosional features.

3.3.1.5 Jurisdictional Waters–Wetlands Management

Jurisdictional wetlands, as defined under Section 404 of the Clean Water Act, were formally delineated at NBVC Point Mugu by the USACE in 2011, according to protocol set forth in the 1987 U.S. Army Corps Wetlands Delineation Manual, Arid West Supplement, and Rapanos Guidance (USACE 2013). The 2011 delineation recorded 2,139 acres of jurisdictional wetlands, making up 48 percent of the installation (shown on Figure 3-8). Jurisdictional wetland types at NBVC Point Mugu are described above.

Specific Concerns

- Wetlands may be degraded by operational and infrastructure projects.
- Sedimentation from land use practices could threaten the integrity of remaining wetland habitat on base, altering hydrology and vegetation composition; loss of jurisdictional wetland acreage could result.
- Non-native species pose a threat to wetlands on base, out-competing native species and in some cases, altering hydrology, resulting in loss of jurisdictional wetland acreage.
- Wetlands may be impaired from sea level rise, regional and local pesticide use, and degraded water quality.

Current Management

NBVC ED oversees the management and protection of wetlands. Any project impacting wetlands is closely reviewed to ensure there are ways to avoid impacting wetlands, such as adjusting the location of the project. If wetlands are adjacent to the project, strict BMPs are put in place to avoid impacts to wetlands. For projects within wetlands, appropriate regulatory permits are secured before projects begin. BMPs identified under permit requirements are implemented and monitored.

Under EO 11990 (Protection of Wetlands) and Navy policy (OPNAVINST 5090.1C CH-1), there shall be "no net loss" of wetlands and Waters of the U.S. at NBVC Point Mugu, including navigable waters and vegetated wetlands.

Wetlands and Waters of the U.S. at NBVC Point Mugu are managed by NBVC ED under the authorities of the USACE and EPA under Section 404 of the Clean Water Act (33 U.S.C. Part 1344), and Section 10 of the Rivers and Harbors Act (33 U.S.C. Part 403). Ancillary authorities include the USFWS, NOAA/NMFS, LARWQCB and the California Coastal Commission. The USFWS and NMFS, pursuant to the Fish and Wildlife Coordination Act, may review federal and federally permitted projects and require project conditions or mitigations to minimize impacts to fish and wildlife. The Regional Water Quality Control Board (RWQCB), under Section 401 of the Clean Water Act, has the authority to review permits that may authorize dredge or fill to

waters under state jurisdiction. Under authority of the California Coastal Act and the federal Coastal Zone Management Act (16 U.S.C. Section 1451), the California Coastal Commission has jurisdiction over permits for development in the coastal zone in wetlands, tidelands, submerged lands (below mean low tide), beaches, estuaries, riparian habitat, streams and public trust lands (see Section 6.4).

Section 404 jurisdiction extends to the high tide line and Section 10 jurisdiction extends to the mean high water mark. Any action that could affect wetlands on base requires environmental review. Placement of fill, discharge of material of any kind, or movement of earth, is prohibited unless under permit from the USACE.

The USACE has a three-step sequencing procedure for evaluating impacts to wetlands (Memorandum of Agreement between USACE and EPA dated 07 February 1990): (1) avoid, (2) minimize, and (3) compensate. Project proponents must demonstrate that project plans have been designed to avoid and minimize impacts to Waters of the U.S. to the maximum extent possible. Avoidance includes demonstrating that there is no practicable alternative which would have a less adverse impact. Minimization requires that consideration be given to redesigning or staging a project to reduce impacts. Compensatory mitigation is only authorized for unavoidable impacts and must replace the loss of values and functions of the Waters of the U.S. proposed for impacts. Compensatory mitigation, enhancement or preservation. All impacts must be avoided or minimized before compensating mitigation will be considered. In some cases, mitigation banking is the appropriate approach to compensating mitigation (33 CFR S 320.4[r]); mitigation banking is discussed under the "Wetland Restoration" section below.

Projects that could result in conveyance of sediment to wetlands are managed through the SA/PRB. NBVC ED manages applications for USACE Section 10 and 404 and LARWQCB Section 401 permits. NBVC Public Works Department conducts maintenance activities in the drainage channels to improve flood control; these activities usually consist of herbicide application to wetland vegetation. When mechanical clearing of sediment is needed, permits are sought from the USACE and LARWQCB.

For avoidance of impacts to wetlands and Waters of the U.S., NBVC ED requires the following BMPs are incorporated into project work plans:

- 1. Prevent discharge of sediments into jurisdictional wetlands and waters:
 - a. Place weed-free wattles at the project site perimeter, as close to the work site as possible. Overlap ends side-to-side, not over or under. Stake down or hold in place with sand bags.
 - b. Use sand bags, tightly butted, one row.

- c. In the instance that insufficient space exists between the project and jurisdictional wetland, for placement of wattles or sand bags, use silt screens as close to the work as possible. On the downhill side of the screen, bury the bottom edge and stake in place.
- 2. For projects that involve pumping water out of a jurisdictional wetland:
 - a. Spray water over vegetation or grassy field outside of the wetland. If there is enough water that would form a channel flowing back to the wetland, place wattles or sand bags to prevent direct flow.
 - b. Create a catch basin outside of the wetland to capture water and allow for percolation.
- 3. Control and contain bore-hole soils or other debris from entering a jurisdictional wetland.
 - a. For auger holes, place tarp around hole and shake all augured soils onto tarp. Remove all soils from jurisdictional wetland that are not replaced into the hole.
 - b. Shavings, filings, paint, and other debris/drips: use tarps to catch materials and remove from jurisdictional wetland.
- 4. Equipment
 - a. Use rubber wheeled vehicles to enter jurisdictional wetland; tracked vehicles or other types of vehicles that kick-up sediments are not allowed.
 - b. Equipment must be clean and free of weed species and mud before entering the jurisdictional wetland
 - c. Place matting, boards, or other plate-like structures in the pathway of vehicles to minimize soil damage.

Assessment of Current Management

Wetlands are managed appropriately at NBVC Point Mugu. All projects that occur near or within wetlands are closely managed and monitored to ensure minimal impacts. Wetlands on base were delineated most recently in 2011 by the USACE (Figure 3-8). A formal delineation is conducted at NBVC Point Mugu every 5 years, to monitor gain or loss in jurisdictional acreage, and to maintain valid delineation records with the USACE and EPA. Due to abundance of wetlands on the installation, repeat delineations normally occur in isolated wetlands and selected edges that are more dynamic, as well as areas close to any known upcoming activities.

Wetlands management involves reviewing projects to determine potential impacts to wetlands, conducting formal delineations, preparing permits, conducting routine inspections, and invasive plant control. If projects occur near wetlands, NBVC ED staff will use a global positioning system handheld unit to flag wetland edge to ensure project personnel are aware of the wetland perimeter.

Management Strategy

Objective: Maintain the natural and beneficial functions of NBVC Point Mugu wetlands by ensuring no net loss of area, function, or value as required by federal Clean Water Act regulations.

- *I.* Update the USACE delineation boundaries at least every five years and the GIS database as needed (DoDINST 4715.03; OPNAVINST 5090.1C CH-1).
- *II.* Continue to use the SA/PRB process to avoid and minimize potential impacts.
 - A. Ensure that projects follow the USACE process of avoid, minimize, and compensate for impacts during project design.
 - *B.* Prohibit dumping, filling or other contamination of wetlands and Waters of the U.S. Obtain USACE permits for projects that involve fill to wetlands.
 - *C*. Ensure project plans and budgets include BMPs for activities that have potential to transport sediment and contaminants to wetlands.
 - D. Monitor USACE-permitted project sites to ensure BMPs are implemented.
- *III*. Conduct invasive plant control to ensure no net loss to wetland function occurs due to non-native species invasions such as iceplant.
- *IV.* Finalize the NBVC Point Mugu Wetland Mitigation Bank and continue to request funding to add acreage to the bank.
- V. Ensure continued funding for wetland monitoring in support of mitigation banking.
- VI. Provide information on wetland regulations and functions during base indoctrination.



Author: GK. Date: 7/26/2013. Path: \\Ecss134fs01\DIV-GIS\Projects\Mugu INRMP 2013\POINT_MUGU_GISDATA_101512\POINT_MUGU_GISDATA_101512\PM_DRAFT_INRMP_072013\FIG3-8_PM_INRMP_JURISDICTIONAL_WATERS_072613.mxd Tetra Tech GIS database; NBVC ED GIS database; USACE 2011 Point Mugu Wetland Delineation boundary file; ASBS boundary digitized from State Water Resources Control Board ASBS This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

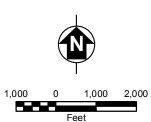






- INRMP BOUNDARY
 - USACE WATERS OF THE U.S.
- AREA OF SPECIAL BIOLOGICAL SIGNIFICANCE
 - USACE JURISDICTIONAL WETLANDS





Naval Base Ventura County California

FIGURE 3-8 POINT MUGU JURISDICTIONAL WATERS

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

3.3.1.5.1 Wetland Restoration and Mitigation Banking at NBVC Point Mugu

The Navy has undertaken several wetland restoration projects, some of which have or will be entered into the proposed NBVC Wetland Mitigation Bank (hereafter also referred to as "bank") (Appendix I). The purpose of the proposed bank is to create in advance of the need, economically efficient and flexible wetland mitigation opportunities for the Navy. NBVC has had and will continue to have unavoidable construction-related wetland impacts as a result of its geographic location and military mission. Creation of a bank will streamline the wetland permitting process, eliminate costly and frustrating construction delays, and reduce the cost of mitigation. To that end, the Navy is in the process of developing a bank prospectus to initiate agency involvement with the proposed bank and detail responsibilities for its implementation under the new mitigation rule requirements in 33 Code of Federal Regulations (CFR) Parts 325 and 332, and 40 CFR Part 230 (DoD and EPA 2008; eCFR 2012a, 2012b).

The principal goal of the bank is to sustain no net loss of wetlands and maintain functional wetland habitat at NBVC Point Mugu, while providing an efficient and flexible mitigation credit and debit system.

Specific objectives for the bank include the following:

- A. Provide an efficient means of mitigating wetland impacts within the NBVC Point Mugu installation, as required under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act;
- B. Establish a systematic approach for defining the credit value of wetland habitat that is created, restored, or enhanced by the Navy;
- C. Establish an effective and efficient system for administering and managing the bank through a ledger.
- D. Request yearly funding to restore or enhance existing wetlands to provide additional credits into the bank.

The bank is developed by an Interagency Review Team (IRT), a multi-agency team that provides technical expertise in support of bank implementation. Members of the IRT are listed below:

- Navy Region Southwest, Naval Base Ventura County
- Los Angeles District of the USACE
- Region IX, U.S. Environmental Protection Agency (EPA)
- Ventura Field Office of the U.S. Fish and Wildlife Service (USFWS)

- National Oceanographic and Atmospheric Administration's National Marine Fisheries Service (NMFS)
- Los Angeles Regional Water Quality Control Board (LARWQCB)

The primary role of the IRT is to facilitate establishment of the bank by developing the Final Mitigation Bank Enabling Instrument. Upon review and approval of the proposed banking prospectus, the IRT will develop the instrument, which provides the legal framework of terms and conditions, regulations, and procedures for operation and management of the bank. The IRT will strive to obtain consensus on its actions. The USACE will have the responsibility for making final decisions regarding the terms and conditions of the banking instrument where consensus cannot otherwise be reached within a reasonable timeframe. The IRT will review and seek consensus on the bank and final plans for the restoration, creation, enhancement, and preservation of wetlands.

NBVC owns all properties at Point Mugu that are proposed for inclusion and credit into the bank, and would serve as the bank sponsor and sole user. The bank would be used for compensatory mitigation for mission-related impacts to wetland habitats within the property boundary of the Point Mugu installation.

As the bank sponsor, NBVC would be responsible for the preparation and overall operation and management of the Final Mitigation Bank Enabling Instrument in consultation with the IRT. NBVC responsibilities would include the following:

- Coordinate monitoring and reporting on the progress of wetland restoration sites;
- Manage funding for ongoing restoration site monitoring efforts;
- Execute monitoring and reporting contracts;
- Evaluate and prioritize requests to use bank credits and provide recommendation to the Commanding Officer;
- Provide guidance on the application process for credit release; and
- Maintain the bank ledger.

NBVC would be accountable for securing adequate funds for the operation and maintenance of the bank during its operational life. NBVC would be responsible for the long-term management of the wetland habitats, as outlined in this INRMP.

NBVC will obtain all appropriate environmental documentation, permits, or other authorizations needed to establish restoration sites and maintain the bank, which may consist of any or all of the following permits, clearances, or approvals:

- NEPA compliance;
- Section 401 Clean Water Act Water Quality Certification or Waiver;
- Section 404 Clean Water Act Fill Discharge Permit; and
- Federal ESA (Section 7 or Section 10) compliance.

The banking process and method for credit calculation and debiting is in development at this time and will be detailed in the IRT-approved prospectus and final banking instrument (Appendix I).

The proposed bank consists of nine wetland restoration sites in differing phases of restoration: LAG4; Sludge Ponds (Pilot and Phases 1-3); South J Avenue; Perimeter More Value; Marine Air Detachment Road; Laguna Road Extension; IRP Site 1 North Upper; IRP Site 1 North Lower; and Dispensary Road (Figure 3-9). Restoration sites proposed for entry into the bank are detailed in Appendix I, NBVC Point Mugu Wetland Mitigation Bank. Two of the nine sites have been determined by the USACE as sufficiently restored to be active in the bank (LAG4 and Sludge Ponds). Restoration, accounting and management of the sites will be described in the bank prospectus and instrument. In addition to the active bank sites, there are 8.87 acres of restoration sites proposed for credit entry into the bank. NBVC is pursuing receiving credit for past wetland enhancement efforts that were completed for enhancing endangered species habitat. For detail on the restoration progress of sites refer to the most recent annual NBVC Point Mugu wetland restoration monitoring report (Tetra Tech 2013b).

Wetland Restoration Monitoring

The purposes of the current wetland restoration monitoring program are as follows:

- (1) Report on the scientific evaluation of the progress of the wetland restoration projects, as required for assessing function and habitat values as directed by USACE (USACE 2004).
- (2) Determine whether the restoration projects are meeting the following objectives:
 - a. Maintain physical conditions, such as elevation and hydrology that are conducive to the establishment of salt marsh habitat.
 - b. Progress toward a state similar to natural wetland habitat (as measured with quantitative and qualitative data from their respective reference sites).
 - i. Restoration site soils and substrate are similar or trending toward similarity to reference site soils;
 - ii. Restoration site hydrology matches the reference site hydrology;
 - iii. Vegetative cover and species diversity are comparable to the reference site;



INRMP = Integrated Natural Resources Management Plan

- iv. The site provides wildlife habitat similar to the reference site; and
- v. The site provides habitat for threatened and endangered species.
- c. Qualify as jurisdictional wetland.
 - i. The site meets the USACE's three-parameter requirement for wetlands: a dominance of hydrophytic vegetation; hydric soils; and wetland hydrology.
- (3) Document impediments to the progress of restoration at the sites, including reporting any necessary corrective actions.
- (4) Recommend future monitoring or restoration, based on the analysis of monitoring results.

Monitoring plays a key role in adaptive management by facilitating the identification of stressors and community trends. The underlying assumption of this evaluation is that species diversity and structural heterogeneity are sensitive to environmental stressors. In salt marshes, the key factors that affect species diversity and community structure are tidal hydroperiod, water salinity, soil salinity, soil physical and chemical properties, sedimentation, and susceptibility to invasive species encroachment. All of these factors vary with intertidal elevation, distance from the tidal source, and natural disturbance regime. Data collected from nearby natural or restored reference sites provide information related to the occurrence of regional or site-specific stressors. Stressors evident in the control site that also occur in the restored site could indicate regional conditions either beyond the control of local management actions or that require Navy biologists to undertake necessary and feasible corrective actions. Stressors evident in the restored site but absent from the reference site would warrant adaptive management actions to alleviate the stressor within the restoration area.

Wetland functions critical for southern California coastal wetlands include provision of habitat for species that depend on the wetland, support of food chains, transformation of nutrients, resistance to invasive species, and maintenance of local gene pools (Zedler 1996b). Restoration goals at NBVC are tailored to site-specific abiotic attributes such as the positioning of the site in the landscape, source of hydrology and soil substrate; and biotic goals, such as support for threatened and endangered species, and fisheries enhancement. The following sections describe the targeted wetland functions and values that the wetland restoration program at NBVC strives to attain for the restoration sites. Wetland monitoring protocols are detailed in Appendix H.

Restoration of Wetland Functions and Values

The goal of the NBVC wetland restoration program is to produce viable, functioning coastal wetlands that closely resemble natural wetlands in both structure and value. Discussed below are the target functions and values for restoration of an estuarine system.

Foodchain Support and Nutrient Cycling

The direct or indirect use of nutrients derived from wetlands by heterotrophic organisms refers to the food-chain support function of wetlands (Ferren and others 1996). Alternatively, the Pacific Estuarine Research Laboratory proposed the definition as the production of organic matter and its direct or indirect use, in any form, by organisms that inhabit, or are associated with, wetland ecosystems (Pacific Estuarine Research Laboratory 1990). Categories of this function include primary production, decomposition, nutrient export, and nutrient utilization. Researchers have documented 68 characteristics of a wetland that are important to food chains, including constriction of a basin's outlet, form of vegetation, substrate type, salinity, hydroperiod, tidal range, plant richness, invertebrate density, suspended solids, and bottom water temperature (Adamus and Stockwell 1983; Sather and Stuber 1984).

The target foodchain support and nutrient cycling for Mugu Lagoon should be in line with the functions and values for a natural estuarine salt marsh system described by Pacific Estuarine Research Laboratory (Pacific Estuarine Research Laboratory 1990). Specifically, a vital target function and value of the food chain will be to provide food for higher trophic levels, including terns, herons, an assemblage of shorebirds, and fish. The federal and state listed endangered California least tern depends on a moderate level of estuarine open water habitat. Marsh plants produce organic carbon, making it available to consumers and decomposers. Epibenthic algae provide attachment sites for topsmelt eggs. Burrowing benthic organisms (such as clams, ghost shrimp, and polychaetes) mix the sediments, aerating the soil and enhancing microbial activity. Benthic mollusks, worms, and crustaceans consume foods produced in, and tidally transported through, the estuarine salt marsh. Suspension feeders filter particles from the water. Deposit feeders scrape the soil surface and deposit fecal pellets and middens. Fish and birds consume algae, detritus, and invertebrates, as well as fish.

Hydrology

Storage of floodwaters is one major function of estuaries. Characteristics that are most often cited as playing a role in controlling floodwaters are size of the wetland, texture of the substrate, and type of vegetation (Sather and Smith 1984). Groundwater recharge and discharge is another hydrologic function of wetlands because estuaries serve as an interface between water exiting the adjacent watershed and the open ocean. A third hydrologic function is the role of wetlands in shoreline anchoring and dissipation of erosive forces (Sather and Smith 1984). Mugu Lagoon protects inland sites from storms, tides, and wave action, and in general provides a buffer between the forces of the Pacific Ocean and the upland areas of NBVC Point Mugu.

Proper wetland hydrology is critical for restoration of wetland habitat (Zedler 1996a). Marsh plants are extremely sensitive to the degree of water stagnation, which influences dissolved oxygen concentration, and salinity of the soil. If the hydroperiod (frequency and duration of tidal inundation) differs from the regime that is needed, even a 10-centimeter difference in elevation can prevent the desired salt marsh plants from growing. Suitable water circulation patterns are also required. Prolonged anoxia (low dissolved oxygen concentration) may develop in areas that receive too little tidal current, thus reducing plant growth. Erosion and removal of

installed vegetation may occur in areas with too strong a current. Specifically for Mugu Lagoon, the target hydrologic regime will be free-moving flow of surface water and groundwater.

The degree of tidal flushing in the estuarine system dictates the ability of a salt marsh to support native plants and animals and dictates the kinds of species that will be present. Mugu Lagoon, with a long history of tidal flushing, supports several native halophytes. Expectations for restoration sites with full tidal flow should thus be greater than for sites with muted tidal flow. The hydrologic regime will dictate what type of habitat is promoted at the restoration sites.

Tidal hydrology drives the sediment dynamics of sites; newly restored sites seek equilibrium in elevations, relative to the tidal prism. Sediments within newly restored sites open to tidal action are dynamic; accumulation and erosion of sediments will differ spatially throughout the site, and temporally, depending on tidal velocities and the concentrations of suspended sediment in the water column. If there is a poor match between the morphology of the site and the initial excavations, changes in newly restored sites can be quite large in the beginning. Zedler recommends that site designs account for the dynamic nature of sediment accumulation processes; sites should typically be overexcavated, but the amount of excavation needed is sitespecific and dependent on natural sedimentation rates in neighboring reference (natural) marshes (Zedler 2001; Phillip Williams and Associates, Inc. and P.M. Faber 2004). To determine how deep to excavate, background data is required on the suspended sediment load in the water column, the stability of unconsolidated sediments at the restoration site, and the time period desired for plant establishment. Data from nearby natural reference sites on sediment load in tidal channels, and the degree of channel stability, would also be helpful in understanding the target system. Zedler identifies that further research is needed to fine tune the methods for determining site-specific sediment flux processes (Zedler 2001).

The Navy is considering a long-term plan for opening culverts and improving tidal flow throughout the lagoon (Tetra Tech 2002). The main focus would be clearing sediments from blocked culverts that extend under the runway. The filled culverts result in muted tidal wetlands to the west, and increased ponding west of the runway. A recent pilot study of airfield pondig was conducted in 2012 that makes specific recommendations and alternatives for culvert modifications and tide gate maintenance (RBF Consulting 2013). A variety of projects are presented in the report; however, at the time of this INRMP, no funding or project approvals are in place. This project would assist the BASH program by reducing ponding along the airfield and its attraction for waterfowl and wading birds. The Navy recognizes that such a project would be beneficial for the restoration of estuarine habitat; however, it would modify existing hydrology of the far western portion of the base and may adversely impact salt marsh bird'sbeak, Forster's tern (Sterna forsteri) nesting habitat, and California least tern foraging areas. Therefore, impacts of modifying hydrology must be thoroughly considered before any modifications are done. Before modifications are conducted, the following needs to be evaluated: the feasibility of increasing tidal flow; potential effects such as habitat loss for salt marsh bird's-beak due to increased tidal elevations; and the effect of changes in hydrologic regime on the installation's current wetland restoration/mitigation efforts. If the tidal prism were increased, this would likely benefit wetland restoration sites. Further evaluation may indicate that increasing tidal flow is feasible for some western areas, but not all.

Restoration in the western arm, where tidal flow is restricted due to channelization, berms, and roads that traverse the area, is limited to high marsh and upland transitional habitats due to the surrounding tidal regime. Sites near Perimeter Road (Perimeter More Value and Marine Air Detachment Road) are characteristic of high marsh and are rarely inundated except at extreme high tides coupled with rain events. Unless hydrologic improvements are made, such as restoring hydrologic connectivity to the surrounding drainage channels at the east and south. restoration sites at the fringe of the marsh will likely continue as limited-functioning high marsh and upland transitional habitat. The geographic setting and lack of hydrologic connectivity of these sites limit the uppermost potential for restoration of wetland functions. The functions expected of sites that receive full tidal flushing - such as organic accumulation, multiple trophic-level support, fishery habitat, and nutrient absorption — are all limited or lacking in these areas. Additionally, the act of confining estuarine waters to ditches limits one of the primary functions of wetlands: the ability to absorb flood waters and nutrients across the landscape. With the threat of rising sea levels, this continued practice may concentrate erosion in the channels (Tetra Tech 2011a). Planning for future restoration projects in the vicinity of Perimeter Road should take a landscape-scale approach to prioritize sites with the highest potential for restoring tidal connectivity to these areas of the western arm, provided restoration does not conflict with the military mission.

Habitat

The provision of habitat may be the most important function of all in the estuarine wetland systems of Mugu Lagoon. Species that rely on the lagoon include federal- and state-listed species (Section 3.5 Special Status Species and Their Protection), estuarine-dependent plants and animals; migratory waterbirds such as wintering waterfowl, shorebirds, waders, gulls, and terns; infauna and epifauna; and estuarine-dependent young-of-the-year marine fish such as halibut (Onuf and Quammen 1990).

Water Quality

Wetlands are key to maintaining water quality because they function as filters to remove pollutants and sediments from moving waters (Sather and Smith 1984). Heavy use of fertilizers on agricultural land in the watershed upstream has resulted in high nutrient loading to Mugu Lagoon. Water that exits the marsh into the Santa Barbara Channel would most likely contain higher concentrations of nutrients if the estuary did not process some of the nitrate loads before the water passed through to the ocean. Algae may play an important role in filtering nutrients and improving water quality, possibly exceeding the importance of the vascular plants that dominate the sites (Pacific Estuarine Research Laboratory 1990). Specific target functions and values of the habitat for Mugu Lagoon will concentrate on controlling known point source pollutants and studying non-point source pollutants to gain a thorough understanding of factors that influence the water quality of the Mugu Lagoon.

Socioeconomic Values

Socioeconomic values of wetlands in the estuarine system involve society's perceptions of the worth of an estuarine ecosystem, typically whether the system provides a form of benefit or pleasure (adapted from Ferren and others 1996). Most of the values are derived from the various ecosystem functions that characterize a wetland or ecosystem.

The consumptive value of estuaries for regional commercial fisheries has probably been underestimated. Halibut, for example, are known to be estuarine-dependent species because of the importance of estuaries to young-of-the-year (Onuf and Quammen 1990). Many non-consumptive values are attributed to estuaries and estuarine wetlands that generally relate to enhancement of the quality of life for humans who live near or visit them. Examples include sport fishing, hunting, boating, swimming, bird watching, botanizing, painting, and walking.

Educational programs, research sites, and conservation areas are also tributes to the acknowledged values of estuaries and estuarine wetlands. Furthermore, federal, state, and local agencies maintain parks, reserves, and refuges to protect the functions and values of estuaries.

A variety of organizations within 45 miles of Mugu Lagoon maintain an active community support program in the form of ecological field tours and birdwatching field trips and classes at NBVC Point Mugu. The NBVC ED has undertaken many research efforts and has provided ecological field classes to universities, colleges, and other schools. Estuarine wetland restoration sites at Mugu Lagoon are usually part of the subject discussion and often included as showcase areas.

Examples of ecosystem attributes and assessment metrics for restoration of wetland functions and values are listed in Table 3-2.

Attribute	Assessment Metrics	Ecosystem Function and Value
Hydrology	Velocity of current Water levels at various tidal cycles Salinity of water and soil	Tidal circulation Tidal lags, inundation regime Relation with stream and tidal flow
Topography	Elevation	Erosion, accretion
Soils	Texture Organic matter Toxic substances Redox Sulfides and Ph	Drainage, resilience of soil Nutrients, resilience of soil Biological accumulation Drainage, anaerobiosis of organic matter Potential for formation of acid sulfate soil
Nutrient dynamics	Nitrogen fixation Total nitrogen Denitrification Organic matter decomposition	Availability to producers Potentially limiting nutrient Nitrogen cycling Nutrient mineralization
Algae	Cover by dominant type Food for invertebrates, potential for blooms	
Vascular plants	Cover Shifts in dominance Density of annual plants	
Consumers	Decomposers and shredders Fish and invertebrates	Food chain support

TABLE 3-2: ECOSYSTEM ATTRIBUTES TIED TO WETLAND FUNCTIONS

Source: Adapted from Zedler 1996b.

Other Wetland Restoration Sites at NBVC Point Mugu

To aid in the recovery of light-footed clapper rails and salt marsh bird's-beak, invasive plants (mostly iceplant) have been treated and physically removed in wetland habitats since 2001. Most of these sites will not be included in the wetland bank, as they were in areas already delineated as wetlands, of small size, abundant and patchy, and there was a need to act quickly to aid in listed species recovery. At these sites, no pre-restoration data was collected as part of a monitoring program, to compare enhanced conditions to undisturbed wetlands. Some of these sites may be investigated to determine if they can be added to the bank, based on aerial photographs which can demonstrate iceplant coverage for pre-restoration site conditions.

Several wetland restoration projects the Navy has completed are not included in the proposed mitigation bank (Table 3-3 and Figure 3-9). These projects were largely conducted as mitigation (negotiated with EPA and USACE) for impacts to wetlands, as described in Appendix I. These sites were intensively monitored by UCLA, from 1999 through 2005. Many of the parameters and procedures in the current monitoring program were designed to be similar to methods used by UCLA. However, the UCLA surveys were conducted throughout the year, resulting in a much larger dataset compared with the current annual monitoring program. A summary of monitoring results can be found in the "Wetland Restoration Monitoring Report for Naval Base Ventura County, Mugu Lagoon" (Ambrose, Vance, and Diaz 2006).

Restoration Site	Year	Acres	Wetland Type	Status
31 st Naval Construction Regiment Small Arms Range	1995	1	Mudflat	Completed; full tidal prism flow.
"L1" Avenue	1997	3.5	Mudflat and sand bar, upper intertidal salt marsh	Completed; muted tidal flow.
"L2" Avenue	2001	2.06	Mudflat and sand bar, upper intertidal salt marsh	Completed; enhancement of existing wetlands in an area of muted tidal flow.
South J Avenue	1997	1	Mud flat, salt marsh	Completed; muted tidal flow.

 TABLE 3-3:
 HISTORIC NBVC POINT MUGU WETLAND MITIGATION RESTORATION PROJECTS

Source: Tetra Tech 2002.

The following details specific concerns for wetland restoration and mitigation banking at NBVC Point Mugu.

Specific Concerns

- Space for wetland creations are limited by property lines and existing land uses.
- Numerous differing methods of credit calculations and valuation of enhancement versus creation must be reconciled to develop a coherent wetland mitigation bank.

- Funding is not secure for long term management of wetland restoration projects that are no longer active in the wetland restoration and monitoring program.
- Invasive species and anthropogenic disturbances may degrade restored wetlands.
- Climate change and sea level rise may alter habitat and functional values of wetland restoration sites.
- Restored wetland sites can be degraded by erosion and sedimentation from anthropogenic or natural causes.
- Pollution may limit the habitat value of restored wetlands.
- Some newly restored sites require regular maintenance to ensure sustainability of native plant populations.

Current Management

NBVC ED management of the wetland restoration program is described in the above section, "Wetland Restoration and Mitigation Banking at NBVC Point Mugu"; permitting is described in Section 3.3.1.5 Jurisdictional Waters-Wetlands Management.

Assessment of Management

The wetland restoration program has very effectively restored and enhanced estuarine wetland habitats, with some sites proposed for inclusion in the NBVC Wetland Mitigation Bank. NBVC ED should continue to identify areas on base that could benefit from wetland creation, restoration, and enhancement. Additionally, projects within the developed landscape should incorporate elements of wetland restoration into landscape designs, such as bioswales and other features that improve water quality through natural attenuation (Section 6.7.4 Sustainability in the Built Environment).

Management Strategy

Objective: Ensure no net loss of wetlands or military mission at NBVC Point Mugu.

- *I.* Finalize the NBVC Point Mugu Wetland Mitigation Bank.
- *II.* Ensure continued funding for wetland monitoring in support of mitigation banking.

- III. Create functional wetlands for entry into the NBVC Point Mugu Wetland Mitigation Bank.
 - A. Research all potential wetland creation opportunities at NBVC Point Mugu.
 - *B.* Explore opportunities for enhancing limited functioning wetlands and add credits to the bank.
 - *C.* Attempt to receive credit for all other past wetland enhancements, such as efforts to enhance light-footed clapper rail habitat.
- *IV.* Continue to adaptively manage the wetland monitoring program to efficiently monitor recovery and incorporate new research and understanding of estuarine systems into monitoring methods.
- *V.* Ensure funding and continue to budget for and implement wetland restoration and long-term adaptive management of restoration sites.
 - *A.* Conduct invasive plant control in current restoration sites and bank sites to ensure no net loss to wetlands occurs due to non-native species invasions (such as iceplant).
 - *B.* Research new methods of controlling non-native species in wetlands without the use of herbicides.
- *VI.* Incorporate buffers in all wetlands and Waters of the U.S. projects to account for sea level rise.

3.3.2 Terrestrial Communities

Terrestrial communities were mapped and classified in 2012 (Appendix Q; HDR 2013) based on *A Manual of California Vegetation* and in accordance with National Vegetation Classification System standards, as required by the Federal Geographic Data Committee (Sawyer, Keeler-Wolf and Evens 2009). Terrestrial section headers follow the NVCS Macrogroups and are detailed on Figure 3-10. Association descriptions and acreages are in Table 4-1 of the "Vegetation Classification and Mapping" report (Appendix Q) (HDR 2013). The discussion in the following sections provides a preliminary list of species known to occur in each vegetation type. Appendix G has a list of flora and fauna recorded at NBVC Point Mugu and Special Area Laguna Peak. For additional information on the habitats of NBVC Point Mugu, planning level surveys are listed in Appendix Q. Sensitive flora and fauna are discussed in Section 3.5 Special Status Species and Their Protection, and listed in Appendix G.



3.3.2.1 Vancouverian Coastal Dune and Bluff

California coastal dune ecosystems have suffered a disproportionately high amount of anthropogenic impacts from industry, tourism, recreation, and residential developments (Pickart and Sawyer 1998). Special status species dependent on beaches and dunes for forage and reproduction (for example, western snowy plover, California least tern, silvery legless lizard [*Aniella pulchra*], and globose dune beetle [*Coelus globosus*]) are vulnerable to local extirpation.

Dune systems are extremely dynamic and dependent upon and highly influenced by wind and wave action. These forces combine to cause sand accumulation or sand depletion, depending on the strength of winds and seasonal patterns. They form parallel to prevailing winds and perpendicular to the coast line. Dunes provide a reservoir of sand available to replace losses from the beach, and serve as a valuable form of protection from erosive wave action (Nordstrom and Psuty 1980; Pye, Saye and Blott 2007). The extent of protection dunes provide depends on their width and crest height; the average height estimated for protective dunes in southern California is approximately 18 feet above mean lower low water, based on wave run-up associated with the largest tsunami of recent record in the Santa Barbara Channel (Nordstrom and Psuty 1980).

Dunes are typically described according to proximity to the ocean: nearshore dunes, moving dunes, and backdunes. Coastal dunes are characterized by vegetation highly tolerant of wind, salty air, sand movement, and an arid climate. Vegetation in the nearshore and moving dunes have special adaptations that include a low growth habit, specialized root systems, succulent leaves, pale coloration, sticky or hairy stems and leaves that trap sand, and unique dispersal mechanisms such as seeds that float (Barbour, Keeler-Wolf, and Schoenherr 2007). Species in the foredunes and moving dunes include red sand verbena (*Abronia maritima*), a California Native Plant Society list 4.2 (limited distribution [CNPS 2012]) species, dune saltbush (*Atriplex leucophylla*), beach-bur (*Ambrosia chamissonis*), beach morning glory (*Calystegia soldanella*), beach evening primrose (*Camissonia cheranthifolia*), saltgrass and seaside heliotrope. Nonnative species include sea rocket (*Cakile maritima*), European beachgrass (*Ammophila arenaria*), and iceplant (*Carpobrotus* spp. and *Mesembryanthemum* spp.).

Sea rocket, an annual, is not typically viewed as problematic. Some restoration ecologists use it as a nurse crop for native seedling protection due to its rapid growth and easy hand removal. It is typically found close to the high tide line and extends inland to the foredunes.

European beachgrass and iceplant have adverse effects on native plants and animals and often displace native species such as sand verbena, globose dune beetle, and silvery legless lizard (Zedler and others 1992). Dense mats of iceplant or European beachgrass on dune hummocks affect the morphology of the hummock and effectively prohibit the dune from further movement. These species have dense root structures and growth habits that alter natural dune morphology and prohibit usage by native wildlife. European beachgrass has a vertical root structure and tall aboveground growth, both of which capture sand and create artificially steep and high sand dune formations. Its dense, high growth habitat provides cover for a variety of predators of federally listed plovers and terns. Additionally, it decreases invertebrate abundance and diversity, and

negatively impacts pollinators (Slobodchikiff and Doyen 1977; Webb, Oliver and Pik 2000). Iceplant has similar impacts: its dense growth habit halts sand movement, and depending on its locations within the dune zones, can create dunes with steep leeward faces. Iceplant alters soil pH, and its dense build up of detritus excludes burrowing dune insects and animals (Albert 2000; D'Antonio 1990). NBVC ED has been treating beachgrass on California least tern and western snowy plover sites since 2005. A few significant populations remain in high dune areas, which are not currently threatening listed species habitat, but will eventually be targeted for extirpation.

Backdunes are a more stable environment that supports shrub cover. At NBVC Point Mugu, the backdunes are a transition zone composed of a variety of vegetation communities and a mix of two macrogroups: Vancouverian-Coastal Dune and Bluff, and in areas of coreopsis (*Coreopsis gigantea*), Viscaino-Baja. Within the Vancouverian-Coastal Dune and Bluff macrogroup is the "California Coastal Evergreen Bluff and Dune Scrub" group, which includes the coyote brush (*Baccharis pilularis*) alliance, and the "Vancouverian/Pacific Dune Mat" group, which contains the dune mat (*Abronia latifolia-Ambrosia chamissonis*) alliance. Within the Viscaino-Baja California Desert Scrub Macrogroup is the "Coastal Baja California North Maritime Succulent Scrub" group, which contains the coreopsis alliance (HDR 2013). Both alliances occur on stabilized dunes and coastal bluffs. Coyote brush ranges broadly throughout coastal sage scrub and oak woodland habitats and on open slopes and terraces.

Most of the beach and dune habitat at NBVC Point Mugu has not been developed or severely degraded by human activity. However, the shoreline at NBVC Point Mugu has severely eroded over several decades as littoral sand transport has been interrupted or reduced (Section 3.2.2.1 Shoreline Sediment).

Sandy beach habitat provides resting and foraging areas for a number of shorebirds. Among the birds that occur on the sandy beach at NBVC Point Mugu are the California gull (*Larus californicus*), Heerman's gull (*Larus heermanni*), ring-billed gull (*Larus delawarensis*), western gull (*Larus occidentalis*), willet (*Catoptrophorus semipalmatus*), western sandpiper (*Calidris mauri*), and California brown pelican (*Pelecanus occidentalis*). The beach provides foraging and nesting habitat for western snowy plovers and California least terns.

The federally threatened western snowy plover nests on open sandy beach (Section 3.5 Special Status Species and Their Protection). Western snowy plovers can be associated with the California least tern, which nest in colonies. All open upper beach and hummock habitat at NBVC Point Mugu, except for areas invaded by iceplant and European beachgrass, is suitable for and is occupied by the western snowy plover (Figure 3-10 and Figure 3-11).

The federally endangered California least tern also nests on open sandy beaches. Estuaries and inland lakes are preferred areas for foraging terns, especially fledglings. At NBVC Point Mugu, most California least terns occupy habitat on the western portion of the installation, with a majority of the nesting population at East Ormond Beach (Figure 3-10 and Figure 3-11). Terns occasionally nest in the eastern arm, but nesting is occasional as reproductive success is low on that site. Both terns and plovers seem to prefer some amount of dune vegetation nearby (about 3 percent cover) (Minsky and others 1987), as well as debris on the sandy beach (driftwood). Eggs

and chicks of both these birds are vulnerable to a variety of predators as well as to human disturbance.

Belding's savannah sparrow, a California state endangered songbird, often forages on the dunes and beaches, especially when an abundance of kelp has washed ashore.

One of the most common animals of sandy beaches is the mole crab (*Emerita talpoida*). Infaunal organisms such as the mole crab occupy a narrow band at the mid-tide level. Cirolanid isopods occupy the mid- to upper-intertidal zone. Kelp flies (*Fucellia* spp., *Coelopa* spp., etc.) are abundant in decaying piles of seaweed, and are a staple of the western snowy plover diet.

Sand dunes are relatively low in nutrients and generally do not support multiple trophic levels; insects are typically the most common species in this habitat. Surveys conducted 2008 and 2009 in coastal dune habitat at NBVC Point Mugu confirmed the presence of globose dune beetles, a state-ranked "critically imperiled" species (CDFW 2012a; Tetra Tech 2012p). The silvery legless lizard (*Anniella pulchra* ssp. *pulchra*), a CDFW species of special concern, has potential and is likely to occur on site, as it prefers areas vegetated with beach bur.

The sandy beach is used as an occasional haulout area for individual pinnipeds, including juvenile elephant seals (*Mirounga angustirostris*) and California sea lions (*Zalophus californianus*).

Specific Concerns

- Some beach habitat, such as Holiday Beach is transected by Beach Road, which results in disturbance, including pedestrian and vehicular traffic, construction activities, debris, pollution, and erosion.
- Sea level rise and coastal erosion may reduce the extent of beach and dune habitat.
- Invasive species may degrade dune habitat, especially by creating artificially high dunes that reduce open nesting areas for plovers and terns, and provide cover for predators.
- Past dune management practices used non-native species to stabilize drifting dunes.

Current Management

NBVC ED manages the sandy beach and dune communities for the protection of federally listed species and to maintain the quality of the habitat. Base biologists monitor these habitats for disturbance to sensitive species, and manage them to ensure conditions are suitable for plover and tern nesting. Access to the beach is restricted and monitored by NBVC Force Protection. Impacts to this habitat from potential construction activities near the sandy beach are generally avoided and minimized through the SA/PRB codified in NBVC Instruction 11010.1.

Base biologists conduct surveys for native plants, snowy plovers, least terns, stranded pinnipeds, and injured, oiled, and dead seabirds. Staff also periodically conduct surveys for silvery legless lizards, globose dune beetles, and sandy beach tiger beetle (*Cicindela hirticollis gravida*).

NBVC ED regularly conducts invasive plant control throughout the beach and dunes (Section 3.7 Invasive Species Management). NBVC Public Works staff regularly removes sand that has accumulated on Beach Road. A program for using this sand for beach replenishment is in development ((Section 3.2.2.1 Shoreline Sediment).

Assessment of Current Management

The Navy's current management of coastal dune habitat is adequate. This habitat type is managed primarily for federally listed species, the western snowy plover and California least tern. Other management that occurs in this habitat type is related to maintaining native beach vegetation and the fauna which requires this habitat type, as well as sand budget maintenance and shoreline infrastructure (Section 3.2.2.1 Shoreline Sediment). One main goal for management of listed species is the preservation of open sandy nesting areas (Section 3.5 Special Status Species and Their Protection). A natural dune ecosystem with a mix of open spaces and sandy hummocks vegetated with native plants, is necessary to sustain the special status species that rely on this habitat type. Native vegetated dunes support other special status species, such as the globose dune beetle and silvery legless lizard. Additionally, the lack of native vegetated dunes is in conflict with sand management and shoreline protection; the absence of dunes promotes sand transport off–site, and requires the Navy to repeatedly remove sand from infrastructure. Conducting native dune restoration where feasible could meet operational and shoreline protection needs while supporting listed species.

Reducing access to the beach promotes its use by migratory birds and marine mammals and reduces potential impacts from disturbance and anthropogenic materials. Use restrictions, bird and plant monitoring, erosion control, and accumulated debris removal will contribute to beach and dune conservation.

Management Strategy

Objective: Maintain, enhance, and increase sandy beach and coastal dune habitats where appropriate.

- *I*. Avoid and minimize potential human-induced disturbances to sandy beach habitat, by continuing to restrict access.
- *II.* Continue to use SA/PRB to avoid and minimize potential impacts.
- *III.* Work collaboratively with NBVC, base facility tenants, and regional authorities (where shoreline stabilization measures are required) to minimize impacts to sandy beach habitat.
- *IV.* Protect beach from erosion and prevent losses of sandy beach habitat.

- A. Conduct sand replenishment, beach stabilization, or other activities as necessary, outside the nesting season.
- B. Regularly delineate and monitor foredune habitat to track beach retreat.
- C. Support the research of other entities that monitor the shoreline to track losses in sandy beach habitat.
- *V.* Encourage the development of natural dune morphology by protecting native vegetation in this habitat type.
- VI. Conduct restoration activities in coastal dune habitat.
 - A. Conduct regular invasive species control.
 - B. Plant native species where natural recruitment is slow or low, focusing on areas where invasive plants were recently removed or treated.
 - C. Restore native plant communities in areas where dune stabilization is needed.
 - D. Ensure a mix of open beach and hummocks to support federally listed beach-nesting birds and promote sand stability where needed.

3.3.2.2 California Chaparral

The coastal scrub community occupies a variety of areas throughout Mugu Lagoon. Most of this habitat is in the northern portions of the installation. The upland community in this transition area is composed of the following NVCS groups: "Californian Maritime Chaparral," "Central and South Coastal Californian Coastal Sage Scrub," and "Central and South Coastal California Seral Scrub" NVCS groups. This community includes several species of shrub, some of which are evergreen (such as the laurel sumac [Malosma laurina] and lemonadeberry [Rhus integrifolia]), and some of which are drought-deciduous (such as the goldenbush [Isocoma menziesii] and California sagebrush [Artemisia californica]). Other species recorded in this habitat include mulefat, saw-toothed goldenbush (Hazardia squarrosa), and telegraph weed (Heterotheca villosa). Invasives include iceplant (Carpobrotus edulis), myoporum, white sweetclover (Melilotus alba), Russian thistle (Salsola tragus), pampas grass (Cortaderia spp.) and annual grasses such as bromes (Bromus spp.), wild oats (Avena barbata) and Bermuda grass (Cvnodon dactylon). California kingsnakes (Lampropeltis getulus californiae) and San Diego gopher snakes (Pituophis melanoleucus annectens) are common species in transition habitats. Southern Pacific rattlesnakes (Crotalus oreganus helleri) also occupy transitional and coastal scrub habitats. The western side-blotched lizard (Uta stansburiana elegans) is abundant on dry ground, especially in sandy, open areas. Great Basin fence lizard (Sceloporus occidentalis *longipes*) is also common in this habitat type.

Two species of small mammals are known to occur in the transition habitat type: the western harvest mouse and deer mouse. Other mammals that have been recorded in upland habitats include three carnivores: coyote, American badger (*Taxidea taxus*), and long-tailed weasel (*Mustela frenata*). A rare occurrence of bobcat (*Lynx rufus*) was recorded on base in 2013; the individual was found dead. It is likely that these larger, highly mobile animals visit the wetland from time to time. The desert cottontail (*Sylvilagus audobonii*), opossum, and California ground squirrel have also been observed. Black-tailed jackrabbit (*Lepus californicus*) are seen less frequently, but used to be more common.

The small mammal species are prey for various birds. Of special interest in the transition habitat are the short-eared owl (*Asio flammeus*), northern harrier, and white-tailed kite (*Elanus caeruleus*).

Coastal scrub communities have the potential to support numerous migratory and resident bird species. Bird species recorded in this habitat type at NBVC Point Mugu include warbling vireo (*Vireo gilvus*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), Costa's hummingbird (*Calypte costae*), blue-grey gnatcatcher (*Polioptila caerulea*), song sparrow (*Melospiza melodia*), and white-crowned sparrow (*Zonotrichia leucophrys*). NBVC facilities at the NBVC Laguna Peak Special Area are on developed, disturbed land, with some small patches of remaining native vegetation at the borders of the property. Outside the Navy property line is coastal sage scrub vegetation. Laguna Peak does not provide appropriate habitat for the federally listed threatened *Dudleya verity*; future surveys will confirm its absence from the property.

Specific Concerns

- Transitional and coastal scrub communities are degraded with non-native plant species. Most upland areas are invaded with exotic grasses and other invasive species.
- There is limited amount of this coastal scrub at NBVC Point Mugu due to the lack of undeveloped upland elevations that support coastal sage scrub and chaparral.
- Sea level rise may impact the coastal scrub community on base; there is little to no acreage to allow for this community type to shift inland.

Current Management

Impacts to this habitat are managed and minimized through the SA/PRB process and with implementation of this INRMP. Invasive plant control is occasionally conducted in this community, with most invasive control work focused on the wetland and beach communities. Base biologists or contractors occasionally conduct wildlife surveys in Point Mugu coastal scrub. NBVC ED is planning a vegetation survey in 2014 at Laguna Peak, to update the Point Mugu flora.

Assessment of Current Management

The Navy's management of coastal scrub habitat is adequate. This vegetation type would benefit from restoration activities that include exotic plant control and re-vegetation with native species such as California sagebrush, bush sunflower (*Encelia californica*), California buckwheat (*Eriogonum fasciculatum*), California coffeeberry (*Rhamnus californica*), wax myrtle (*Myrica californica*), white sage (*Salvia apiana*) and/or yellow bush lupine (*Lupinus arboreus*) (Sawyer and Keeler-Wolf 1995).

Small mammal and reptile surveys should continue to be conducted to help natural resource managers identify species diversity, abundance, and habitat use to develop appropriate BMPs for projects that could affect native species.

Management Strategy

Objective: Conserve and enhance the ecological integrity and native diversity of California Chaparral at NBVC Point Mugu.

- *I.* Continue to use the SA/PRB to minimize potential impacts to this habitat type.
 - *A.* Use species-level information gathered from surveys to guide development of project-specific BMPs for this habitat type.
 - B. Conserve current habitats by avoiding or minimizing development.
- *II.* Maintain, enhance, and increase coastal scrub habitats where appropriate.
 - *A.* Investigate opportunities on base to conduct restoration or enhancement of these habitat types, focusing efforts on areas where scrub can retreat inland if sea level rises.
 - B. Create new upland habitats where feasible.
 - *C.* Increase vegetative buffers for this habitat type where coastal scrub is adjacent to disturbed land or open space (where no conflict with operations occurs).
 - D. Regularly control non-native plants.
 - *E.* Revegetate with plant species native to coastal scrub habitat to increase plant diversity.
- *III*. Promote the use of drought-deciduous coastal sage scrub species in landscaping projects throughout the base.

Objective: Increase knowledge base of the California Chapparal at NBVC Point Mugu.

IV. Conduct or support an inventory of plant species at NBVC Special Area Laguna Peak.

3.3.2.3 California Annual and Perennial Grassland

The grassland community at Point Mugu is dominated by invasive grasses, and found in upland and transitional areas, where one community or habitat type (for example, the upland) shifts to another (for example, to a wetland). Species composition changes along the elevation gradient, with more facultative wetland plant species occurring at the low end, to upland plant species in higher areas. The wetland plants are primarily composed of saltgrass and very small remnant populations of pickleweed, whereas the upland plant species are dominated by invasive exotics such as: black mustard (*Brassica nigra*); annual grasses such as bromes (*Bromus diandrus, B. hordeaceus, B. madritensis*), perennial ryegrass (*Lolium perenne*), barley (*Hordeum vulgare*),, wild oats (*Avena barbata*), and Bermuda grass (*Cynodon dactylon*); iceplant; Australian saltbush; spearscale (*Atriplex triangularis*); and curly dock (*Rumex crispus*). This transition area is within the "Mediterranean California Naturalized Annual and Perennial Grassland" group.

Additional non-natives at these sites include include filarees (*Erodium* spp.), Italian thistle (*Carduus pycnocephalus*), Maltese star-thistle (*Centaurea melitensis*), and Russian thistles (*Salsola tragus*). Prior to base development, historical records indicate these areas were tidal marsh, modified to grasslands with development of the airfield. Appendix Q has vegetation type descriptions and Appendix G has a list of plant species recorded in this community.

Birds of the mixed-transition habitat type include the turkey vulture (*Cathartes aura*), loggerhead shrikes (*Lanis ludovicianus*), mourning doves (*Zinaida macroura*), corvids (primarily ravens [*Corvus corax*]), and an array of emberizids (*Emberiza*). Bird species recorded in the annual grassland community include killdeer, mourning dove, rock dove (*Columba livia*), American crow (*Corvus brachyrhynchus*), red-tailed hawk, and house finch (*Carpodacus mexicanus*). A small population (two to six individuals) of burrowing owls (*Athene cunicularia*) regularly winter in the airfield grasslands. Historically, they have been documented nesting in Ventura County, so there is potential for future nesting at Point Mugu.

Mammals commonly recorded include California ground squirrels, opossum, black-tailed jackrabbit, desert cottontail, deer mouse, California pocket mouse, and western harvest mouse. Reptile species that typically occur in grasslands are Great Basin fence lizard (*Sceloporus occidentalis longipes*) and San Diego gopher snake.

Specific Concerns

• Grasslands on base are limited to the airfield and abandoned golf course, and are nonnative; as such they act as point sources for the spread of invasive species to nearby natural areas.

- The selection of native annual grass species for erosion control is a practice that needs to be addressed for all sites that may require re-vegetation to satisfy BMPs.
- Regionally, very few California native grasslands remain intact in Ventura County.

Current Management

This community mainly occurs on the northern end of the airfield and is regularly mowed. Grasslands within the abandoned golf course are not mowed and therefore are slowly transitioning into scrub habitat. Wildlife surveys are conducted in the grassland community and include documenting locations of burrowing owls.

Assessment of Current Management

Surveys are adequate to determine wildlife that utilize grassland communities on base. Airfield grasslands are managed as part of the developed airfield, and not managed for natural grasslands. Pockets of wetlands within the grassland community are managed to ensure airfield activities do not impact those habitats. Additional surveys are required to determine if grassland birds use the airfield grasslands for nesting. Opportunities should be investigated for ways to plant native grasslands on base and within the airfield.

Management Strategy

Objective: Increase native California grassland habitat at NBVC Point Mugu.

- *I.* Explore opportunities to create California native grasslands on base.
- *II.* Explore native grasses that could replace grasses currently growing in the airfield without increasing the BASH hazard.
- *III*. Ensure that grasses used in seed mixes for erosion control BMPs do not include non-native species.
- *IV.* Survey migratory bird use of the airfield grassland to identify preferred food sources. Based on surveys, investigate food source modification or other actions to decrease attractiveness of this habitat to migratory birds (Section 3.4.4.1 Bird/Animal Aircraft Strike Hazard).

3.4 FISH AND WILDLIFE MANAGEMENT

The following sections address fish and wildlife management at NBVC Point Mugu and where applicable, Special Area Laguna Peak.

3.4.1 Invertebrates

Benthic invertebrates at NBVC Point Mugu have been studied by a number of investigators, including researchers from the Los Angeles Museum of Natural History (Nagano and Hogue 1982), and the University of California at Los Angeles (UCLA) (Peggy Fong, Richard Vance, Department of Organismic Biology, Ecology, and Evolution; and Richard Ambrose, Environmental Science & Engineering Program Department of Environmental Health Sciences). Invertebrate species documented at NBVC Point Mugu are in Appendix G Species Lists and NBVC Approved Landscaping Plant List.

Information on species and habitat preferences is taken from reports on the Tijuana River Estuary (Zedler and others 1992) when Mugu-specific data are lacking. The Tijuana River Estuary, 186 miles south of Mugu Lagoon, is assumed to support similar habitat types and benthic invertebrates.

Studies of invertebrates at the Tijuana River Estuary have included resource inventories and short-term or species-specific investigations (Zedler and others 1992). Several investigators depicted the invertebrate community before flooding in 1978. More than 75 species of invertebrates, primarily benthic forms, were identified during this period (Zedler and others 1992).

In 1982, the Los Angeles Museum of Natural History identified 528 insect species at NBVC Point Mugu, and estimated that 1,500 could be found if year-round surveys were conducted (Nagano and Hogue 1982). The report acknowledged that a complete inventory of Mugu Lagoon and Marsh would require the skills of many experienced collectors and taxonomists. Even then, it would be next to impossible to make a complete inventory of the insect fauna of Mugu Lagoon. As a result, it is imperative that insects are accounted for in biological studies at NBVC Point Mugu. Most insect studies at NBVC Point Mugu have focused on adding to the faunal inventory. Abundance data is generally lacking. Wetland restoration monitoring examines insect diversity and abundance, but is limited to annual survey events within restoration and reference sites.

The 2002 INRMP identified the need for an updated inventory of insect fauna (Tetra Tech 2002). University of California at Los Angeles (UCLA) conducted insect surveys at several wetland restoration and reference sites (Section 3.3.1.5) from 2001 to 2005 (Ambrose and others 2006). The UCLA study depicts a complex picture of insect interactions and distributions within the salt marsh. As is well-documented in other locations, insect populations at NBVC Point Mugu vary annually and intra-annually (Ambrose and others 2006). In 2008, the Navy conducted an inventory of insect and spider populations at several sites across the salt marsh. The 2008 study also focused on documenting special status species and other taxa of interest, including species that are indicators of pollution and environmental health. The 2008 study noted that tiger beetles (Cicindela, Coleoptera) should be monitored over time because they are useful indicators of riparian, beach, and marsh health, serving as harbingers of pollution and changes to the environment (Tetra Tech 2009b). Most species of tiger beetle at Point Mugu are also considered sensitive species.

Terrestrial and intertidal invertebrates at NBVC Point Mugu are those that live all or a portion of their life on land, including those marine species exposed at low tides. Species that live primarily in subtidal areas (estuarine channels and tidal creeks) are described in Section 3.4.1.2 Marine Invertebrates.

3.4.1.1 Terrestrial (and Intertidal) Invertebrates

Terrestrial invertebrates are discussed by typical habitat below.

Intertidal Mud and Sandflat Species: Macroinvertebrates species characteristic of exposed flats are the California horn snail, the yellow shore crab (*Hemigrapsus oregonensis*), the fiddler crab (*Uca Pugnax*), and the lined shore crab (*Pachygrapsus crassipes*). California horn snails can be extremely abundant (hundreds to thousands per square meter), and both horn snails and crabs are important foods for shorebirds, including the federally endangered light-footed clapper rail (Zedler and others 1992). University of California, Santa Barbara, has conducted significant research on the effects of parasites on the growth, reproduction, and population dynamics of California horn snails at Point Mugu (Lafferty 1993). Other invertebrates include oligochaetes, polycheates, amphipods, filter-feeding bivalve mollusks, and thalassinidean shrimp.

Insect surveys conducted in 2010 and 2011 at the IRP Upper and Lower wetland restoration sites (Section 3.3.1.5 Jurisdictional Waters-Wetland Management), which consist of mud and sandflats, recorded the highest diversity of Ephydridae and Sciaridae families than all other restoration sites surveyed during that period (Tetra Tech 2012n). Both Ephydridae and Sciaridae are important estuary insects that provide food for marsh vertebrates and can be found walking in and around the mud and watered areas. The Ephydridae family is the most abundant of the acalyptrate Diptera, which feed on algae, cyanobacteria, detritus, and decomposing carcasses, and a few are predators. Studies indicate that insect colonization within marshland reflects changes in nutrient levels: when soil organic matter is high, the success rate of colonization is high. When salinities are high, the success of herbivorous insects is low. Newly restored marshlands typically show high colonization rates of insects when nitrogen concentrations within sediments is high (Moseman and others 2004).

<u>Low-Marsh Species</u>: The lower marsh of Mugu Lagoon is probably the most-studied habitat of the entire system. Still, knowledge of the total community is incomplete. Horn snails, lined shore crabs, and yellow shore crabs are abundant, but their habits are not well known. Crabs and snails feed on the algal mats and detritus and are eaten by the larger marsh birds. Where these shore crabs co-occur, interference competition and predation by striped shore crabs may confine yellow shore crabs to lower intertidal zones (Zedler 2001). Both build burrows in mud banks, and are primarily active at night. Striped shore crabs can tolerate a range of salinites, occurring in brackish and hypersaline conditions (Zedler 2001). At wetland restoration sites at NBVC Point Mugu, striped shore crabs are more abundant than yellow shore crabs (Tetra Tech 2012n).

<u>Mid-Marsh Species</u>: High species richness and abundance in mid-marsh elevations are attributed to dependable moisture and the ubiquity of algae, which grows everywhere from pools to beneath the salt marsh canopy (Zedler 1982). In winter, filamentous green algae dominate the

epibenthos, and in summer, filamentous blue-greens form dense tufted mats over the soil and plant stem bases. Zedler has recorded more than 70 species of diatoms occurring within these filamentous mats at Tijuana River Estuary (Zedler 1982).

The animals that eat these foods include Ephydrid flies, whose eggs are implanted on decaying plant matter; California horn snails; amphipods, and snails (*Assiminea* sp. and *Melampus* sp.). High concentrations of insects, especially water boatmen (*Trichocorixia* spp.), occur in the pools. They feed on the algae and mosquito larvae, and in turn, are eaten by California killifish (*Fundulus parvipinnis*), which spawn and develop in these pools (Zedler and others 1992).

The state-listed critically imperiled wandering skipper (*Panoquina errans*) occurs in NBVC Point Mugu likely occurs throughout the estuary. Its host plant, saltgrass, can be eaten by the larvae only when it is wet from high tides. The skipper has also been observed in sand dune habitat (Nagano and Hogue 1982).

The federally endangered salt marsh bird's-beak (Section 3.5.1 Federally Listed Species and Critical Habitat) is a preferred food of the salt marsh snout moth (*Lipographis fenestrella*) larvae. Nagano and Hogue (1982) recorded this species, and the 5-year status review of salt marsh bird's-beak identified insect predation as a threat specific to the Mugu population (USFWS 2009a).

The larvae of the moth consume capsules and unfertilized ovaries; however, a large number of capsules escape attack. The extent and impact of herbivory to this plant's population is unknown (USFWS 2009a).

Surveys were conducted in 2010 for the federally endangered El Segundo blue butterfly (*Euphilotes battiodes allyni*), in coastal buckwheat (*Eriogonum parvifolium*) patches at Point Mugu, as part of a larger effort to search for occupation of appropriate coastal habitats. No El Segundo blue butterflies were observed; however, the search effort was not intensive. Coastal buckwheat habitat will likely increase at Point Mugu, with continued removal of iceplant from the back dunes. This type of habitat enhancement will provide additional habitat for this species, should a population become established in the future.

Argentine ants (*Linepithema humile*) have been recorded in wetland restoration sites and their associated natural reference sites, within high marsh and transitional wetlands at NBVC Point Mugu (Tetra Tech 2012n). This species is regionally abundant and problematic; they recruit rapidly and will numerically dominate and aggressively displace native insects. Once established, Argentine ants are detrimental to other arthropods and alter the plant community and availability of food for vertebrates (Tetra Tech 2009b).

<u>Salt Panne Species</u>: Three species of tiger beetle (genus *Cicindela*) have been recorded in the salt pannes at NBVC Point Mugu, one of which is a state-listed critically imperiled special status species (*Cicindela gabbi*) (Section 3.5.2 Special Status Species and Their Protection). The 2002 INRMP noted that Tijuana River Estuary supports the highest diversity and abundance of tiger

beetles of any coastal locality in southern California and possibly all of California (Keeney 2001; Tetra Tech 2002). No abundance data is available for tiger beetles at NBVC Point Mugu (Tetra Tech 2009b).

Numerous tiger beetles (Gabb's tiger beetle [C. gabbi], mudflat tiger beetle [C. trifasciata sigmoidea], and C. hemmorrhagica) were observed throughout the Laguna Road Extension restoration site (Section 3.3.1.5 Jurisdictional Waters-Wetland Management) during wetland restoration site monitoring in 2010 and 2011. Tiger beetles are considered a sensitive indicator species because of their longevity, their constant contact with pore water in soils, and their specific environmental needs. Tiger beetles are considered good indicators of the disturbance to coastal systems (Nagano and Hogue 1982), with the least-disturbed habitats harboring several species of tiger beetles.

Tiger beetle larvae are ambush predators that spend from 3 to 5 years in wet soils and sand. The larvae can survive total immersion and anoxic conditions longer than adults and most other terrestrial invertebrates (Chown and Nicolson 2004). They can be found in open areas of the upper marsh, salt pannes, and mudflats. The sandy beach tiger beetle (*C. hirticollis gravida*) (described below for species in beaches and dunes) have also been recorded at NBVC Point Mugu in sand dune and beach habitat, and is a state-listed critically imperiled species (Tetra Tech 2009b; CDFW 2012a). The wet sandy soil substrate of the Laguna Road Extension restoration site provides habitat for this indicator species. Other tiger beetles recorded at NBVC Point Mugu include Frost's tiger beetle (*C. senilis frosti*), a state-listed critically imperiled species (CDFW 2012a), that inhabits pickleweed stands and the banks of Calleguas Creek, in areas of fresh and brackish water; and the western tiger beetle (*C. oregona oregona*), found in mudflats and salt pannes (Tetra Tech 2009b). NBVC has provided access to researchers from the University of California, Los Angeles, to conduct a variety of studies on tiger beetle populations at Point Mugu.

Both adult and larval tiger beetles are predaceous and feed on any arthropods. Adults are found on mud or sand near permanent bodies of water. Larvae inhabit burrows in the soil in the same area as the adults. The larvae use hook-like mandibles to capture and kill their prey, which is then consumed in the burrow. Because their prey includes insects that are harmful to man, these beetles are considered beneficial.

Another group of insects that can be regarded as good indicators of disturbance are the true bugs of the order Hemiptera, family Saldidae (Zedler and others 1992). At the Tijuana Estuary, several taxa of these insects occur on the least-disturbed salt pannes. These salt-tolerant insects are carnivorous, feeding on springtails, mites, and other insects and spiders (Zedler and others 1992). Two members of this family, *Pentacora signoreti*, and *Saldula pallipes*, are abundant at NBVC Point Mugu (Nagano and Hogue 1982). Individuals coated with salt crust have been observed on salt pannes, although the mechanism for tolerating high salinities is not known.

In 1982, Nagano and Hogue documented several large colonies of Timberlake's bee (*Melissodes tepida timberlakei*), a species of ground nesting bee, at Point Mugu. The burrows of these communal insects serve to aerate the salt flat soils in much the same way that earthworms do in

less saline soils (Nagano and Hogue 1982). Burrows of other communal and solitary bees and wasps observed in the middle and high marsh areas of Point Mugu may perform the same function, and should be investigated (Nagano and Hogue 1982). Ground nesting bees such as Bombus pennsylvanicus sonorous, Anthidium edwardsii, and Timberlake's bee, are important pollinators of the federally endangered salt marsh bird's-beak (Section 3.5.1 Federally Listed Species and Critical Habitat). Of these, Anthidium edwardsii was found in a 1985 study to be the most effective pollinator of salt marsh bird's-beak at NBVC Point Mugu (USFWS 2009a). The promotion of salt marsh bird's-beak pollination requires adequate nesting grounds for these ground dwelling species (USFWS 2009a). Rove beetles (Staphylinidae, Genus Bledius) are common at the Tijuana River Estuary (Norby 1984) and at Mugu Lagoon (Nagano and Hogue 1982). Several other genuera of Staphylinidae occur at NBVC Point Mugu. At Tijuana River Estuary, several species of these small beetles inhabit complex underground labyrinths that are evidenced at the surface by excavated "middens" (Zedler and others 1992). The density of middens reaches 500 square meters; the tunnels beneath them are about 20 centimeters in depth. Norby (1984) reported densities of beetles were highest in March 1984, when eight adults and 22 juveniles were recorded per 1,650 square centimeter core. Reproduction occurred in the spring with eggs attached to the sides of burrows by means of a clear, threadlike material.

Intertidal elevation is the most important physical variable that characterizes rove beetle distribution patterns. They are densest in a narrow belt at about the high tide line. The beetles prefer soil dampened by tidal inundation but not covered by standing water. A typical biweekly fluctuation in the densities of middens occurs with the high summer tides; as a high tide recedes, midden mounds appear as the beetles begin to burrow, more densely at the region where the soils have begun to dry and less densely at the water's edge. As the soil dries, the middens accumulate as excavation continues; then, an ensuing high tide erases the surface middens, and the pattern is repeated. The location of the beetles during high tide is not known. In studies of a Scandinavian species of *Bledius*, Larson (1953, as cited in Zedler and others 1992) found that they evacuated tunnels during high tide and could be found beneath debris at the wrack line, although this pattern was not repeated at the Tijuana River Estuary. Very few beetles were ever observed outside a burrow, regardless of tide.

<u>Beach and Dune Species</u>: Insects recorded in the dune habitat at NBVC Point Mugu include the state and global ranked "critically imperiled" globose dune beetle (CDFW 2012a). The globose dune beetle inhabits foredunes and sand hummocks, and feeds on vegetation and detritus buried in the sand. It is absent from areas invaded by iceplant. This species was recorded in 1982 and more recently in 2008 and 2009 (Tetra Tech 2012p).

The state ranked "critically imperiled" sandy beach tiger beetle (*Cicindela hirticollis gravida*) occurs in sandy beach habitat; in 1982 it was recorded at the barrier beach where pinnipeds haul out (Nagano and Hogue 1982) and in 2004 it was found in moist depressions in the sand dunes near the intersection of Beach Road and L Avenue (Tetra Tech 2009b). Adults of this population were observed to be active in the spring, unlike known populations in Southern California that are active during the summer. This species was not found in 2008 (Tetra Tech 2009b). Other special status invertebrates are listed in Section 3.5.2 Special Status Species and Their Protection.

Specific Concerns

- Climate change, sea level rise, and the potential conversion of habitats may cause adverse effects on invertebrate populations.
- Populations of salt marsh bird's-beak pollinators may be decreasing and contributing to a decline in the salt marsh bird's-beak population.
- Habitat degradation by pollution, anthropogenic disturbances, and non-native species may adversely affect terrestrial and intertidal invertebrates.
- Loss of salt panne habitat for ground-nesting bees.
- Argentine ants may pose a serious threat to beneficial invertebrate species like pollinators and subsequently endangered species such as salt marsh bird's-beak.

Current Management

Terrestrial invertebrates are not actively managed on base. Impacts to the habitats where they may occur are managed and minimized through the SA/PRB and with implementation of this INRMP. Insects encountered are occasionally identified to the species level and documented, to ensure the invertebrate list is current. Insect diversity is also, at times, collected during other surveys: pitfall traps placed for herpetological monitoring also capture insects; annual wetland monitoring includes sampling insects in wetland restoration and reference sites. Annual monitoring of invertebrates in wetland restoration and reference sites is conducted under the wetland restoration monitoring program (Section 3.3.1.5 Jurisdictional Waters-Wetlands Management). NBVC ED facilitates and supports research conducted on the installation by universities or other institutions.

Assessment of Current Management

NBVC ED protects important invertebrate habitat such as salt pannes from disturbance, as well as considers salt panne and mudflat habitats during wetland restoration projects. NBVC ED should continue to fund and support research that adds to the understanding of invertebrate species on base. An inventory of invertebrates should occur in all habitat types if funding becomes available. Regular surveys may be used to detect changes in indicator species and special status species, and confirm the suitability of NBVC Point Mugu habitats to support these populations. Surveys would also aid in identifying new incursions of non-native species. Information gained from regular surveys could aid natural resource management, and affect the kinds of BMPs that are developed for activities in species' associated habitats. Monitoring populations through time can provide valuable information on habitat function and its ability to sustain a diversity of species.

Management Strategy

Objective: Conserve invertebrates and their habitats.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species and habitats.
- *II.* Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *III.* Conduct or support regular monitoring of invertebrates throughout the base to facilitate and guide natural resource management decisions.
 - A. Continue to develop community and species-level invertebrate inventory.
 - B. Integrate resultant survey data into GIS database.
- *IV.* If non-natives are present, determine their potential for ecosystem damage and prioritize for their removal.
 - A. Include identified problem non-native species in the Integrated Pest Management Plan.
- *V.* Continue to support and facilitate the research of invertebrates on base by outside educational or research institutions.
- *VI*. Ensure the protection of habitats necessary to sustain special status invertebrate and pollinator populations.
 - A. Conserve salt panne habitat for tiger beetles and ground nesting bees.
 - B. Monitor changes in salt panne habitat using aerial photography.
 - *C.* Conserve sand dune habitat for globose dune beetles.
 - D. Incorporate salt panne habitat into wetland restoration projects when applicable.

3.4.1.2 Marine (Subtidal) Invertebrates

Historically, Mugu Lagoon's benthic community was dominated by bivalve molluscs, especially the purple clam (*Sanquinolaria nuttaili*), littleneck clam (*Protothaca staminea*), false mya (*Cryptomya californica*), California jackknife clam (*Tagelus californianus*), and bent-nose clam (*Macoma nasuta*). Polychaete worms, gastropod molluscs, and decapod crustaceans were also numerically important. A very important food resource and common benthic invertebrate of the

eastern arm of Mugu Lagoon is the ghost shrimp (*Callianassa californiensis*) (Tetra Tech 2002). It is not known how the bivalve community has changed over time. Anecdotally it has been suggested that the ghost shrimp population at Point Mugu may have declined significantly.

The distributions of infauna are strongly influenced by sediment type. Most larval settlement is limited by the availability of substrate, and adult distributions are influenced by grain size, pH, total organics, organic carbon and nitrogen, and dissolved oxygen (Zedler and others 1992). Filter feeders, such as the dominant bivalves, are associated with medium-sized grains because finer sediments contain too little organic material in suspension and because coarser sediments are too unstable. Finer sediments may also clog filtering mechanisms. Deposit feeders, such as ghost shrimp and certain polychaetes, often occur on finer sediments, which have higher concentrations of organic carbon and nitrogen, but less dissolved oxygen and lower pH (Zedler and others 1992).

Hosmer (1977, as cited in Zedler and others 1992) found that distributions were correlated with sediment type for six species of bivalve molluscs that were common at Tijuana River Estuary. Overall, at Tijuana River Estuary, there was a significant decrease in biomass of molluscs with smaller grain size, and the largest individuals were found in coarse, well-sorted sediments (Zedler and others 1992). Individual species exhibited a variety of patterns. The remaining nine species of bivalve molluscs found by Hosmer (1977, as cited in Zedler and others 1992) were not encountered frequently enough to characterize their distribution patterns.

Purple clams have been found at Mugu Lagoon throughout a wide range of sediments. Higher biomass and densities have been recorded in coarse sand, decreasing with finer sediments. This species was absent from sediments with high silt or clay contents. Littleneck clams occur in very coarse to fine sediments, with highest densities in finer sediments. Maximum biomass and density were found in 15 to 20 percent silt to clay ratio (silt/clay). False mya occurred in all sediment types from very coarse to very fine sand (Tetra Tech 2002). At the Tijuana River Estuary, biomass and densities for false mya were bimodal, with highest values at around 35 percent silt/clay (Zedler and others 1992). California jackknife clams were collected in medium to find sand. Biomass and density increased with a decrease in sediment size. At the Tijuana River Estuary, biomass for California jackknife clams was highest at 5 to 10 percent silt/clay; density peaked at 20 to 25 percent silt/clay; and size tended to decrease with higher silt/clay percentages (Zedler and others 1992). The bent-nose clam was found in sediments ranging from coarse sand to very fine sand. At the Tijuana River Estuary, biomass density increased with a decrease in sediment size for the bent-nose clam (Zedler and others 1992). Density and biomass were optimum at about 15 percent silt/clay (Zedler and others 1992). The white sand clam (Macoma secta) was found only in medium to fine sandy sediments and had the narrowest grain size distributional range Zedler and others 1992). Both biomass and size of white sand clams were constant with changes in grain size, although density was higher in medium sand.

The depth of water also influences the benthos. In a study of littleneck clams, Smith (1974, as cited in Zedler and others 1992) concluded that size and density increased with increasing tidal depth. Smith found average densities as high as 207 per 0.25 square meter in the subtidal areas compared with 20 per 0.25 square meter in the intertidal zone. Factors affecting survivorship of

this species include sediment grain size, temperature, salinity, duration of feeding time, and probability of predation as. Increased availability of food and stability of the substrate are also associated with deeper water (Tetra Tech 2002).

Niesen (1969, as cited in Zedler and others 1992) sampled areas near the mouth of Tijuana River Estuary to characterize the population of the sand dollar. Densities at that time ranged from 60 to 250 per square meter, with a mean of 170 per square meter (n=10). The largest individuals recorded were 13 millimeters in diameter. Onuf postulates similar densities of the sand dollar on the eastern arm of Mugu Lagoon before the floods and higher sedimentation rates of the late 1960 and early 1970s winter storms (Onuf 1987). Anecdotally it has been suggested that the sand dollar beds and population may have declined significantly within Mugu Lagoon.

In 1992, the dominant crustacean in the Tijuana River Estuary was the ghost shrimp (Zedler and others 1992). Hosmer (1977, as cited in Zedler and others 1992) investigated its competitive interactions with two sympatric burrowing shrimp of the same family: *Callianassa gigas* and a species of *Upogebia*. His work suggested that the distribution and abundance of *C. californiensis* and *Upogebia* are controlled by specific substrates, while *C. gigas* appears to be controlled by competitive interaction with the other two species because of the broad overlap in substrate and food exploitation (Zedler and others 1992).

Peterson (1975, as cited in Zedler and others 1992) compared the benthos at the Tijuana River Estuary and at Mugu Lagoon. He examined the subtidal, sandy bottom habitats of the two areas and found that the dominant macro-invertebrates each occupied a characteristic depth within the sediments. Sand dollars occupied the top few centimeters and most of the test of each was exposed to the water column. Littleneck clams were found within the top 6 centimeters. Ghost shrimp and its obligate commensal, false mya, occurred together at 0 to 55 centimeters. There was some overlap with the purple clam, which was found at 25 to 55 centimeters. The California jackknife clam burrowed up to 60 centimeters deep. Peterson attributed their vertical separation to competition for space, because there was little segregation in use of food. All but one was a suspension feeder; thus, they used the same food source, regardless of burial depth (Zedler and others 1992).

Dominant species were similar in the Tijuana River Estuary and at Mugu Lagoon, but densities and relative abundances were different. The purple clam and California jackknife clam were much more abundant at the Tijuana River Estuary, which Peterson (1975, as cited in Zedler and others 1992) thought was a result of the scarcity of other deep-burrowing competitors. Hydraulic harvesting of callianassid shrimp was common at the Tijuana River Estuary during the 1960s and 1970s; their removal, according to Peterson, allowed the clams to expand their populations with little effect on other dominant species. Manipulative field experiments supported his interpretation of the data.

In 1980, Hosmer resampled several areas that were included in his 1977 thesis work, and Rehse (1981, as cited in Zedler and others 1992) compared the two data sets on bivalves and callianassid shrimp. Flooding caused mass mortalities of many species. Absent from the 1980 collections were the yellow clam (*Florimentis obesa*), egg cockle (*Laevicardium substriatum*),

bentnose clam, white sand clam (*Macoma secta*), California mactra (*Mactra californica*), Washington clam (*Saxidomus nuttail*), Carpenter's tellen (*Tellina carpenteri*), and *Callianassa gigas*. The dominant bivalve before the 1978 to 1980 period was the purple clam, while the dominant in 1980 was false mya (Tetra Tech 2002).

Juvenile recruitment was high after the 1980 floods, particularly for ghost shrimp, whose density increased 72 percent while biomass decreased 95 percent. Significant decreases in mean size were also recorded for ghost shrimp, blue mud crab, and purple clam, indicating that mass mortality was followed by recruitment. However, the mean sizes of two species (false mya and littleneck clam) were not significantly less than in 1977, which suggested that both survived the stresses of reduced salinity and altered substrate (Tetra Tech 2002).

These changes support the hypothesis that benthic macrofauna are strongly associated with sediment particle size. Dune wash-over and dredging also alter substrate type and add to our understanding of substrate dependency. Despite these disturbances, bivalves continued to persist, although in lower number than where influence of wastewater was not as severe (Nordby and Zedler 1991). Lowered salinity also contributes to compositional change, as has been shown for both wastewater inflows (Nordby and Zedler 1991) and river flooding (Zedler and others 1992, Peterson 1975; Onuf 1987).

The ability of invertebrates to establish or recover from extreme conditions is largely determined by the availability of larvae (for example, life history characteristics), but chance also plays a role (Zedler and others 1992). Species with large number of larvae present when estuarine habitats are accessible and suitable for settling have high probability for recruitment. Only the most resilient species (short-lived species with early reproductive age) have persisted during continued hydrologic disturbances. It is not clear whether sources of larvae of the species that once dominated the estuary are sufficient. Whether the historical benthic community will ever regain its high species richness, or whether large, old clams will ever be abundant again, remains to be seen.

Oyster bed restoration has been conducted in Mugu Lagoon, for enhancement of the native Olympia oyster population (Figure 3-7). Initial restoration activities started in 2008 with the investigation of suitable oyster recruitment locations and provision of additional settling substrate. Since then it has slowly evolved in developing new methods to attempt to provide additional settling substrate. Oyster bed restoration efforts increased in 2011 and involved testing mini-reef designs in winter and spring of 2011. The installation of mini-reef beds is used to attract oyster spat and the establishment of native oyster reefs. The areas near the Laguna Road causeway were selected for installation. Hydrology within the lagoon is altered significantly by the restriction at the Laguna Road causeway. Locations close to the causeway are swept by high velocity currents with incoming and outgoing tide. These currents have created sand/gravel beds on either side of the causeway. Surveys of these beds showed that native oysters settle and grow on the cobble present in the gravel beds. Most often these oysters are found singly on cobble stone. Due to high water velocities and silt loads however, mini-reef beds were found to be impractical. Alternative methods were used and included the installation of spat collector sticks and wire mesh oyster shell bags on either side of the causeway, and adjacent South L Avenue. This project continued through October 2012 and is now funded by a grant from TNC (McCormick 2011).

Marine invertebrates documented in NBVC Point Mugu are detailed in Appendix G. The species lists are fairly dated and recorded from the following sources: "A Report on Mugu Lagoon," prepared by the University of Southern California in 1964, and "The Natural Resources of Mugu Lagoon," produced by the Marine Science Institute of University of California, in 1976. As such, a current inventory of marine invertebrates is needed. Upcoast, at NBVC Port Hueneme, surveys for aquatic nuisance species are conducted periodically by CDFW under the California Aquatic Invasive Species Management Plan (CDFG 2008a). No such targeted surveys are conducted at Mugu Lagoon.

Specific Concerns

- No recent data on marine invertebrates at NBVC Point Mugu.
- Marine invertebrates at NBVC Point Mugu may be affected by project activities that create erosion problems or by activities such as drainage ditch maintenance.
- Poor water quality, pollution, sedimentation, and aquatic invasive species are threats to marine invertebrate populations.

Current Management

Impacts to marine invertebrates and their habitats are minimized and avoided through the SA/PRB, implementation of this INRMP, and consultation with NMFS under EFH directives (Section 6.4). Water quality for marine invertebrates is managed under the NBVC Point Mugu SWPPP (Section 3.2.3.2, Surface and Stormwater Management), and Environmental Restoration Program (see Section 6.5, Environmental Restoration Program).

Assessment of Current Management

Direct management of marine invertebrates is minimal; however, marine invertebrate habitats are protected from disturbance through the SA/PRB and with implementation of this INRMP. In addition, the NBVC Water Quality program monitors water quality and sedimentation. NBVC ED is in the process of conducting oyster bed restoration, as described above and shown on Figure 3-7. Most of what is known of marine invertebrate populations at NBVC Point Mugu is from earlier surveys and data extrapolated from similar habitat at Tijuana River Estuary. Data on invertebrates is also available from surveys completed for the Environmental Restoration Program (Section 6.5, Environmental Restoration Program). Aquatic invertebrates and benthic macro-invertebrates are useful indicators of water and sediment quality, as species differ in their tolerances to pollution. Numerous studies on benthic fauna have been conducted in the lagoon and drainage channels under the Environmental Restoration Program at NBVC Point Mugu. Benthic community data collected under CERCLA could be used by natural resource managers to assess the condition of the marine ecosystem and invertebrate community. Population data

collected on a regular basis could aid natural resource managers in evaluating vulnerability and changes in populations, in response to natural or anthropogenic effects.

Management Strategy

Objective: Conserve and enhance the integrity of marine invertebrate populations and their habitats in NBVC Point Mugu waters.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species and their habitats.
 - A. Continue to coordinate with NMFS to determine appropriate BMPs to reduce impacts to EFH.
 - *B.* Enforce and comply with all applicable state regulations regarding the take and management of marine invertebrates, should any such activity occur.
- *II.* Avoid or minimize impacts to water runoff that would affect marine water quality.
 - A. Ensure the implementation of BMPs and water quality improvement goals developed under the NBVC Point Mugu SWPPP and Environmental Restoration Program (see Section 3.2.3.2, Surface Water Hydrology and Stormwater Management and Section 6.5, Environmental Restoration Program).
 - *B.* Monitor water quality and sediments, and continue supporting the activities conducted under the Calleguas Creek Watershed and TMDL programs.
- *III*. Regularly conduct surveys of aquatic habitats throughout the base to facilitate and guide natural resource management decisions.
 - *A.* Conduct a basewide inventory to update the species list and distribution within the estuary.
 - *B.* Use information on habitat requirements of key species to guide the development of project-specific BMPs.
 - *C.* If non-native species are present, determine their potential for ecosystem damage and prioritize for their removal.
 - *D.* Coordinate with other NBVC programs and outside agencies and institutions that conduct benthic invertebrate surveys and studies to ensure data are distributed to NBVC natural resources staff.
- *IV.* Support the marine invertebrate research conducted at NBVC Point Mugu by outside institutions and agencies, such as the Olympia oyster research.
- *V.* Enhance native species diversity and abundance.

A. Continue to support oyster bed restoration and monitoring.

3.4.2 Pollinators

Pollinator-specific surveys are not regularly conducted at NBVC Point Mugu and Special Area Laguna Peak. Insect inventories are described in Section 3.4.1.1 Terrestrial Invertebrates. Specific pollinators at NBVC Point Mugu have been identified as crucial for the reproductive success of the federally endangered salt marsh bird's-beak (USFWS 2009c). Ground-nesting bees such as *Bombus pennsylvanicus sonorous, Anthidium edwardsii*, and Timberlake's bee are important pollinators of salt marsh bird's-beak. *Anthidium edwardsii* was identified as the most effective pollinator of salt marsh bird's-beak at NBVC Point Mugu in 1985 (USFWS 2009a).

Specific Concerns

Several issues could negatively impact pollinator populations and their habitats at NBVC Point Mugu and Special Areas:

- Improper use of pesticides and herbicides can directly harm pollinators and their habitats.
- Erosion and sedimentation, invasive flora and fauna, and anthropogenic disturbances can degrade pollinator habitat.
- Pest management program response to behives and swarms are often in conflict with the goals of pollinator protection.
- Climate change and sea level rise may reduce or alter pollinator habitats and populations.
- Habitats such as salt pannes are transitioning into vegetative marsh, reducing available habitat for pollinators.

Current Management

Specific pollinators are not currently targeted for focused management on base. Pollinator habitats are managed through SA/PRB, habitat enhancement, and invasive plant control. The DoD Legacy Resources Management Program works to promote native habitats and pollinator populations. The DoD recognizes that pollinators are key components of a healthy ecosystem, "vital to installation landscapes and to carrying out the military mission" (DoD 2012). Pollinators sustain native plant communities, which are found to be more resilient to training impacts than poorer quality habitats (DoD 2012). Information on DoD initiatives that support pollinators and thereby increase the ability of installations to meet readiness and stewardship obligations, can be found at the DoD Legacy Resource Management Program's "Pollinator Habitat Restoration for DoD Land Managers" website: http://www.dodpollinators.org/Importance.html.

The implementation of management strategies detailed in this INRMP, and specifically in Section 3.3 Ecosystems and Ecosystem Management, Section 3.4.1 Invertebrates, Section 3.7 Invasive Species Management, and Section 6.8 Landscaping and Grounds Maintenance, support pollinator populations.

Assessment of Current Management

The SA/PRB and implementation of this INRMP, adequately address impacts to pollinators and their habitats. The habitat restoration and native landscaping strategies detailed in this INRMP promote native pollinator populations on base. Assessments of habitat management are described in Section 3.3.2, Terrestrial Communities. More focus could be directed at identifying opportunities on base where habitat restoration could support ground-nesting bees.

Management Strategy

Objective: Conserve and enhance pollinator populations and their habitats when not in conflict with the military mission.

- *I.* Inventory and monitor populations of pollinators.
 - *A.* Conduct a pollinator survey focused on salt marsh bird's-beak pollination, to determine strategies for increasing pollinator habitat and thus the potential success of the salt marsh bird's-beak population.
- *II.* Develop BMPs to ensure that pollinator species and their habitats are not adversely impacted by base activities.
 - A. Coordinate specifically with the NBVC Pest Management Program to ensure minimal impacts to pollinators such as bees and their hives.
- *III.* Identify opportunities to create pollinator friendly landscapes.
- *IV.* Conserve habitats (salt pannes) for ground-nesting species.
- V. Identify opportunities where restoration of habitat for ground nesting bees could be created.
- *VI.* Develop and distribute outreach and education materials on pollinators.
- *VII.* Develop and distribute outreach and education materials on pesticide impacts to pollinators.
- *VIII.* Revegetate disturbed areas with native species on the NBVC Approved Landscaping Plant List (Appendix G), and encourage the use of pollinator-friendly plants in landscape and restoration projects. Control the spread of invasive species like Argentine ants.

IX. Support and facilitate research conducted by outside institutions or agencies on pollinators at NBVC Point Mugu.

3.4.3 Reptiles and Amphibians

Herpetological diversity at NBVC Point Mugu is relatively low, due to the saline habitat and isolation from large tracts of natural upland habitat. Herpetofauna at NBVC Point Mugu are limited to areas of high ground. A recent survey conducted at the base identified the abandoned golf course and mowed airfield areas as having the most potential to support a variety of reptiles and amphibians (HDR 2012). Some regional turtle and amphibian species may be found in upland and freshwater marsh or riparian areas on base. Many of these species are not exclusively found in wetland areas, but prefer upland habitats such as grassland (HDR 2012). Reptiles and amphibian species documented at NBVC Point Mugu are in Appendix G Species Lists and NBVC Approved Landscaping Plant List.

The Great Basin fence lizard was the most common species recorded during the 2012 survey, occurring in riparian and upland areas. Southern Pacific rattlesnake prefer grassland and riparian habitats, and can be found in the upper fringe of intertidal salt marsh habitat, transitional, and coastal scrub habitats (HDR 2012). The California kingsnake and gopher snake are common species in transition habitats. The western side-blotched lizard is abundant on dry ground, especially in sandy, open areas. The Southern alligator lizard (*Elgaria multicarinata*) is also common in this habitat type (Tetra Tech 2002). The state sensitive two-striped gartersnake (*Thamnophis hammondii*) was located on installation, however only one individual was found. A second gartersnake was found in housing, but may have been an escaped pet captured off base (HDR 2012).

Amphibians documented at Point Mugu include the Baja California treefrog (*Pseudacris hypochondriaca hypochondriaca*), western toad (*Bufo boreas*), and non-native African clawed frog (*Xenopus laevis*).

Two state-listed "Species of Special Concern" occur at NBVC Point Mugu: two-striped gartersnake, and Pacific pond turtle. The state special status silvery legless lizard has been recorded in the region, near Mandalay Beach in Oxnard, and in Thousand Oaks. It is a secretive and difficult lizard to detect, especially at low densities. The 2012 survey notes that the species is probable within the extensive dunes, but likely at a low density, or in localized populations that avoid detection with standard visual searches and cover board surveys; no individuals were observed (HDR 2012).

Specific Concerns

- The presence of disease-causing chytrid fungus is unknown and is a data gap for natural resource management decision making processes.
- Non-native animals may threaten native reptiles and amphibians.

- Habitats of native reptiles and amphibians may be lost, disturbed, or degraded.
- Native rattlesnakes in the NBVC Point Mugu housing area are a safety concern to residents and their pets.
- Drainage channel maintenance may impact reptile and amphibian populations.

Current Management

Potential impacts to reptile and amphibian habitats are managed and minimized through the SA/PRB and with implementation of this INRMP. Intensive surveys for reptiles and amphibians were most recently conducted in 2012. NBVC ED conducts coverboard surveys and occasionally conducts surveys for Pacific pond turtle. NBVC ED also relocates snakes that occur in housing and industrial areas.

Assessment of Current Management

Reptiles and amphibians are monitored adequately at NBVC Point Mugu. Monitoring populations through time can provide valuable information on habitat function and its ability to sustain a diversity of species. The inventory of reptiles and amphibians in all vegetation types at NBVC Point Mugu should be kept current. Survey results would confirm the suitability of NBVC Point Mugu habitats to support these populations and identify the presence of non-native species and special status species. Information on species presence would aid natural resource managers and likely affect how habitats are managed and what kinds of BMPs are developed for activities in their associated habitats.

Management Strategy

Objective: Maintain and conserve habitat for native reptiles and amphibians.

- *I.* Continue to conduct herpetological surveys throughout the base to guide natural resource management decisions.
 - A. Continue to monitor Pacific pond turtle population.
 - *B.* Maintain the cover board program to track current populations and record new species occurrences.
 - *C.* Investigate use of the installation by two-striped garter snakes.
 - D. Monitor for non-native species such as the bullfrog.
 - *E.* Integrate resultant survey data into GIS database.
- *II.* Continue to use the SA/PRB to minimize potential impacts to native species and habitats.

- *III*. Use information on species and habitat requirements to guide the development of project-specific BMPs.
- *IV.* Monitor and reduce populations of non-native species. If they are present, determine their potential for ecosystem damage and prioritize for their removal.
- *V.* Continue to relocate snakes from developed areas.
- *VI*. Educate base personnel on snakes, rattlesnake identification, and protocol for responding to their presence.
- VII. Support and facilitate herpetological research conducted by other institutions or agencies.

3.4.4 Birds

This section addresses the presence and management of migratory birds under the federal directive of the MBTA (16 U.S.C. § 703 *et seq.*) and EO 13186 (Appendix B), including federally listed and non-listed species. Specific measures for management of federally listed species are detailed in Section 3.5, Special Status Species and Their Protection.

Mugu Lagoon serves as critical foraging and roosting habitat for shorebird populations on their spring and fall migrations, and for overwintering. Mugu Lagoon provides habitat for up to 66,000 shorebirds during the spring and more than 10,000 at times, in the fall and winter. NBVC Point Mugu is a potential site of regional and international significance based on the large population of shorebirds that use Mugu Lagoon. The National Audubon Society has also recognized NBVC Point Mugu as an important migratory stopover for birds. In 1998, the Audubon Society, Ventura Chapter, nominated Mugu Lagoon as an American Bird Conservancy "Important Bird Area (IBA)" of global significance (Tetra Tech 2002).

The term "shorebird" is applied in North America to a large group of birds and includes species such as sandpiper, plovers, oystercatchers, avocets, and stilts. Fifty-three species of shorebirds occur regularly in the U.S. Forty occur regularly within the Pacific Flyway; of those, 19 are identified regionally as species of high concern (for example, the black oystercatcher, common snipe, dunlin, greater yellowlegs, and sanderling) (Brown and others 2000).

Each year, most species of shorebirds undertake long migrations from their wintering grounds, as far south as Tierra del Fuego in South America, en route to their breeding grounds, as far north as the Arctic Circle. The Pacific Coast of the Americas is portrayed as a flyway for the migration of this diverse assemblage of shorebirds (Morrison and Myers 1989). Because many shorebirds undertake extremely long migrations, protection for critical sites must be coordinated over vast distances, often involving many different countries. In addition, the rate of reproduction for shorebirds generally is low, so it is difficult to reverse past declines and recover populations rapidly.

During migration, shorebirds rest and feed at traditional staging sites, building up depleted stores Staging areas are crucial because large proportions of the population are of nutrients. concentrated into relatively small areas compared with both summer breeding grounds and winter ranges. This concentration of the population leaves the shorebirds extraordinarily vulnerable to environmental disruption. In some cases, between 50 and 80 percent of the entire population of a species may visit a single site. Therefore, loss of critical staging areas could have major implications on hemispheric populations. Furthermore, acquisition of nutrients at staging sites has consequences for subsequent migration, survival, or breeding success. Most species of shorebirds rely on wetlands as staging habitat during migration (Page and Gill 1994). Along the Pacific Flyway, coastal estuaries have historically supported a wide variety of shorebirds and large numbers of individuals during migration. These estuaries have experienced high levels of habitat alteration from agricultural and urban development over the past two centuries. Two telemetry projects along the Pacific Flyway found shorebirds from Mexico and Panama at Point Mugu, and demonstrated that almost all individuals stopped at Point Mugu along their migration, with an extended stay. This project demonstrated that Point Mugu is an important re-fueling area, and more importantly, a staging area as well (Baird 2006; Warnock and others 2006).

Identification and conservation of key staging areas is crucial in maintaining populations of shorebirds. The loss of salt marsh estuary habitats is a primary concern for conservation of shorebirds at NBVC Point Mugu. Species composition at NBVC Point Mugu is mostly western sandpiper, least sandpiper, willet, marbled godwit, and dowitchers. However, many other species of shorebirds and waders use Mugu Lagoon and surrounding habitats.

Coastal salt marshes and estuarine areas play important roles as feeding areas for shorebirds and other taxa such as wading birds, waterfowl, grebes, coots, and rails. Some investigators consider sandy beaches to be the prime habitat for shorebirds during their migration. However, that theory conflicts with information about use of salt marsh habitat by shorebirds. Various marsh habitat types provide shorebirds foraging and resting grounds during their extensive migratory journeys. Shorebirds are especially vulnerable to loss of habitat because many return every year to the same highly productive sites along migration routes and in wintering areas (Smith and Houghton 1984; Johnson and Baldassare 1988). An element of shorebird ecology that raises challenges in conservation is the extraordinary degree to which some species depend on a small number of strategic migration stopover sites. Concentration makes these sites extremely vulnerable to environmental disruptions because much of the shorebird population is in the same place as the same time.

In a study of habitat utilization and feeding strategies of shorebirds at the Tijuana River Estuary, Boland (1981) found that intertidal mudflats and sandflats were used by many more species and individuals than any other habitat type. He observed that the species that fed in these habitats appeared to partition their activities among various depths of the sediment and water. Boland concluded that the length of leg and bill dictated the feeding position of each species, and that the community was composed of species that differed in lengths of leg and bill. Such differences in morphologies should reduce competitive interference by reducing overlap in where the birds feed. However, as Boland pointed out, tides constantly change the depth of water so that longerand shorter-legged birds may take foods from the same spots but at different times. Thus, they cannot avoid exploitative competition when food supplies are limited. Boland (1988) has tested these ideas through gut analysis of eight shorebird species and quantitative analysis of the availability of invertebrates as food at Morro Bay in central California. He found that food was limiting during winter and spring, and that exploitative competition occurred among many of the species—even among species with different morphologies (for example, dunlin, willet, and marbled godwit).

Waders, such as the greater yellowlegs (*Tringa melanoleuca*), feed on items in the water column and on the surface of the sediment. Long-billed sandpipers (for example, marbled godwit) probe deep into the sediment, often wading deep into the water. Short-billed sandpipers such as the western sandpiper probe shallower and remain near the edge of the water, while plovers (for example, semi-palmated plover) feed on the surface of moist-to-dry sediments.

Brusati and others (2001) compared the ecological function of natural and created wetlands for shorebirds in Texas. They found few significant differences in density or biomass of invertebrates among sites. Greater differences were found seasonally than between natural and created sites (Brusati and others 2001). Cluster analysis showed no clear difference in the behavior of black-bellied plovers, long-billed curlews, western sandpipers, least sandpipers, and willets, on natural and restored sites (Brusati and others 2001).

Although no studies quantified the effect of closing the mouth of an estuary on shorebirds at the Tijuana River Estuary, it was estimated that shorebird abundance was reduced 70 percent during this period, an effect attributed to the absence of tidal submergence and exposure of bottom sediments. The mouth of Mugu Lagoon has closed only once in the last 27 years (Dow 2001). Available shorebird habitat increased with the addition of box culverts at Laguna Road in 1984, which significantly increased the tidal prism in the western arm. The modification provided additional mudflats, which were previously regularly ponded. Shorebird numbers may not have significantly changed as a result of the culverts, as there was an abundance of mudflats elsewhere in the estuary, prior to the additional culverts. However, bird species which use coastal salt marsh habitat likely increased, as that habitat was rejuvenated with the increased tidal prism.

Several birds that are associated with water and are rare in California can be seen at Mugu Lagoon. These include the yellow-crowned night heron (*Nyctanassa violacea*), reddish egret (*Egretta rufescens*) and black skimmer (*Rynchops niger*).

The channels and tidal creeks at Mugu Lagoon are important foraging and resting areas for a variety of bird life such as great blue herons, which prey on fishes in the channel. Shorebirds forage primarily for invertebrates in the sand and mud sediments and in the water column; diving birds prey on fishes; wading birds use both fishes and invertebrates for food, while others, such as dabbling ducks and plovers, feed on vegetation and surface insects. Two federally endangered and one California endangered bird species forage in the tidal channels: federally endangered California least tern and the light-footed clapper rail; and state-listed endangered Belding's savannah sparrow. Other birds that feed on fishes in the channels are the belted kingfisher (*Megaceryle alcyon*) osprey (*Pandion haliaetus*), and double-crested cormorant (*Phalacrocorax auritus*).

Light-footed clapper rails rely on habitat at the edge of tidal creeks and channels for feeding, as do Belding's savannah sparrows. Feeding studies of California least terns (Atwood and Minsky 1983; Zedler and others 1992) document feeding in near-shore waters, as well as estuarine channels and bay habitats. Preferred fishes include northern anchovy, topsmelt, and jacksmelt (*Atherinops californiensis*). Breeding adults catch and feed these small fish (4 to 9 centimeters long) to the chicks. The young begin to fly at about 20 days of age, and the fledglings develop foraging skills in calm, protected waters. "Even estuarine and freshwater localities that are distant from active nesting sites...may be heavily used by least terns during post-fledgling dispersal; loss or disturbance of such areas may reduce the survivorship of dependent young" (Atwood and Minsky 1983).

Within the low marsh, no animal characterizes this habitat type better than the light-footed clapper rail (Onuf 1987; Zedler and others 1992). At Mugu Lagoon, light-footed clapper rails forage in the lower intertidal salt marsh and intertidal tidal creeks. Nesting occurs in spiny rush (*Juncus acutus* spp. *leopoldii*), which grows at the upper marsh/lower marsh fringe; spiny rush prefers areas adjacent roads where runoff provides additional freshwater. At Mugu Lagoon, rails are surveyed annually, during the early spring and summer. Broadcast calls are used to elicit a response from clapper rails. Broadcast calls, passive listening at dusk, and searching for nests or evidence of nesting are used to determine the population status and nesting success. Winter censuses are not accomplished at Mugu Lagoon because the tidal regime in light-footed clapper rail habitat is restricted, forcing lower tidal amplitude. During winter flood events, plenty of dry upland vegetated habitat is available adjacent the marsh, which provides cover for rails, making visual observation difficult.

Considering the combined acreages of marshes that are regularly occupied by light-footed clapper rails, the vegetated marsh and most closely associated habitats at NBVC Point Mugu represent more than 25 percent of the light-footed clapper rail's potential habitat base (Tetra Tech 2002). The subpopulation at NBVC Point Mugu was the sixth largest in the state in 2011 (NBVC 2011). An efficient predator management program is in place and focused management on light-footed clapper rail recovery. Significant pesticide issues notwithstanding, intensive monitoring, demographic and genetic augmentation, and additional nesting cover should help maintain or expand this northern subpopulation during the current decade (Tetra Tech 2002).

Within mid-marsh habitat, a variety of waders and shorebirds commonly forage and include: willet, marbled godwit (*Limosa fedoa*), long-billed curlew (*Numenius americanus*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), and great egret (*Ardea alba*). Land birds also use this habitat type, including Belding's savannah sparrow, common yellowthroat (*Geothlypis trichas*), and marsh wren (*Cistothorus palustris*).

The preferred habitat of state-listed endangered Belding's savannah sparrow (Section 3.5.2 Other Special Status Species at NBVC Point Mugu and Special Area Laguan Peak) is salt marsh dominated by pickleweed. This species builds its nest low to the ground, often under pickleweed canopy, but sometimes in saltgrass or shoregrass. The birds perch on the taller plants and defend territories throughout most of the summer. They eat insects in the marsh, but often fly to creek

or channel banks or even to the beach to feed. Several investigators have studied their behavior, responses to disturbance, and habitat preferences.

Birds that have been documented to feed, nest, or both in the high marsh of Mugu Lagoon include the black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), song sparrow (*Melospiza melodia*), western meadowlark (*Sturnella neglecta*), redwinged blackbird (*Agelaius phoeniceus*), and killdeer. Other birds use the area extensively for foraging. Raptors, such as the northern harrier (*Circus cyaneus*) and red-tailed hawk (*Buteo jamaicensis*), exploit the populations of small mammals, while Belding's savannah sparrows, horned larks (*Eremophila alpestris*), and wintering loggerhead shrikes (*Lanius ludovicianus*) feed on insects and other small prey.

Salt pannes are often used as foraging areas for Belding's savannah sparrows and various shorebirds, which feed on the insects there. California least terns and western snowy plovers are both known to nest on salt pannes. The latter two species will, at times, use preformed depressions, such as animal or human footprints, or past nests in the hardpan, for nest scrapes. The birds will create their own scrapes when sediment is not hard-packed. When localized pannes are inundated, western snowy plovers also use them as feeding areas.

The data on shorebirds at Mugu Lagoon support the concept that salt pannes provide alternative resting and feeding sites during high tides. Of the 43 shorebird species studied, 28 used the salt panne habitat type for feeding (Tetra Tech 2002). Heavy use of these non-tidal areas by waders, sandpipers, and plovers shows that estuarine shorebirds are not restricted to intertidal habitats (Keeney, unpublished data).

Migratory birds also use the man-made areas of NBVC Point Mugu and Special Area Laguna Peak, for forage and nesting. Developed areas provide roosting and nesting habitat in structures and landscaping. The following describes nesting migratory birds found in developed areas at NBVC Point Mugu. A complete species list is provided in Appendix G, Species Lists and NBVC Approved Landscaping Plant List.

Cliff swallows (*Petrochelidon pyrrhonota*) nest on buildings in the industrial and housing areas; tree swallows (*Tachycineta bicolor*) nest in the housing area. In airfield hangars, great horned owls (*Bubo virginianus*) and barn owls (*Tyto alba*) nest. Common species in the developed areas are mockingbirds (*Minus polyglottos*), robins (*Turdos migratorius*), doves (*Zenaida spp.*) and house finches (*Haemorhous mexicanus*). Snowy egrets nest with black-crowned night herons and yellow-crowned night herons in ficus trees within the housing area. In eucalyptus trees, great blue herons and red-tailed and red-shoulder hawks nest. Cooper's hawks (*Accipiter cooperii*) have been found nesting in ornamental trees. It is suspected that burrowing owls, a CDFW Species of Special Concern (Section 3.5.2) may have attempted to nest in the airfield grasslands in 2009. The pair disappeared and direct evidence of nesting was not confirmed. Historically they have been documented nesting in Ventura County, so there is potential for nesting in the future at Point Mugu.

The federally endangered least Bell's vireo (*Vireo bellii pusillus*) has been recorded sporadically in various willow patches at NBVC Point Mugu since 2009. In 2011, USDA Wildlife personnel conducted 11 presence/absence surveys in accordance with USFWS survey guidelines, in willow habitat adjacent the airfield. Surveys were conducted in anticipation of potential willow stand removal. One individual was detected on two separate occasions. Additional passive surveys conducted by NBVC ED did not detect any individuals (NBVC 2011). None were detected in 2012.

Specific Concerns

- Loss of migratory bird habitat.
- Non-native predators have negative impacts to migratory birds.
- Habitat degradation from invasive species.
- Installation operations can potentially have negative impacts to migratory birds and their habitats.
- Birds attracted to habitats within the airfield are at risk.
- The duck hunting program can negatively impact migratory birds through disturbance or accidental take.
- Conflicts between birds and facility tenants, and housing, particularly through maintenance or demolition activities that could result in potential take under the MBTA.
- Tree and brush trimming and removal during the nesting season may have potential impacts to nesting migratory birds.
- Difficulty in educating building tenants on protocols for responding to the discovery of nesting or trapped birds, particularly raptors, in their facilities.

Current Management

All bird species at NBVC Point Mugu and Special Area Laguna Peak, with the exception of rock doves, European starlings, and house sparrows, are protected by federal law under the MBTA (16 U.S.C. § 703 *et seq.*) and EO 13186 (Appendix B). Appendix E, INRMP Benefits for Migratory Birds, further details NBVC Point Mugu's efforts and strategies for bird conservation to maintain compliance with the MBTA. The MBTA, enforced by the USFWS, makes it unlawful "by any means or manner, to pursue, hunt, take, capture [or] kill" any migratory bird except as permitted by regulation. A large number of bird species is covered by the MBTA, including listed and non-listed species (50 CFR § 10.13). The regulatory definition of "migratory bird" is broad and includes any mutation or hybrid of a listed species and includes any part, egg, or nest of such bird (50 CFR §10.12.).

To provide guidance for conflicts arising between military readiness activities and the MBTA, the USFWS issued the Final Rule on "Migratory Bird Permits: Take of Migratory Birds by the Armed Forces" (50 CFR Part 21 in FR 28 February 2007, pages 8931-8950), hereinafter referred to as the "Migratory Bird Rule." The Migratory Bird Rule authorizes the military to "take" migratory birds during military readiness activities under the MBTA without a permit. However, if the military determines that the activity will have a "significant adverse effect" on a population of migratory birds, they must work with the USFWS to develop and implement conservation measures to minimize and/or mitigate the effects. The MBTA and Migratory Bird Rule are further addressed in Section 6.4 Regulatory Compliance. Currently there are no anticipated takes of migratory birds at NBVC Point Mugu or Special Area Laguna Peak that would require use of this exemption, other than single nests, such as a house finch that may nest in parked aircraft or operational equipment.

Conservation measures under the Migratory Bird Rule require monitoring and record-keeping for five years from the date the Armed Forces commence their conservation action. During INRMP reviews, the Armed Forces must report to the USFWS migratory bird conservation measures implemented and the effectiveness of the conservation measures in avoiding, minimizing, or mitigating take of migratory birds (50 CFR Part 21 in FR 28 February 2007, pages 8931-8950).

Current management generally strives to meet these goals:

- Survey for and protect all migratory birds on the installation from disturbance and/or take.
- Conduct bird surveys on the installation to better understand species presence, abundance, distribution, nesting locations, and seasonality.
- Conduct intensive annual efforts to track nesting success of federally listed species.
- Survey the population of Belding's savannah sparrow every five years.
- Remove non-native and selected native predators that prey heavily on migratory birds.
- Remove or treat non-native plant species that degrade migratory bird habitat.
- Integrate migratory bird conservation principles, measures, and practices into installation activities and avoid or minimize, to the extent practicable, adverse impacts on migratory birds and migratory bird habitats.
- Identify unintentional actions that have, or are likely to have, a measurable negative effect on migratory bird populations.
- Develop and implement standards and practices designed to lessen the amount of unintentional takings to the extent practicable and consistent with mission requirements.
- Ensure GIS layers and data regarding migratory birds is current.

Implementation of federal regulations requires an understanding of bird populations and their seasonal and yearly fluctuations to assess potential impacts to population viability. At NBVC Point Mugu, regular surveys of shorebirds are conducted each year as part of a larger Pacific Coast survey effort. Survey protocols are detailed in Appendix H Monitoring Protocols. Surveys are conducted to obtain data on annual variation and long-term trends. NBVC ED also conducts wintering surveys in support of a regional effort to understand variation, trends, and habitat associations of wintering shorebirds in coastal estuaries. NBVC ED uploads winter survey data to the Pacific Flyway Shorebird Survey program led by Point Reyes Conservation Science. The Pacific Flyway Shorebird Survey program is a multi-partner monitoring program designed to guide the management and conservation of wintering shorebirds in the Pacific Flyway. Data collected at NBVC Point Mugu are combined annually with comparable data from other sites across California and the Pacific Flyway to assess shorebird Survey program can be found at http://data.prbo.org/apps/pfss/.

Mist-netting during spring and fall migration has occurred at NBVC Point Mugu at two sites from 2007-2010. This was done to document use of the base by migratory birds, which may not be easily observed during regular bird surveys, as well as documenting the return rate of banded birds. During one of these mist-netting efforts in 2009 at the Las Posas site, two least Bell's vireos were captured; this was the second documentation of this species since it was first observed in 2001. Mist-netting has not occurred since 2010, but may resume during future spring or fall migration periods, as time allows. The primary willow patch where mist-netting occurred was removed for airfield compliance in February 2012. When mist-netting resumes, it will occur at the Las Posas site or at a new location. Occasionally contractors are funded by NBVC ED to conduct inventories using point-count surveys.

Least Bell's vireo occurrence at NBVC Point Mugu fluctuates, but NBVC ED will continue to conduct passive presence/absence surveys. In the event that occurrence increases at the base, NBVC ED would conduct more intensive monitoring by USFWS permitted individuals. Locations of occurrence will continue to be stored in the GIS database.

NBVC ED conducts migratory bird monitoring activities under a federal U.S. Geological Survey bird banding permit; federally listed species are monitored under a USFWS recovery permit issued under Section 10(a)(1)(A) of the ESA; and carcasses are collected for transfer to a museum, under a USFWS special purpose salvage permit. Raptor relocation occurs under a USFWS MBTA permit and CDFW scientific collection permit. Species recorded during surveys at NBVC Point Mugu are in Appendix G, Species Lists and NBVC Approved Landscaping Plant List. NBVC ED does not conduct bird monitoring at Special Area Laguna Peak.

NBVC ED distributes a basewide email prior to each nesting season explaining appropriate actions to take when encountering nesting birds. Conflicts arise occasionally between facility tenants and nesting migratory birds, from demolition or maintenance of buildings, and landscaping activities. These are currently minimized by the general practice of scheduling these activities outside of the nesting season. For activities that must occur during nesting season, surveys for bird nests are conducted prior to the demolition of any structure or removal of trees

or brush. If nests are found, NBVC ED and associated MBTA regulations direct that the nests are not to be disturbed and potentially disruptive activities must be halted until the young have fledged. The exception to this is birds or nests that occur in airfield operations areas. Management of birds in these areas is conducted under the BASH program, and discussed in Section 3.4.4.1. Management of nests in airfield hangars is conducted by the BASH program. NBVC ED coordinates with BASH to conduct bird banding in conjunction with raptor relocation activities.

Open bay doors of large warehouses and airfield hangars frequently attract owls and raptors to their interiors. Once inside warehouses, they often cannot exit on their own and may be injured or perish. Currently, facility tenants report the presence of injured or trapped birds to the NBVC ED. Staff members attempt to capture these individuals for release or transport to local wildlife rehabilitators.

Assessment of Current Management

NBVC ED adequately manages migratory birds and their associated nests on NBVC Point Mugu. An intensive effort is completed annually to locate, identify, and track bird species on the installation and protect their nests from disturbance. Their habitat is protected and enhanced when possible, by conducting invasive species control.

NBVC Point Mugu is a unique coastal strand landscape located within the Pacific Flyway, a major migration route for waterbirds. Preserving this habitat will help sustain waterbird populations and support future studies aimed at understanding patterns in bird migration. Understanding these patterns can benefit research institutions, conservation groups, and military installations by providing data necessary to properly manage lands and minimize or avoid damage from conflicting uses. To ensure impacts to tern colonies and nesting plovers are avoided or minimized, base biologists should continue regular monitoring.

Conducting regular avifauna surveys supports the understanding of seasonal patterns and trends. It is important to continue to investigate and assess military use impacts on resident and migratory bird populations, particularly those that are nesting, to document any significant adverse effects and maintain compliance with the MBTA.

The current checklist of birds should continually be updated and data added to a comprehensive database that includes Geographic Information Systems. New survey data may be added to appendices of this INRMP as part of the INRMP metrics annual update process.

NBVC ED should continue to distribute basewide emails prior to each nesting season, on appropriate actions to take when encountering nesting birds. New personnel indoctrination materials should include information on nesting and trapped birds. Dissemination of information could be updated in instances of changes in staff or building tenants, and in hunter education and awareness.

The SA/PRB process and the implementation of this INRMP, effectively manage for potential impacts to nesting and migratory birds.

Management Strategy

Objective: Conserve and enhance bird populations and habitat, as practicable.

- *I.* Continue to use the SA/PRB to avoid and minimize potential impacts and "takes" of migratory, resident, and special status bird species, and their habitats.
 - A. Implement bird conservation principles, measures, and practices through avoidance and minimization measures to protect migratory bird populations.
 - 1. Use species-level information gathered from surveys to guide development of project-specific BMPs for migratory birds. BMPs shall include protective measures such as siting projects to avoid important nesting areas or to avoid collisions of birds with structures, or timing projects to avoid peak breeding activity.
 - 2. Through the SA/PRB process, thoroughly and specifically address project impacts on federal- and state-listed species, and species of special concern, focusing on the effects of the proposed action on the sustainability of these populations. Special consideration should be given to priority habitats, such as important nesting areas, migration stop-over areas, and wintering habitats.
 - 3. Identify areas of unintentional take of species of concern and minimize such take. EO 13186 states that agencies will identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions, the agency (NBVC) shall develop and use principles, standards, and practices that will lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the USFWS. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations.
 - *a.* Restrict access into and disturbance of nesting and breeding grounds during critical periods. Incorporate this restriction as conservation measures for proposed projects.
 - *b.* Educate hunters on species identification to avoid takes under the MBTA and ESA.

- *c*. Prevent or abate effects on migratory bird populations caused by pollution.
- *d.* Reduce pesticide use (see Section 6.8, Landscaping and Grounds Maintenance).
- *e*. Limit the use of rodenticides. Remove any dead or dying rodents from a treated area to reduce the possibility of secondary poisoning through raptor consumption of poisoned rodents.
- 4. Conserve natural habitats, especially primary roosting, foraging, and nesting areas, from human induced disturbance and invasive species.
 - *a.* Provide training and information to facility managers regarding protection of migratory birds in compliance with laws to avoid and minimize take, and conserve and restore habitat (EO 13186).
 - *b.* Limit disturbance during the breeding season. When disturbances are absolutely necessary, ensure that NBVC ED has provided approval and disturbance is timed to minimize its impacts on nesting birds and avoid take.
 - *c*. Ensure tree trimming occurs outside the nesting season, except for instances where health and safety are a concern; in this instance, coordination with NBVC ED must occur prior to tree trimming activities, to conduct a nest survey.
 - *d*. For building maintenance, restructuring, or demolition activities that are scheduled to occur during the nesting season, ensure surveys are conducted prior to the activity.
 - *e*. Ensure tenants are aware of protocols for responding to birds injured or trapped inside buildings and warehouses.
 - *f.* Protect wetland habitat as directed by EO 11990 and Navy policy (OPNAVINST 5090.1C CH-1).
 - g. Avoid detrimental habitat alteration caused by establishment of invasive plants. Eliminate and prevent the spread of invasive species that crowd out other species necessary to migratory bird survival (2003 Defense Reauthorization Act Proposed Rule).
 - a. Conduct regular program of weed removal from areas identified as primary roosting, foraging, and nesting areas.
 - *h*. Identify opportunities and funding for restoration or enhancement of degraded bird habitats.

- *i*. Support cleanup efforts to reduce contaminants and toxic buildup in the ecosystem, including monitoring and reducing nonpoint sources.
- *j.* Maintain closure signs near listed species nesting areas.
- II. Monitor populations and maintain, restore, and enhance habitats that provide for the health of migratory and resident populations of birds depending on habitats at NBVC Point Mugu to complete their life cycles, emphasizing federally listed species, Birds of Conservation Concern, and other special status species.
 - *A.* Inventory and monitor habitat and populations of migratory birds that use NBVC Point Mugu to evaluate conservation effectiveness.
 - *1.* Continue monitoring program and regularly survey nesting populations of herons, egrets, Forster's terns, American avocets, and black-necked stilts.
 - B. Identify migratory bird species of concern that will be the focus of monitoring.
 - To identify bird species of concern, use periodic reports of Birds of Conservation Concern published by the USFWS Division of Migratory Bird Management; priority migratory bird species documented in the comprehensive bird conservation plans (U.S. Shorebird Conservation Plan, Colonial Seabird Conservation Plan, North American Waterbird Conservation Plan); species or populations of waterfowl identified as high, or moderately high, continental priority in the North American Waterfowl Management Plan; focus species identified in the California Partners-In-Flight (PIF) plans; listed threatened and endangered bird species in 50 CFR 17.11; and MBTA-listed game birds below desired population size 2.
 - *C.* Maximize the effectiveness of ongoing monitoring and management efforts by continuing to implement standardized, scientifically sound survey protocols to collect and analyze distribution of birds across habitat types and seasonally.
 - 1. Consolidate existing migratory bird monitoring information.
 - 2. Maximize cost effectiveness by collecting standardized data on multiple species in addition to any specialized protocols aimed at one species.
 - 3. Inventory birds using methods that can be integrated with the work of regional partners.
 - *a.* Investigate the compatibility of the USDA Forest Service (USFS) published guidelines for standardized monitoring techniques for monitoring birds (Ralph and others 1993).
 - *b.* Determine how current established monitoring programs might contribute to regional databases and monitoring protocols.

- D. Collect and assess information on environmental contaminants and other physical or biological stressors having potential relevance to migratory bird conservation. Where such information is collected in the course of agency actions or supported through federal financial assistance, reasonable efforts shall be made to share such information with the USFWS, U.S. Geological Survey-Biological Resources Division, and other appropriate repositories of such data.
- *E.* To comply with the Defense Reauthorization Act, use the best scientific data available to assess through the NEPA process, or other environmental requirements, the expected impact of proposed or ongoing military readiness activities on migratory bird species likely to occur in action areas.
- *F.* Regularly monitor infrastructure that may pose a hazard to migratory birds in order to document any significant adverse impact to populations.
 - *1.* Support or facilitate the Navy's removal of all infrastructure that is no longer needed, such as large antennas or towers.
- G. Include the results of monitoring in the annual review of this INRMP.
- *H.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - *1.* Continue to conduct basewide shorebird surveys in coordination with statewide efforts such as the Pacific Flyway Shorebird Survey program
 - 2. Increase communication and coordination between program managers and specialists hired to implement specific projects or conduct monitoring.
 - *3.* Use cooperative assistance from wildlife agencies, organizations, and volunteers to help collect needed data. Integrate with regional databases.
- *III.* Monitor populations of resident land birds, shorebird, and seabirds to protect sustainability of populations, breeding colonies, and their habitat.

3.4.4.1 Bird/Animal Aircraft Strike Hazard (BASH)

Closure of military bases in California has increased the intensity of air operations at the remaining installations; at the same time, fragmentation and loss of historical wetlands have concentrated migratory birds at the remaining wetland locations. The large number of birds that use Mugu Lagoon as a migratory stopover increases the dangers for aviation operations (Harrington and Perry 1995; Tetra Tech 2002). The unique juxtaposition of NBVC Point Mugu Lagoon and the adjacent duck hunting club leaves both birds and aircraft at risk of collision. Aircraft operation involves the potential for striking birds, an occurrence known as BASH.

Seasonal movements such as spring and fall migration as well as overwintering waterbirds (such as waterfowl and shorebirds) near runways pose various hazards to aircraft. Flocks of birds, or larger birds, pose the greatest BASH risks to aircraft operations: Small shorebirds can create a large flock of 2,000 to 5,000 individuals, flocks of blackbirds are common, or large birds such as waterfowl and gulls (in thermals), can be seen in in flocks of 10 to 100 birds. Of particular concern to BASH management is the larger spring or northbound migration, as opposed to the smaller fall or southbound migration (Shuford and others 1994). Of the birds observed at NBVC Point Mugu, waterfowl, egrets, shorebirds, turkey vultures, gulls, swallows, and raptors present the greatest wildlife hazard to pilots and aircraft (Navy 2012).

Collisions are costly in terms of both equipment and possible loss of life (Tetra Tech 2002). Since 1980, across various Naval installations, approximately 20,000 wildlife/aircraft strike events have occurred and resulted in 2 deaths, 25 aircraft destroyed and over \$300 million in damage (Navy 2012). At NBVC Point Mugu, since 1980, there have been seventeen damaging wildlife/aircraft strikes. The cumulative cost of damage from these wildlife/aircraft strikes is over \$84 million. From 2000 through 2003, 173 wildlife/aircraft strike events, involving 224 birds, were reported at NBVC Point Mugu. While the majority of these were non-damaging to the aircraft involved, each event had the potential to cause significant damage. There was a total of 36 bird strikes during 2012 and 49 strikes in 2011. Of the strikes in 2012, two resulted in damages estimated at a total of \$380,000.

The single greatest loss due to a wildlife/aircraft strike at NBVC Point Mugu occurred on May 9, 2000, when an E-2C Hawkeye was lost, resulting in a total loss of \$82 million. While conducting night landing operations, each engine sucked in a species of diving duck 0.25 to 0.50 miles out over the Pacific Ocean, on approach to the runway, and caused engine failure (Tetra Tech 2002). This incident reinforced the BASH issue and the BASH program became an intensive and funded program. Although it is not possible to manage birds over the Pacific Ocean, efforts are being made to address BASH on land at NBVC Point Mugu.

The significance of wildlife risks to aviation and human safety at airports was acknowledged through a Memorandum of Agreement (MOA) signed in 2003, between the Federal Aviation Administration, U.S. Air Force, U.S. Army, U.S. Environmental Protection Agency, USFWS, and U.S. Department of Agriculture. The MOA was formed to establish procedures necessary to coordinate the missions of each of the signatory agencies, in an attempt to minimize wildlife/aircraft strikes, while protecting environmental resources (Navy 2012). The BASH program was established to manage the hazard associated with collisions between wildlife and aircraft. The program focuses on (1) managing habitat to reduce its attractiveness to wildlife and (2) managing wildlife populations, thereby minimizing the potential of wildlife/aircraft strikes. The Navy prepared implementation guidance on the Navy BASH program 07 July 2011. This guidance established policy and procedures for implementing the BASH program, in accordance with the Commander Navy Installations Command BASH Program Manual and consistent with the FAA Advisory Circular (150/5200-33). BASH program procedures include mandatory BASH reporting and carcass collection procedures.

Through proactive wildlife and habitat management, the BASH program aims to minimize the potential for loss of aircrew life, damage to aircraft, and impairment of training resulting from wildlife/aircraft strikes. Effective BASH management is centered around risk minimization

within the airfield-operating environment, and accurate reporting of wildlife/aircraft strikes, per OPNAVINST 3750.6R. Understanding seasonal and temporal variability in migratory bird populations, and in the context of how aircraft are operating at NBVC Point Mugu, facilitates the development of management objectives that serve to minimize the potential for wildlife/aircraft strikes.

To that end, NBVC developed a BASH Management Plan for Point Mugu (NAVFAC 2009), that provides guidance to minimize wildlife hazards on and around the airfield that pose a threat to aviation safety. The plan addresses procedures for effectively minimizing and communicating hazardous wildlife activity, reporting wildlife/aircraft strikes, collecting and identifying wildlife/aircraft strike remains, and improving awareness of the potential hazards to naval aviation due to wildlife. The guidelines, as presented in the management plan, are to be adopted by the tenant squadrons and departments of NBVC Point Mugu.

The Bird Hazard Working Group is organized to implement and monitor the BASH Management Plan; collect, compile, and review wildlife hazard data; and to recommend actions in land and wildlife management and/or operational procedures to reduce wildlife hazards to aircraft. The Bird Hazard Working Group allows installation departments concerned with wildlife hazards on the airfield the opportunity to meet and discuss problems and possible solutions. Bird Hazard Working Group members include civilian and military personnel from the following installation departments: (1) Environmental Division, (2) Aviation Safety Department, (3) Air Operations Department, (4) Air Traffic Control, (5) Public Works Department, (6) Facilities Support Contracts Department, and (7) Airfield Facilities Support Department. The 146th Channel Island Air National Guard Safety Department and Ventura County Federal Fire Department (Crash Crew) are also members of the Bird Hazard Working Group. USDA Wildlife Services provides contracted BASH ground support, for implementation of BASH management measures.

NBVC ED completed an environmental assessment of the BASH plan in 2009 (NAVFAC 2009), which analyzed the environmental impacts of the BASH program, with a finding of no significant impact. A biological assessment was also prepared to analyze the impacts to federally listed species from the BASH Program. The Navy received a Biological Opinion from the USFWS that concurred the BASH Management Plan would not jeopardize listed species (*Biological Opinion for the Bird/Animal Aircraft Strike Hazard Program at Naval Air Station Point Mugu, Ventura County, California [1-8-06-F-13]* (USFWS 2006).

The 2012 BASH Management Plan for NBVC outlines and prioritizes the necessary management recommendations for achieving an effective BASH program at NBVC Point Mugu (Navy 2012). An NBVC BASH instruction (37050.5B) was also created, outlining the BASH program and responsibilities. Refer to the BASH Management Plan for detail and locations of activities. Recommendations include the following, in order of priority:

(1) Wildlife dispersal— conduct hazing, raptor trapping and relocation, and lethal control of birds and mammals; install anti-perching mechanisms; place grid or plastic flagging over open water; remove abandoned structures; and repair Perimeter Road fence.

(2) Habitat modification— repair the tide gates at Marine Air Detachment Road and Oxnard Drainage Ditch 2 at Calleguas Creek, to improve drainage to decrease attraction to waterfowl;

manage stormwater to prevent ponded areas from forming in ditches and depressional areas; conduct tree and woody vegetation removal within the Primary Surface Area to eliminate perches and cover for wildlife; fill wetlands within the airfield area, which attract birds; remove cattail stand; remove or thin eucalyptus trees; and mow grassland to appropriate heights.

(3) Monitoring and Research— conduct monthly migratory bird surveys in and outside the Primary Surface Area; develop a BASH risk model or recommendations for the Bird Hazard Working Group, reflective of quantitative measures of wildlife hazards to aviation safety at NBVC Point Mugu; conduct passerine trapping and banding, targeting blackbirds; and participate in the Bird Detecting Radar System Users Group and collaborate with the Space and Naval Warfare Systems Command System Center. Establish re-vegetation test plots using alkali rye grass, as a substitute for airfield grass that attracts birds. Determine how to potentially reduce emerging invertebrates in the airfield which attract foraging birds.

(4) Administrative— actions such as the preparation of a Biological Assessment for BASH Management Plan (already completed), update this INRMP with revised BASH Management Plan, employment of a wildlife control specialist to implement wildlife control measures to reduce strike hazards (currently, in 2013, there are three staffed wildlife control specialists), update the BASH Management Plan, Review INRMP annually to address changes in BASH management, conduct surveys to update data supporting BASH and INRMP, coordinate habitat remediation with other NBVC ED programs, update NBVC BASH website, and partner with other agencies and organizations to promote listed species populations off base to offset operational restrictions on base, such as Ormond Beach restoration;

(5) Training— training personnel on reporting procedures for near misses and strikes, species identification, wildlife collection protocols, implementing no-bird feeding program, and hazing procedures; and

(6) Communication—conveying hazard information to aircrew personnel, development of working relationships with adjacent landowners on topic of reducing wildlife activity on their property.

Specific Concerns

- NBVC Point Mugu contains habitats that attract wildlife into hazardous aircraft operating areas.
- NBVC Air Operations does not have an adequate funding stream to continually manage habitat for removal of attractants.
- The removal of mammalian predators and prey, and migratory birds from BASH managed habitats may upset the ecological balance, especially with the removal of predators.
- Potential impacts to federally listed species from hazing activities or habitat modification.

- Western snowy plovers are beginning to nest in the airfield operating areas.
- Potential areas for riparian restoration or enhancement are within BASH hazard areas.
- Wetlands targeted for management under BASH will be negatively impacted from plans to modify hydrology and/or convert to upland with placement of fill.
- Accidental non-target mortalities from BASH program trapping activities include native species such as the long-tailed weasel (*Mustela frenata*) and burrowing owl.
- Habitat modification or removal of vegetation during nesting season may impact birds.

Current Management

NBVC Air Operations is responsible for managing the BASH program. From 2001 through 2010, NBVC ED managed the BASH Program. NBVC ED is currently responsible for initiating the necessary environmental documentation for implementation of BASH management practices, including consultations with USACE, USFWS and CDFW, per the regulations under Section 10 of the Rivers and Harbors Act, Section 401 and 404 of the Clean Water Act, MBTA, and ESA. NBVC ED maintains a USFWS Depredation at Airports permit, and a USFWS banding permit, for trapping and banding raptors. Raptor relocations conducted for the BASH program are authorized with a scientific collecting permit from CDFW to cover relocation activities outside of the fenceline.

BASH projects are reviewed by NBVC ED during the SA/PRB process to ensure compliance with the management objectives in this INRMP and the mitigation measures outlined in the Biological Opinions. NBVC ED maintains a database of all wildlife/aircraft strikes that occur at NBVC Point Mugu. BASH issues and BASH activity measures will continue to be evaluated under this INRMP. The effects of each proposed measure will be discussed during Bird Hazard Working Group meetings. Any new BASH activities should be placed in the BASH Plan to keep current and referenced in the INRMP annual updates. Any associated NEPA and/or consulations/permits for any new projects or activities must occur before any new BASH projects are implemented.

Any new BASH measures recommended that "may affect" threatened or endangered species or habitat will require consultation with USFWS. The Natural Resources Manager will initiate these consultations based on internal discussions of the repercussions of each action on compliance. Table 3-4 details activities that may require additional environmental review. All the current BASH measures, with the exception of modifying invertebrate food web within the airfield have had a proper environmental review. Permits from the USACE will still be required for any impacts to wetlands from the BASH Program.

Military activities are in accordance with the USFWS *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California (5090 Ser PW420/075) (1-8-99-F-24),* issued 06 June 2001, which addresses activities associated with the airfield.

Many non-listed bird species may pose risks to aircraft operations, including game birds that are attracted by the hunting clubs located on the western side of NBVC Point Mugu (Figure 2-1). Natural resources management at NBVC Point Mugu is in accordance with the ESA and MBTA, and the objectives for habitats and species outlined in this INRMP. As discussed during the Programmatic Biological Consultation with USFWS, aircraft operations affect listed species primarily through disturbance from noise. Flight paths may cross above nests of the western snowy plover and California least tern on the sandy beach. California least terns forage over the ocean's near-shore environment as well as in many areas of Mugu Lagoon's open-water habitats. Light-footed clapper rails inhabit intertidal salt marsh. The vicinity of these species to the runways makes them susceptible to disturbances from aircraft overflight and take-off. The locations of listed species and wetland habitat in relation to the airfields at NBVC Point Mugu are shown in Figure 3-8 and Figure 3-11.

Activities conducted for implementation of the BASH program and Management Plan are covered under the *Biological Opinion for the Bird/Animal Aircraft Strike Hazard Program at Naval Air Station Point Mugu, Ventura County, California (1-8-06-F-13)*, issued 20 December 2006. The BASH Biological Opinion addresses the following categories of activities that occur with implementation of the BASH Management Plan: habitat modification, wildlife exclusion, wildlife dispersal, and lethal control.

NBVC ED prepares and submits annual reports to USFWS under the directive of the Biological Opinions. Numbers of trapped and relocated raptors are recorded, as well as any observed disruption or harassment to listed species during BASH program activities. NBVC ED also prepares a report submitted to the migratory bird office, recording all lethal removal of migratory birds and nests, as well as raptors relocated. USDA also prepares an annual report under their contract, of all USDA-conducted BASH activities each fiscal year. For the reporting years 2004 through 2011, no California least terns, or light-footed clapper rails were known to be disturbed or incidentally harassed during project activities (NBVC 2011). It is assumed some western snowy plovers that nest on the airfield and overrun are occasionally disturbed when BASH vehicles are in the immediate area, or when pyrotechnics are used in the nearby area. The Biological Opinions are in Appendix O, and address mitigation measures necessary to avoid and minimize impacts to listed species at NBVC Point Mugu.

Assessment of Current Management

Air Operation and NBVC ED adequately work together to address and reduce the BASH risk while having minimal impacts to natural resources. Removal of vegetation, lethal removal of selected migratory birds and mammals, and raptor relocation are having the most impacts to natural resources, however these effects are likely minimal. BASH issues and activities conducted for implementation of the BASH Management Plan should continue to be evaluated and included in this INRMP. The BASH Management Plan should be updated to reflect natural resources requirements and to remain consistent with this INRMP. Tree and vegetation removal should occur outside the nesting season; in the event that take occurs, it must be recorded under the depredation permit regulations.

Management Strategy

Objective: Minimize BASH impacts to migratory birds and raptors and their habitats to the maximum extent feasible, while reducing BASH hazards.

- *I.* Continue to use the SA/PRB to avoid and minimize potential impacts and "takes" due to BASH activities, of migratory, resident, and special status bird species, and their habitats.
 - A. Implement bird conservation principles, measures, and practices through avoidance and minimization measures to protect migratory bird populations.
- *II.* Work closely with Air Operations and USDA ground staff to minimize impacts to resources.
 - *A*. Ensure non-lethal techniques are the preferred and primary method for dispersing birds.
 - B. Ensure all requirements and limits of the USFWS depredation permit are followed.
 - C. Relocate raptors in lieu of lethal removal.
 - D. Ensure amount of predators removed would not upset the ecological balance.
 - *E.* Ensure vegetation removal for BASH only occurs outside of migratory bird nesting season.
 - *F.* Determine appropriate native habitats within the Primary Surface Area.
 - G. Promote habitat modification projects that permanently remove attractants.
 - *H.* Ensure mowing plan reduces attractiveness to migratory birds.
 - *I.* Work with USDA BASH crew to reduce lethal take of non-target animals.
 - *J.* Work with USDA to develop habitat modification projects to deter hazardous wildlife from areas within the Primary Surface Area (Figure 2-1).
- *III*. Continue to participate and coordinate with the Bird Hazard Working Group.

TABLE 3-4: NBVC POINT MUGU ONGOING AND PROPOSED BASH ACTIVITIES: POTENTIAL SIGNIFICANT IMPACT TO NATURAL RESOURCES REQUIRING ADDITIONAL ENVIRONMENTAL REVIEW POTENTIAL SIGNIFICANT IMPACT TO NATURAL

Activity	Ongoing or Proposed ¹	Impacts to Natural Resource	Impact/ Consequence	
Maintenance of wetland habitat (freshwater marsh and riparian vegetation) within Primary Surface Area.	Ongoing	Minimal	Reduce available bird habitat and reduction in bird use to reduce BASH risk. Loss of Migratory Bird habitat and potential increase in weeds. May result in change in habitat types, such as a willow forest converted to bulrushes if sites are not treated regularly.	
Removal by cutting of vegetation outside of Primary Surface Area, but within airfield clearance zones.	Ongoing	Minimal	Reduce available migratory bird habitat and reduction in bird use to reduce BASH risk. Loss of Migratory Bird habitat. Potential increase in weeds due to removal efforts.	
Use of firearms, bangers, screamers, canons, dogs, and falconry to disperse birds.	Ongoing	Minimal	Reduce bird presence near airfield to reduce BASH risk. Noise deterrents have the potential to cause birds to fly; however, not all birds will leave the area and some birds will habituate to the noise with time. Reduction in foraging habitat for migratory birds. Possible disturbance to clapper rails in airfield locations adjacent to rail habitat.	
Vehicle equipped with sirens, lights, air horns, and hoses. Normally only done by Fire Department when BASH dispersal team not available.	Ongoing	Minimal	Depending on the location of use, the vehicle could affect listed species.	
Remove equipment used as perches or outfit with spike stripping.	Ongoing	Minimal	May reduce raptor presence on airfield and reduce BASH risk.	
Mowing airfield to maintain BASH recommended grass height.	Ongoing	Minimal	Reduce attractiveness to some bird species. May impact nesting grassland birds if the area is utilized for nesting.	
Modifying grasslands by covering with cement, asphalt, or other hardscape.	Proposed	Moderate	Reduce use of grasslands by birds and invertebrates to reduce BASH risk. Will reduce available grassland habitat for insects and animals.	
Hydrological modification to reduce standing water.	Proposed	Significant	Reduce use of airfield area by waterbirds and impact wetlands by modifying hydrology. Impacts minimal to significant dependent upon extent of modifications and locations.	

TABLE 3-4: NBVC POINT MUGU ONGOING AND PROPOSED BASH ACTIVITIES: POTENTIAL SIGNIFICANT IMPACT TO NATURAL RESOURCES REQUIRING ADDITIONAL ENVIRONMENTAL REVIEW (CONT.)

Activity	Ongoing or Proposed ¹	Impacts to Natural Resource	Impact/ Consequence	
Spray grasslands with herbicides to reduce invertebrate populations.	Proposed	Moderate	Reduce insect abundance and likely bird use of area to reduce BASH risk. Will reduce prey availability to migratory birds and reduce grassland insect populations.	
Depredation of birds.	Ongoing	Moderate	Reduce bird abundance and reduce BASH risk. May have an impact to species in decline or species found in smaller numbers.	
Depredation of non-targets. ³	Ongoing	Moderate	Reduce mammal abundance and reduce BASH risk. May disrupt ecological integrity of system if remove top predators or result in take of non-target species such as the burrowing owl.	
Raptor relocation.	Ongoing	Moderate	Reduce raptor abundance and reduce BASH risk. Predator removal may affect balance of ecosystem. Relocation may adversely affect the moved individuals if they have low survival, post-release.	
Fill wetland.	Proposed	Moderate to Significant	Reduce use of airfield area by waterbirds and reduce BASH risk. Reducing wetlands on base may have moderate to significant impacts, depending upon locations and quality of habitat converted.	
Netting of wetlands.	Proposed	Moderate	Reduces bird abundance to reduce BASH risk. Reduces available foraging habitat for migratory birds and may lead to mortality if netting not maintained and birds become entangled.	

Notes

¹ Implementation is dependent on obtaining funds.

² Activity could have a potentially significant effect on natural resources and special status listed species that would require an Environmental Assessment/Environmental Impact Statement, consultation with USFWS, or both, before it could be implemented.

³ The present version of the BASH plan addresses only depredation of mammals. Future revisions of the impact table will address species such as the burrowing owl. BASH Bird/Animal Aircraft Strike Hazard

CDFW California Department of Fish and Game

ESA Endangered Species Act

FOD Foreign Object Debris

NBVC Naval Base Ventura County

USACE U.S. Army Corps of Engineers

USFWS U.S. Fish and Wildlife Service

3.4.5 Mammals

3.4.5.1 Terrestrial Mammals

Small mammals use the drier areas of salt marsh at Mugu Lagoon. Small mammals have been trapped at NBVC Point Mugu, with a significant effort to determine changes in density once the western arm tidal prism was increased in 1980. No recent data on density has been determined. In Tijuana River Estuary, according to Taylor and Tiszler (Entrix and others 1991), the western harvest mouse, deer mouse, and house mouse (*Mus musculus*) were all trapped in areas where glasswort and pickleweed grew, especially around the salt pannes at the Tijuana River Estuary. The highest densities were recorded in spring (up to 75 per hectare). Deer mice were dominant, with 59 percent of the captures. Western harvest mice represented 31 percent, and the remainder was house mice (Tetra Tech 2002).

Two species of small mammals are known to occur in the transition habitat type at NBVC Point Mugu: the western harvest mouse and deer mouse. Other mammals that have been recorded in upland habitats include two carnivores, the coyote and the long-tailed weasel (*Mustela frenata*). The black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audobonii*), opossum, and California ground squirrel are commonly observed. Squirrels, raccoons, and opossums are trapped under the predator management program (Section 3.6 Predator Management), in sensitive nesting areas. The small mammal species of transitional and upland habitats are prey for various birds, including the short-eared owl (*Asio flammeus*), northern harrier, and white-tailed kite (*Elanus caeruleus*) (Tetra Tech 2002).

Mammals trapped or observed in the upland habitats included four carnivores, the coyote, feral cats, American badger, and the long-tailed weasel. The black-tailed jackrabbit, desert cottontail, opossum, California ground squirrel, western harvest mouse, deer mouse, brush mouse (*Peromyscus boylii*), California vole (*Microtus californicus*), house mouse, and house rat (*Rattus rattus*) are the various small mammals that were trapped or observed at Point Mugu, in mixed transition disturbed habitat during remedial investigations on the base. It is likely that the larger, highly mobile animals visit the wetland habitats from time to time. Observations of traps or anecdotal observations in the upland include the following small mammals: California kangaroo rat (*Dipodomys californicus*), cactus mouse (*Peromyscus eremicus*), and dusky-footed woodrat (*Neotoma fuscipes*) (Tetra Tech 2002).

Bat surveys have commonly recorded the Mexican free-tailed bat (*Tadarida brasiliensis mexicana*), a year-round resident which inhabits buildings and residential homes at NBVC Point Mugu. Yuma myotis (*Myotis yumanensis*) has been documented roosting on base in the chapel, which has since been modified to exclude bats by sealing openings. Several buildings on base provide roosting habitat for bats, and are not in conflict with tenants. To prevent bats from entering buildings or offices where they are in conflict with occupants, exclusion activities are conducted. These include sealing holes and screening openings. In 2003, NBVC ED erected bat houses and a bat condo to provide replacement habitat for evicted bats. To date, six bat houses are free-standing and distributed throughout the base, and two are attached to buildings (building 372 and 351). One large bat condo, which can house thousands of bats, was installed adjacent to

building 612. Bats that are captured inside interiors of buildings or offices are placed in the bat condo. To date, the condo is not occupied. The free-standing houses have minimal and seasonal occupation; bird nesting material has been found in the boxes and likely inhibits bat use. The bat boxes placed on buildings are used more regularly (Tetra Tech 2009d).

CDFW Species of Special Concern bats recorded at Point Mugu include: Pocketed free-tailed bat (*Nyctinomops femorosaccus*), recorded roosting at Point Mugu (Tetra Tech 2009d); western mastiff bat (*Eumops perotis californicus*); and the big free-tailed bat (*Nyctinomops macrotis*). The latter two species are suspected to forage but not roost at the base (Tetra Tech 2009 d, 2012u). Additional species recorded foraging at the base include the hoary bat (*Lasiurus cinereus*). The western mastiff bat is a member of the free-tailed bat family, Molossidae, and is the largest native bat in North America. The western mastiff and big free-tailed bat are state-listed "vulnerable" and "imperiled," respectively. Bats are protected by CDFW code. Bats are long-lived mammals with few predators, low reproductive rates, and slow population growth (BCI 2012). The public tends to consider these animals pests; however, bats play an important role in the ecosystem by controlling insects, particularly mosquitoes.

The 2002 INRMP recommended studies to evaluate the status of bat populations at NBVC Point Mugu, and the development of a Bat Management Plan. In 2003, the "Bat Survey Report and Management Plan" was developed to address bats at NBVC Point Mugu (Brown and Berry 2003). Bat surveys are conducted annually by NBVC ED staff at the larger roosts. A more intensive, focused bat monitoring effort occurs when the bat management Environmental Program Requirements (Section 7.3 Budget Considerations) is funded and contractors hired.

Mammals recorded during surveys at NBVC Point Mugu are listed in Appendix G.

Specific Concerns

- Potential impact to ecosystem balance due to predator/prey removal associated with BASH combined with the predator management programs.
- Conflicts with residents when wildlife are in housing or industrial areas.
- Impacts from competition with non-native mammals.
- Impacts from increasing presence of non-native mammals in sensitive nesting areas.
- Conflicts with bats occupying buildings and houses.
- Mammal habitat loss or degradation.
- Impacts of sea level rise on habitat.

Current Management

Ongoing activities are managed to ensure minimal impacts to mammals. Data is collected to determine species presence and distribution. Potential impacts to the habitats of terrestrial mammals are managed and minimized through the SA/PRB and with implementation of this INRMP.

Bats on base are managed according to the goals set forth in the NBVC Bat Management Plan. The bat survey program at NBVC Point Mugu is part of the bat management plan (Brown and Berry 2003), which has six principal goals as set forth in the 2002 INRMP (Tetra Tech 2002): (1) evaluate the status of bats on the base, (2) integrate the findings into the bat management plan for NBVC Point Mugu, (3) evaluate the efficacy of bat boxes at providing suitable alternative housing for bats at NBVC Point Mugu, (4) evaluate natural and anthropogenic roosting sites to make recommendations for reducing interactions between bats and humans, (5) monitor roost sites and foraging habitats, and (6) provide recommendations for bat management techniques.

NBVC ED assists in providing advice in bat exclusion activities within targeted warehouses and other buildings, and also maintains the bat condo and bat boxes throughout the installation.

Coyotes, raccoon, and opossums are managed under the predator management program, for listed species protection (Section 3.6 Predator Management). Mammals in buildings and residential areas are managed under the pest management program (Section 3.7.3 Pests and Disease Vectors).

Assessment of Current Management

NBVC ED adequately surveys and inventory mammals in all habitat types. Survey results would confirm the suitability of NBVC Point Mugu habitats to support these populations and identify non-native species presence. Information on species presence would aid natural resource managers and likely affect how habitats are managed and what kinds of BMPs are developed for activities in their associated habitats. Monitoring populations through time can provide valuable information on habitat function and its ability to sustain a diversity of species.

Management Strategy

Objective: Maintain terrestrial mammal populations and enhance their habitats at NBVC Point Mugu and Special Area Laguna Peak.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.

- *II.* Continue to conduct mammal surveys, focusing on secretive mammals that may occur, to maintain accurate database of mammal occurrence.
 - A. Integrate resultant survey data into GIS database.
- *III*. Track population and distribution of long-tailed weasels and badgers, reducing impacts to those species from BASH activities.
- *IV.* Reduce incidental take of long-tailed weasels.
- *V.* Coordinate with pest control staff on management of mammals in housing and industrial areas.
- *VI.* Educate the housing tenants on mammalian wildlife in area, and how to reduce conflicts. Educate the public on the benefits of bats and protocols for contacting NBVC ED in the event of bats in buildings.
- VII. Continue conducting regular bat surveys, including Anabat recordings.
- *VIII.* Assist in determining proper methodology to exclude bats from buildings.
- *IX.* Continue to maintain bat houses and bat condos.
- *X.* If non-native wildlife are present, determine their potential for ecosystem damage and prioritize for their removal.

3.4.5.2 Marine Mammals

The Pacific harbor seal (*Phoca vitulina richardsi*) are widely distributed from Alaska to Baja California. The best estimate of the California stock of harbor seals is about 34,233 individuals (Carretta and others 2011). Harbor seals favor near-shore coastal waters and frequent isolated sandy beaches, mudflats, offshore rocks, bays, and estuaries. In general, the species seems to prefer protected rather than exposed areas. Suitable characteristics for a haulout site seem to include adequate protection from land predators, direct access to deep water, proximity to food resources, and protection from strong wind and waves. Haulout areas for marine mammals are designated Environmentally Sensitive Habitat by Ventura County and are protected under the local coastal plan and Marine Mammal Protection Act (MMPA).

Pacific harbor seals regularly use several locations within Mugu Lagoon for haulout grounds (Figure 3-7). Intertidal mudflats within Mugu Lagoon's Central Basin are used by harbor seals for resting, molting, and breeding. Some beaches are used as haulout sites for resting; however, this is a very uncommon occurrence. Peak counts at Mugu Lagoon have exceeded 500 individuals, representing about 1.46 percent of the seals hauling out along all California shorelines, including offshore rocks and islands (Carretta and others 2011).

Pupping season is approximately early March to the middle of July at Mugu Lagoon. There have been occurrences, however, in which a few pups were born in December, not all which have survived. Conversely, pups born as late as June have survived. Harbor seal pups are precocious and are almost immediately able to crawl and swim, often within an hour of birth.

They normally remain with their mothers about one to two months, after which they are weaned and separate from their mother. After being weaned, the pups tend to disperse from their birth site, often traveling long distances to explore their new habitat. Harbor seals also haul-out during the molting period in the late spring, and smaller numbers haul-out at other times of the year.

Status at NBVC Point Mugu

The harbor seal is a year-round resident at Mugu Lagoon. Like coastal haulout populations farther north, the colony at Mugu Lagoon increased in numbers. In the early-to-mid 1980s, fewer than 100 harbor seals were counted there during the molting period of May and June. From 1988 to 1995, from 120 to 243 seals were counted in June during the index counts conducted by CDFW personnel.

Since early April 1992, NBVC Point Mugu field biologists have conducted year-round counts of harbor seals hauled out at Mugu Lagoon. Counts are available for every month from April 1992 through the present, with the exception of 1998, when counts were made only during the period from June through August when a strong El Niño Southern Oscillation (ENSO) prevented the field biologists from performing the census.

The peak number of harbor seals observed hauled out at NBVC Point Mugu during 2000 was 361 adults. Numbers of hauled out harbor seals have on occasion been over 500. From April to July as many as 150 to 300 seals may be hauled out each day, however there is a large day-to-day variation in these counts. The numbers of births recorded at Point Mugu for years 2008 through 2013 indicate an average of 53 pups per year. The tent campground near the main haulout area is closed annually from February 15 thru Memorial Day weekend, to reduce potential disturbance to females and their pups.

There is no documented record of pinnipeds hauling out on sandy beaches at NBVC Point Mugu to pup, rather only occasional sightings of individual sea lions (*Zalophus californianus*) or young elephant seals (*Mirounga angustirostris*).

Specific Concerns

- Disturbance to hauled out seals due to anthropogenic causes such as those at the tent camp site, aircraft or weapons testing operations.
- Hazards associated with base personnel approaching sick or injured marine mammals.

- Water pollution or an unexpected spill or release of contaminants may threaten the health and viability of marine mammals.
- Habitat loss or degradation.

Current Management

NBVC ED ensures marine mammals are protected from disturbance. If any project or activity has the potential to disturb marine mammals, NBVC ED will consult with NMFS to determine if an Incidental Harassment Authorization is required. All marine mammals are protected by the MMPA of 1972, as amended. The MMPA prohibits the take (hunting, killing, capture or harassment) of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The USFWS is responsible for the following marine mammals: sea and marine otters, walrus, polar bear, three species of manatees, and dugong. The USFWS may authorize and permit take (with limitations and mitigation measures) of marine mammals under their purview. Those mammals that are truly marine inhabitants, cetaceans and pinnipeds, other than walrus, are the responsibility of NMFS.

NBVC Point Mugu has taken steps to protect the marine mammals that inhabit the lagoon, such as closing the lagoon to recreational activities (kayaking, canoeing, wading, and swimming). These steps have involved collaboration between base biologists and biologists from state and federal agencies. NBVC Point Mugu has allowed permitted studies of the marine mammals on the base to gain a better understanding of these species and their needs. At the time of writing, no current or upcoming research has been requested. Environmental Division personnel remain abreast of regulatory issues as they concern activities on the base that may affect harbor seals at NBVC Point Mugu. Construction near haulouts is avoided. Harassment of marine mammals or use of haulout or rookery areas is prohibited. The entire sandflat and mudflat habitat areas of Mugu Lagoon will be protected from any degradation and is off-limits to any recreation.

NBVC ED conducts weekly monitoring of harbor seals at Mugu Lagoon, year round. Observations are noted in usually five separate different haul-out areas. The western arm of Mugu Lagoon (west of Laguna Road) is more commonly used by harbor seals in the late summer and fall. Figure 3-7 depicts the haulout areas.

Young of the year (pups) and adults are counted during the surveys; no attempt is made to collect data on age or sex. Field biologists note the tide; harbor seals with tags, net entanglements, and injuries; and, when alert posture is observed, the potential source of disturbance for harbor seals.

Current mission operations at NBVC Point Mugu are not in conflict with federal regulations on conservation of marine mammals. Harbor seals seem to be acclimated to base activities such as personnel and vehicles in the area, launch operations, and aircraft overflights. Should further investigation reveal that mission activities are affecting the essential behaviors of marine mammals (pupping and foraging) that could lead to incidental take or harassment, Environmental Division staff will coordinate with appropriate Navy and NMFS channels to meet legal

requirements, in accordance with Section 101(a)(5)(A-D) of the MMPA of 1972. At the time of writing, NBVC Point Mugu has no consultations with NMFS.

The Navy follows regional stranding and injured wildlife protocol established by the Southwest Region Marine Mammal Stranding Network. A National Memorandum of Understanding between NOAA/NMFS and the Navy, "To Assist in Marine Mammal Stranding Investigations" (Agreement No. PR-055), requires the development of Regional Stranding Investigation Assistance Plans. The Regional Stranding Investigation Assistance Plan is being developed at the regional level with the Navy Stranding Response Coordinators. The plan will apply only to unusual stranding events that involve specific species and numbers during Navy Fleet major training events. NBVC ED works with Channel Islands Marine and Wildlife Institute when sick or injured pinnipeds are observed; in some instances, individuals are captured and transported to the institute for treatment and rehabilitation.

Marine mammals are sensitive to human presence adjacent to or in their shoreline habitats. Disturbance can cause them to abandon a site or to injure or abandon pups. Potential impacts to marine mammals and their associated habitats are managed and minimized through the SA/PRB and with the implementation of this INRMP. NBVC ED manages consultations with NOAA/NMFS, when necessary. Activities that have potential to impact marine mammals are discussed in Section 6.6, Oil Spill Response and Hazardous Substance Prevention and Cleanup.

Assessment of Current Management

Current management of marine mammals provides adequate protection from disturbance and necessary information to guide the decision-making process of the natural resource managers. Continued monitoring of marine mammals and their habitats should occur to ensure their protection in accordance with MMPA regulations. Information on species presence and distribution throughout the base aids the natural resource manager and affects how their habitats are managed and what kinds of BMPs are developed for their conservation. Monitoring populations through time can provide valuable information on habitat function and its ability to sustain a diversity of species. NBVC ED should continue to assess effects of mission activities on marine mammals on a case-by-case basis. If it is determined that mission activities could cause significant adverse effects to the essential behaviors of marine mammals (pupping and foraging) or cause harassment as defined by MMPA, NBVC Point Mugu should apply for a 5-year Programmatic Marine Mammal Incidental Take Permit from NMFS.

Fixed-wing and rotocraft aircraft should observe a 1000-foot distance from harbor seal haulout and pupping areas, except when maneuvering in landing patterns.

Management Strategy

Objective: Minimize impacts to marine mammals and their habitat at NBVC Point Mugu.

- *I.* Continue to use the SA/PRB to minimize potential impacts to marine mammals and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *II.* Maintain compliance with MMPA mandates.
 - A. Protect haul-outs from disturbance.
 - *1.* Place signs on Family Beach and around pinnipeds hauled out on beaches, to promote public safety and minimize disturbance.
 - 2. Relocate tent camp site or at a minimum continue to enforce seasonal closure.
 - *B.* Continue to monitor marine mammal populations and evaluate interactions related to base activities.
 - 1. Monitor and protect NBVC Point Mugu haul out sites, where not in conflict with mission critical needs.
 - 2. Continue to track population of harbor seals and other pinnipeds.
 - 3. Continue to track breeding success by recording quantities of pups.
 - *C.* Implement educational instruction on marine mammal issues and individual responsibility for NBVC Point Mugu personnel, for presentation during indoctrination.
 - 1. Continue to promote education through pamphlets and signs to reduce disturbance or contact with marine mammals.
 - 2. Coordinate with NBVC Force Protection and Command Duty Officer to ensure knowledge of strandings communications and reporting protocols.
 - *3.* Ensure base personnel are aware of protocols for reporting marine mammal strandings.
 - *D.* Continue to coordinate with Channel Islands Marine and Wildlife Institute for injured or sick animals.
 - E. Continue to report marine mammal strandings.

F. Coordinate with NOAA/NMFS on obtaining Incidental Take Authorizations when necessary.

3.4.6 Fish

Past investigations on the fish habitat and species present in Mugu Lagoon have provided some insight into the submerged aquatic habitat, mainly within the central basin. In these studies, it was reported that fish were less abundant in the western arm than in the central basin and eastern arm (Onuf 1987), and was attributed to the restriction of tidal exchange in the western part of the lagoon. Older studies of the lagoon include a 1976 survey conducted by California Department of Fish and Game (now CDFW) and USFWS (MacDonald 1976), and a study conducted by University of Southern California from 1962 through 1964 (MacGinitie and MacGinitie 1964). At the time of the 1976 study, 25 species of fish had been recorded in the lagoon. In 1973 the California Department of Fish and Game released 38,000 silver (coho) salmon yearlings to develop a marine sport fishery. Recent surveys have not detected these species. Fish samples were collected in the eastern arm of Mugu Lagoon between 1977 and 1982. Christopher Onuf reported that 39 species of fish were identified in Mugu Lagoon, with the four most common being small species that included arrow gobies (Clevelandia ios), topsmelt (Atherinops affinis), Pacific staghorn sculpin (Leptocottus armatus), and shiner surfperch (Cymatogaster aggregate). The only common larger fish identified included sharks, rays, and the shovelnose guitarfish (Onuf 1987). A more recent survey of fish conducted from September to November 1993 by Michael Saiki identified 16 species (Saiki 1997).

The 2002 INRMP identified the need for updated studies on the fisheries of Mugu Lagoon. An inventory of fish at Mugu Lagoon was conducted in 2008 (Tetra Tech 2009c). Species recorded at Mugu Lagoon that move freely between the lagoon and open ocean to feed, and return to the lagoon shallows to spawn, include species such as topsmelt and shiner perch. Commercial or recreational species that have been documented in the estuary include California halibut, surfperches (Embiotocidae), sardines, croakers (Sciaenidae), and gobies (Gobiiadae), although none occurred in high numbers relative to resident species. Species such as flounder (*Platichthys stellatus*), yellowfin croaker (*Umbrina roncador*), shovelnose guitarfish and leopard shark (*Triakis semifasciata*) were caught in even smaller numbers. Outside of formal surveys, shovelnose guitarfish and sharks have been observed by NBVC biologists in the upper channels of the estuary, as far as M Avenue (located just east of the runway).

The federally endangered tidewater goby was recorded in July 2011 in Calleguas Creek, at the northern boundary of the installation (Bonterra Consulting 2011). Before to 2011, this species was last recorded in Calleguas Creek on 6 June 1940 (Section 3.5.1.2). One federally endangered steelhead trout (*Oncorhynchus mykiss*) was recorded 26 April 2013 in Conejo Creek, approximately 10 miles upstream from Mugu Lagoon (CDFW 2013). The Point Mugu estuary plays an important role in providing passage for migrating adult steelhead and habitat for smolt (Section 3.5.3.3).

University of California, Santa Barbara, is conducting a 20-year sampling of fisheries on the eastern arm of the estuary, as part of the San Onofre Nuclear Generating Station wetland restoration requirements. Mugu Lagoon is one of the reference sites. This research will provide NBVC with annual updated fisheries information for that portion of the lagoon.

In addition to general fish surveys, the 2002 INRMP identified that studies are needed for specific species such as the grey smoothhound shark and the shovelnose guitarfish. The 2002 INRMP noted that a field biologist found many fresh carcasses of the grey smoothhound shark while monitoring the population of salt marsh bird's-beak (the date of observation was not detailed). These sharks were in an intertidal mudflat and salt marsh in the far western portion of Mugu Lagoon's western arm. Of the carcasses found, 15 to 17 were gravid females (Tetra Tech 2002). Thus, it is suspected that this area may be used as a nursery area. In addition, previous field biologists at NBVC Point Mugu believed that the shovelnose guitarfish also used Mugu Lagoon for nurturing eggs during their gestation period before live birth. It is also known that there are halibut nurseries at the east side of the Laguna Road causeway; additional studies may provide more information on the numbers and conditions of this population (Onuf 1987; Tetra Tech 2002).

Fish surveys are also conducted as part of the wetland monitoring program (Section 3.3.1.5 Jurisdictional Waters-Wetlands Management). Fish species recorded in Mugu Lagoon are presented in Appendix G.

Previous studies at Mugu Lagoon found that the type of habitat at the sampling locations greatly influenced the abundance and diversity of species caught. Areas of the lagoon inhabited by eelgrass (*Zostera marina*) (prior to its extirpation from the lagoon) showed the most diversity and abundance of fish. Fish were least abundant in shallow, bare sites (Onuf 1987). These studies concluded that decreasing water depths and virtual elimination of eelgrass could have a cascading effect on the suitability of various sites for different species. This relationship between depth and habitat type suggests that the physical characteristics of the Mugu Lagoon, including sedimentation and the tidal regime, also play important roles in the success of fish populations and the larger estuarine ecosystem.

The 2008 surveys resulted in a total of 2,453 fish representing 15 families and 17 species collected at NBVC Point Mugu between August and November 2008. In general, more species were collected at stations with the greatest tidal exchange, such as in the lagoon habitat. The other four habitat types consisted of drainage channels and exhibited low species diversity. Species assemblages in the areas with less tidal action were dominated by topsmelt, longjaw mudsucker (*Gillichthys mirabilis*), and Pacific staghorn sculpin, which are year-round resident species of Mugu Lagoon (MacDonald 1976). These species, and California killifish (*Fundulus parvipinnis*), are commonly captured during wetland restoration monitoring, in newly created tidal channels and ponded depressions on the marsh plain. Juvenile Pacific staghorn sculpin are typically found in shallow water habitats of tidal creeks. In mature sites and natural reference sites, California killifish are common in shallow, vegetated edge habitats, more typically with shallow, sloping banks.

Research from other restoration sites in California reveal that killifish are an opportunistic species and will often colonize new restoration sites, tapering off in subsequent years (Zedler 2001). However, the relationship of restoration age and colonization of fish and invertebrate assemblages is not linear and not necessarily additive. This is especially relevant in a highly dynamic environment such as the salt marsh ecosystem, which is pulse-driven (Zedler and Callaway 1999; Zedler 2001). Hydrologic processes and sedimentation and erosion affect development of tidal channels in restoration sites and the faunal assemblages that inhabit them. Faunal assemblages in the channels develop in varying rates across taxonomic groups, and vary seasonally depending on the monitoring time period, and in response to changes in channel morphology and hydrologic factors. Additionally, fish distribution and their individual habitat functionality requirements can indicate hydrologic and topographic conditions within tidal channels. Tolerances to dissolved oxygen and salinity levels, as well as flow velocities and substrate qualities, vary among species. It is well documented that changes in accretion or erosion of sediments caused by hydrologic processes can affect faunal assemblages (Zedler 2001). Other investigators in similar habitats have found that species diversity decreases after periods of reduced salinity (Onuf 1987; Zedler and others 1992).

The addition of the box culverts at Laguna Road in 1984 may have had a significant effect on the fisheries west of the culverts. Prior to the additional culverts, water ponded west of Laguna Road, due to constricted flow through the older culverts. Conditions were likely more brackish west of the Laguna Road causeway, due to freshwater flows from the northwest portion of the installation, and rainfall. The additional culverts increased the tidal prism, allowing water to drain and enter at larger rates and volumes, affecting salinity conditions and modifying fisheries species assemblages.

3.4.6.1 Ichthyoplankton

Estuaries are considered essential spawning and nursery grounds for many fish species. Nordby (1982, as cited in Zedler and others 1992) compared the Ichthyoplankton communities of the estuarine channels in the Tijuana River Estuary with those in adjacent, near-shore waters. In addition, large, main estuarine channels and tidal creeks also were compared. Larvae of 28 taxa of fishes representing 19 families and more than 27 genera were collected during the study period, and eggs from 18 taxa were found (Zedler and others 1992). There were distinct differences in the Ichthyoplankton assemblages collected from each habitat. Estuarine larvae demonstrated patterns of spatial distribution related to channel morphometry and other channel organisms that indicated preferences for spawning habitat.

Larval collections in the tidal creeks were dominated by longjaw mudsucker and Atherinidae, presumably topsmelt. Longjaw mudsucker is a species typically found in low-order narrow tidal creek channels with steep clay banks and are often commensal in crab burrows; they prefer soft, muddy substrate. The longjaw mudsucker is known to prey on and inhabit the burrows of the yellow shore crab (MacDonald 1976). High densities of these larvae were collected where crab burrows were abundant. Atherinid larvae and eggs were associated with macroalgal mats, primarily *Enteromorpha* species, which grow in the low tidal-velocity creeks. Topsmelt attach their eggs to the algal blades, and the juveniles and adults feed on the abundant plant material

(Onuf 1987; Zedler and others 1992). Topsmelt are a species associated with subtidal habitats, preferring large, deep channels. Juveniles are pelagic and occupy a variety of habitats, venturing over intertidal marsh at high tides and migrating into upper estuarine areas during spring and fall (Zedler 2001).

A complex of three indistinguishable goby larvae comprised of arrow goby, shadow goby (*Quietula y-cauda*), and checkspot goby (*Ilypnus gilberti*) dominated larval collections (61 percent) in the main channels, while longjaw mudsucker made up 29 percent of the total. The larvae in the goby complex were most dense at the sampling station closest to the mouth of the estuary, apparently as a result of substrate preference. The substrate at this site was mud/sand compared with mud and clay/shell substrates of the other main channel sampling stations. The arrow goby was the most abundant post-larval goby collected; these gobies have been reported to live commensally with ghost shrimp (MacDonald 1976). Ghost shrimp burrows were common in mud/sand substrate. Thus, it appears that the distribution of goby complex larvae is related to substrate and interaction with another channel organism.

Because of their position relative to the mouth of the estuary, larvae of the goby complex were transported by tides to the near-shore habitat, where they made up 57 percent of the total. These species spawn in low tidal velocity with associated fine sediments (Zedler and others 1992); thus, it is doubtful that spawning occurred in the near-shore habitat. Conversely, eggs from species that spawn near shore, especially Sciaenidae and Pacific sardine (*Sardinops sagax caeruleus*), were imported to this estuary during flooding tides. These two species made up 69 percent and 12 percent of main channel eggs and 70 percent and 11 percent of near-shore eggs. However, very few larvae from near-shore species were collected within the main channels, suggesting that most imported eggs are not retained until they hatch. The near-shore larval dominants, queenfish (*Seriphus politus*), white croaker (*Genyonemus lineatus*) and northern anchovy (*Engraulis mordax*), were rarely collected within the estuary.

Tidal flushing appears to be a determining factor in the distribution of ichthyoplankton at Tijuana River Estuary. The presence of post-larval Sciaenidae within the estuary suggests that some near shore-spawned eggs can hatch or develop there. The transportation of goby species to the near-shore environment is probably fatal. Brothers (1975, as cited in Zedler and others 1992) measured 98 percent mortality for spawned cohorts of arrow goby at a similar wetland habitat in Mission Bay (15.5 miles north of Tijuana River Estuary) and determined that tidal translocation was the major source of mortality for the species.

The Gobiidae larvae that dominant Tijuana River Estuary is common to other southern California enclosed bays and estuaries. Although not of commercial importance, except as bait, these low-tropic level species are important ecologically in that they make the primary productivity of the estuarine system available to higher order consumers. For example, arrow gobies have been shown to be important food items for California halibut as well as other sport fishes (MacDonald 1976).

3.4.6.2 Essential Fish Habitat

Many marine fish that are federally managed by the Pacific Fishery Management Council and National Oceanographic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) rely on shallow coastal habitats during part of their lives. The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265; 16 U.S.C. 1801-1884), as amended (Public Law 109-479), provides for conservation and management of fishery resources. The NMFS is given responsibility for identifying Essential Fish Habitat (EFH) for all federally managed marine and anadromous fish species. The Pacific Fishery Management Council and NMFS are responsible for designating EFH for each life stage of federally managed marine fish species.

The Magnuson-Stevens Act defines EFH as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. These waters include aquatic areas and their associated physical, chemical, and biological properties used by fishes and may include areas historically used by fishes.

The submerged aquatic habitat at NBVC Point Mugu is essential to the viability of the ecosystem and is the foundation for an estuarine environment. The entire Mugu Lagoon and estuary are designated EFH by NOAA/NMFS (NOAA 2012).

Within the jurisdiction of this INRMP, two EFH designations occur: Coastal Pelagic and Groundfish. Both EFH zones extend from the coastline out to 200 miles offshore along the entire length of the west coast of the U.S. The Coastal Pelagic EFH includes surface waters, or more specifically, waters above the thermocline where sea surface temperatures range between 50° F to 79 °F. The Groundfish EFH includes surface waters and benthos, encompassing all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths seaward to the 200 mile boundary (DoD 2002).

EFH that is considered to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, may also be identified by NMFS as Habitat Areas of Particular Concern. Designating areas of EFH that are also Habitat Areas of Particular Concern is a measure to provide those habitats extra management protection, and intended to give the fish species within Habitat Areas of Particular Concern extra buffer against adverse impacts. Habitat Areas of Particular Concern designated for groundfish include all waters, substrates, and associated biological communities falling within estuaries, canopy kelp, seagrasses, rocky reefs, and other habitat areas of interest (Pacific Fishery Management Council 2008). As such, Mugu Lagoon is a designated Habitat Areas of Particular Concern for groundfish.

NBVC Point Mugu will need to recognize the inter-relationships between and among species managed by the Magnuson-Stevens Act, the MMPA, and the ESA to apply the ecosystem approach to the conservation and enhancement of EFH in general (NOAA 1997). Any project with potential impacts to EFH requires consultation with NMFS. The Navy must incorporate

into project plans, NMFS recommendations for conservation practices that minimize, offset, or avoid impacts to EFH. At the time of this INRMP, no EFH consultations are in place.

Specific Concerns

- Pollution, sedimentation from Calleguas Creek watershed, and aquatic invasive species could threaten fish populations.
- Sea level rise could modify habitat quality for freshwater fishes.
- Fishery surveys may adversely affect captured tidewater gobies.

Water quality for fish in drainage channels and harbor waters is managed under the NBVC Point Mugu SWPPP (see Section 3.2.3.2, Surface Water Hydrology and Stormwater Management), and Environmental Restoration Program (Section 6.5, Environmental Restoration Program).

Current Management

Fisheries are surveys are conducted somewhat regularly; however, due the extent of the estuary it is challenging to get a complete picture of the entire estuary and fisheries distribution, density, and seasonal occurrence. Very few, if any, projects have the potential to significantly impact fisheries within the estuary. Potential impacts to fish and their habitats are managed and minimized through the SA/PRB and the implementation of this INRMP. Activities that could impact EFH require coordination with NMFS and are avoided, offset, or mitigated. Federal action agencies that fund, permit or carry out activities that may adversely affect EFH are required to consult with NMFS regarding the potential effects of their actions on EFH and respond in writing to NMFS conservation recommendations. Under the EFH regulations, an adverse effect is any impact that reduces the quality or quantity of EFH. Direct impacts include (but are not limited to) physical destruction or degradation of the habitat by construction or contamination. Indirect effects take many forms, including loss of prey, interference with reproductive success, or disruption of resting or social behavior (NMFS 2011). At the time of this INRMP, no EFH consultations are in place.

Assessment of Current Management

Fisheries management and surveys within the estuary are sufficient; however, due to abundance of habitat and seasonal changes in fisheries, much more can be learned. Regular fisheries surveys should continue throughout the lagoon, estuary, and drainage channels. Survey results would identify the presence of special status and non-native species; regular monitoring could identify stressors within populations and the suitability of the lagoon to support a diverse fisheries. Information on species presence would aid natural resource managers and likely affect how habitats are managed and what kinds of BMPs are developed for activities that occur in their associated habitats. Additionally, monitoring populations through time can provide valuable information on habitat function and its ability to sustain a diversity of species.

Management Strategy

Objective: Conserve and enhance fisheries habitat.

- *I.* Continue to use the SA/PRB to minimize potential impacts to fish and aquatic habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
 - B. Continue to coordinate with NMFS for project activities that may result in impacts to EFH.
 - *C.* Enforce and comply with all applicable state regulations regarding the take and management of marine fishes, should any such activity occur.
- *II.* Continue to conduct fish surveys to facilitate and guide natural resource management decisions.
 - A. Integrate resultant survey data into GIS database.
 - *B.* If non-natives are present, determine their potential for ecosystem damage and prioritize for their removal.
 - *C.* Support and facilitate research by outside organizations and agencies on fisheries at NBVC Point Mugu and ensure data is collected by NBVC ED and incorporated when appropriate into the INRMP.
 - D. Regularly survey distribution of tidewater gobies, no less than every 10 years.
- III. Maintain water quality.
 - *A.* Continue to support implementation of Calleguas Creek Watershed TMDLs, and the goals of the NBVC Water Quality Program and Environmental Restoration Program.
- *IV.* Improve diversity of species.
 - A. Continue to research potential areas for oyster and eelgrass restoration.
 - B. Conserve eelgrass habitat by avoiding or minimizing disturbance.

3.5 SPECIAL STATUS SPECIES AND THEIR PROTECTION

Special status species include those species that are federally or state-listed endangered, threatened, candidate, or California "species of special concern"; marine mammals protected under the MMPA, and plants identified by the California Native Plant Society on the Rare Plant Rank list. Appendix G, Species Lists and NBVC Approved Landscaping Plant List identifies

special status species recorded, and those having potential to occur, at NBVC Point Mugu and Special Areas.

In addition, some migratory bird species have been determined by the DoD to be of the highest concern and are thus included on the DoD "Partners in Flight Priority Species" list. Additionally, the USFWS identifies bird species that "without additional conservation actions, are likely to become candidates for listing under the ESA"; these species are listed as "Birds of Conservation Concern" (USFWS 2008). Appendix G details special status bird species that occur at NBVC Point Mugu.

The federal species are protected under federal legal mandate by ESA and compensatory measures for these species have been developed in the Programmatic Biological Opinion and BASH Biological Opinion (USFWS 2001b, 2006). The protection and conservation of state listed species, however, is not coextensive with this obligation to protect and conserve federal listed species. Although there is no federal mandate for the protection of state listed species, NBVC Point Mugu cooperates with CDFW to protect state threatened and endangered species.

Federally listed and other special status species that occur at NBVC Point Mugu are discussed in the following sections. Federally listed species that have potential to occur are also detailed.

3.5.1 Federally Listed Species and Critical Habitat

Federally listed threatened and endangered species that occur at NBVC Point Mugu are discussed below. NBVC Point Mugu has no USFWS designated critical habitat within its boundaries. No federally listed species have been recorded at Special Area Laguna Peak. The Laguna Peak facility consists of paved and landscaped land, and provides no suitable habitat for federally listed species that may occur in the region. Upcoming surveys planned for Laguna Peak will confirm the absence of listed species; if any special status species are documented, this INRMP will be updated with management strategies (Section 3.3.2.2).

Critical Habitat

The ESA was revised by the National Defense Authorization Act of 2004 (Public Law 108-136) to recognize INRMP conservation measures and species benefits that could obviate the need for critical habitat designation on Navy lands. All Navy installations with federally listed threatened or endangered species, proposed federally listed threatened or endangered species, candidate species, or unoccupied habitat for a listed species where critical habitat may be designated, must structure the INRMP to avoid the designation of critical habitat. The INRMP may obviate the need for critical habitat if it specifically addresses the benefit provided to the listed species and the provisions made for the long-term conservation of the species. The species benefit must be clearly identifiable in the document and should be referenced as a specific topic in the INRMP table of contents.

The following details the USFWS three-point criteria test used to determine if an INRMP provides a benefit to the species. The USFWS strongly encourages installations to use these criteria when structuring INRMPs, to avoid the need for critical habitat designation. These criteria and specific conservation measures that provide for long-term conservation of listed species that may occur at NBVC Point Mugu are further detailed in Appendix F, INRMP Benefits for Threatened and Endangered Species.

- 1) The plan provides a conservation benefit to the species. The cumulative benefits of the management activities identified in a management plan, for the length of the plan, must maintain or provide for an increase in a species population, or the enhancement or restoration of its habitat in the area covered by the plan (i.e., those areas deemed essential to the conservation of the species). A conservation benefit may result from reducing habitat fragmentation, maintaining or increasing populations, ensuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.
- 2) The plan provides certainty that the management plan will be implemented. Persons charged with plan implementation are capable of accomplishing the objectives of the management plan and have adequate funding for the management plan. They have the authority to implement the plan and have obtained all the necessary authorizations or approvals. An implementation schedule, including completion dates, for the conservation effort is provided in the plan.
- 3) The plan provides certainty that the conservation effort will be effective. The following criteria will be considered when determining the effectiveness of the conservation effort: the plan includes (1) biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals); (2) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives and standards for these parameters by which progress will be measured are identified; (3) provisions for monitoring and, where appropriate, adaptive management; (4) provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort are provided; and (5) a duration sufficient to implement the plan and achieve the benefits of its goals and objectives.

NBVC Point Mugu was originally included in the designation of critical habitat for the western snowy plover, with 85 acres total, and has since been exempted. The USFWS Final Rule on 29 September 2005 (70 FR 56970) and most recently in 2012 (77 FR 36728 [19 June 2012]) exempts NBVC Point Mugu from critical habitat designation, under Section 4(a)(3)(B)(i) of the ESA, due to the protections afforded to the species and habitat, from implementation of this INRMP.

The following describes, for historical reference only, the original designation of Point Mugu as critical habitat. In 1999, USFWS designated 28 areas along the coast of California, Oregon, and Washington as critical habitat for the western snowy plover (64 FR 68508-68544). Sand spits,

dune-backed beaches, beaches at the mouths of creeks and rivers, and salt panne at lagoons and estuaries are the preferred habitats for nesting (USFWS 1999). All of these habitats are found at NBVC Point Mugu, and consequently the installation was included in the 28 areas that were designated as critical habitat. Critical habitat for the western snowy plover at NBVC Point Mugu was listed on 07 December 1999. Critical habitat at NBVC Point Mugu included the beaches from the boundary at the western arm to the boundary at the eastern arm (Figure 3-11). In a letter to USFWS on 11 April 2000, however, NBVC Point Mugu proposed that the portion of the coastline designated as Family Beach not be considered critical habitat because the necessary "primary constituent elements" discussed in the final rule are absent (Tetra Tech 2002).

For the western snowy plover, the primary constituent elements are essential for the "primary biological needs of foraging, nesting, rearing of young, roosting, and dispersal, or the capacity to develop those habitat components" (USFWS 1999). The best areas for supporting these needs are estuarine ecosystems with beach and dune habitats such as are present at NBVC Point Mugu.

Family Beach has been a developed site for more than 70 years and supports several recreation facilities for NBVC Point Mugu (Tetra Tech 2002). In the letter to USFWS, the Navy noted that Family Beach displays only two of the 10 primary constituent elements, and that no western snowy plovers have been observed at Family Beach over the 10-years that their population has been monitored at NBVC Point Mugu. Based on the evidence that was presented in the letter, the Navy requested concurrence from USFWS that Family Beach does not meet the requirements for designation as critical habitat as published in the final rule. On June 6, 2000, USFWS concurred that activities at Family Beach are not likely to adversely affect the western snowy plover or its critical habitat and concluded that further consultation under ESA Section 7(a)(2) is not required. Since then, western snowy plovers have been observed roosting during the winter on Family Beach, with no nesting attempts documented.

NBVC Point Mugu has no critical habitat designations within its boundaries.

Installation Compliance with the Programmatic Biological Opinion

Most issues related to federal threatened and endangered species were addressed in an ESA Section 7 Programmatic Biological Consultation with USFWS and are presented in the Biological Assessment (Keeney 1999) and the Programmatic Biological Opinion (USFWS 2001b) (see Appendix O). The installation must follow the conservation measures the Navy included in the project descriptions for the Biological Opinion (pages 9-12), reasonable and prudent measures (pages 31-32), and terms and conditions (pages 32-37) established in the Programmatic Biological Opinion. The management guidelines presented in this INRMP are intended to supplement the Programmatic Biological Opinion and to support the installation's efforts to comply ESA and other federal and state laws and regulations.

The Programmatic Biological Consultation for Navy activities at NBVC Point Mugu was initiated to evaluate ESA issues related to current and proposed future activities at NBVC Point Mugu. The resulting Programmatic Biological Opinion addresses the effects on federal listed species of past, current, and future activities at NBVC Point Mugu. The Biological Opinion

establishes the requirements for ESA compliance regarding incidental take of federal threatened or endangered species that are a result of routine operations and maintenance activities associated with the installation mission. The major compliance issues included evaluation of impacts from the following activities:

- Target drone launches
- Aircraft overflights
- Maintenance of roads and facilities
- Maintenance of the boundary fence
- Utilities
- Beach missile launch operations and associated activities
- Police operations
- Pest management
- Traffic
- Recreation
- Research, including monitoring and predator management

Of the 11 activities identified, impacts to listed species from five are primarily the result of high levels of noise. The effects of the activities on listed species are discussed in detail in the Biological Assessment and Biological Opinion presented in Appendix O.

Federally listed species and their occurrence and use of NBVC Point Mugu are described below and summarized in Table 3-5. Federally listed species that have not been recorded but have a potential of occurring, are detailed in Section 3.5.3. Rare sightings of federally listed species, such as the marbled murrelet (*Brachyramphus marmoratus*), which aren't expected to occur in the habitats at Point Mugu, are not discussed herein. Rare and unusual sightings are listed in Appendix G, Species Lists and NBVC Approved Landscaping Plant List. Monitoring protocols are in Appendix H. Appendix F presents a general summary of monitoring data for each federally listed species that occurs at NBVC Point Mugu.

Distributions of federally listed species at NBVC Point Mugu are on Figure 3-11. Species descriptions and occurrence at NBVC Point Mugu are described in the following sections. Management of federal special status listed species at NBVC Point Mugu is governed by the Programmatic Biological Opinion and the BASH Biological Opinion (Section 3.4.4.1 Bird/Animal Aircraft Strike Hazard) (USFWS 2001b, 2006). A biological assessment was recently completed for the Countermeasures Testing and Training on the Point Mugu Sea Range; the Biological Opinion is in development (Navy 2013b). Navy management of federally listed species at NBVC Point Mugu will be in accordance with the requirements of the Biological Opinion. This INRMP and its management strategies are developed to assist in the recovery of listed species at NBVC Point Mugu. Species-specific management is described below. The western snowy plover and California least tern are managed with parallel objectives and strategies because these two species nest in similar habitats. Management strategies for these species are combined at the end of the California least tern discussion.

Family Name	Scientific Name	Common Name	Conservation Status
VEGETATION			
Scrophulariaceae	Chloropyron maritimum subsp.maritimum	Salt marsh bird's-beak	FE,SE
FISH			
Gobiiadae	Eucyclogobius newberryi	Tidewater Goby	FE
BIRDS			
Charadriidae	Charadrius nivosus nivosus	Western snowy plover	FT
Laridae	Sterna antillarum browni*	California least tern	FE, SE
Rallidae	Rallus longirostris levipes	Light-footed clapper rail	FE, SE
Vireonidae	Vireo bellii pusillus	Least Bell's vireo	FE, SE

TABLE 3-5: NBVC POINT MUGU FEDERALLY LISTED SPECIES

 * = Current name: Sternula antillarum browni (accepted by American Ornithological Union in 2006)
 FE = Federally Endangered
 FT = Federally Threatened
 SE = State Endangered Notes:

ST= State Threatened

3.5.1.1 Salt marsh bird's-beak (Chloropyron maritimum subsp.maritimum)

Background of Species

The USFWS listed salt marsh bird's-beak (Chloropyron maritimum ssp. maritimum Baldwin others 2012] previously and Cordylanthus maritimus ssp. maritimus [Hickman 1996]) as endangered in 1978 (43 FR 44810-44811 [28 September 1978]). This species is also state-listed endangered. Salt marsh bird's-beak is a halophytic member of the Orobanchaceae family (Baldwin and others 2012), formerly included in the Scrophulariaceae family (Hickman 1996). Historically found in more than 20 salt marshes from Morro Bay, San Luis Obispo County to Baja California, Mexico (USFWS 1985a), this rare plant may now be found in only six locations throughout its former range. The status of the three historical occurrences in Baja California, Mexico populations is unknown (USFWS 2009b). As a result of this decline, salt marsh bird's-beak



PHOTOGRAPH 3-2: SALT MARSH BIRD'S-BEAK Credit: Tetra Tech 2002

is currently classified as an endangered plant species by both USFWS and CDFW.

Salt marsh bird's-beak habitat preferences include sandy loam soils and openings in the canopy architecture (Phillip Williams and Associates, Inc. and P.M. Faber 2004). Salt marsh bird's-beak distribution corresponds with vegetation that is sparse, low, or contains small gaps to enable seedlings to establish in the absence of strong competition and shade. It is negatively correlated with dense, tall, or continuous patches of vegetation with low species diversity. Openings in the canopy allow seeding establishment, and digging by small mammals may be important to the plant's ecology (USFWS 2009b). However, too much disturbance (for example, repeated trampling) destroys its habitat. This annual plant is hemiparasitic. Its roots develop special structures called haustoria that penetrate a variety of other plant species to gain water and nutrients. Subpopulations of salt marsh bird's-beak sometimes disappear for a year or more.

The flowers are self-compatible and pollinated by ground nesting bees, including *Bombus pennsylvanicus sonorous, Anthidium edwardsii*, and *Melissodes tepida timberlakei*. Of these, *Anthidium edwardsii* was found to be the most effective pollinator of salt marsh bird's-beak at NBVC Point Mugu, during a 1985 study (USFWS 2009a). *Melissodes tepida timberlakei* has also been recorded as a pollinator at NBVC Point Mugu (Nagano and Hogue 1982). The promotion of salt marsh bird's-beak pollination requires adequate nesting grounds for these species (USFWS 2009a). The plant's germination usually depends on the amount and distribution of fresh water from winter rains. Generally, at Mugu Lagoon, it germinates from June to November with the purplish to pink plants observed from about July through October. On occasion, salt marsh bird's-beak can be found through December and recently into January.





Legend



ATYPICAL WESTERN SNOWY PLOVER NEST LOCATIONS

LEAST BELL'S VIREO OBSERVATIONS



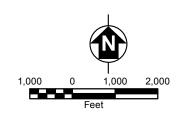
INRMP BOUNDARY SALT MARSH BIRD'S-BEAK 2010

CALIFORNIA LEAST TERN NESTING HABITAT

WESTERN SNOWY PLOVER NESTING AREA WESTERN SNOWY PLOVER CRITICAL HABITAT ADJACENT TO NBVC

LIGHT FOOTED CLAPPER RAIL HABITAT TIDEWATER GOBY OCCUPIED HABITAT

ESRI WORLD IMAGERY SATELLITE IMAGE



Naval Base Ventura County California

FIGURE 3-11 POINT MUGU FEDERALLY LISTED SPECIES

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

INRMP = Integrated Natural Resources Management Plan NBVC = Naval Base Ventura County

The primary distribution is located west of Runway 3 (north-south runway); however, a few remnant populations are located in specific areas east of Runway 3. Through preliminary GIS analysis, it has become clear that the data for the salt marsh bird's-beak in their current state cannot be analyzed as a single data set. Keeney and Ball (1998, as cited in Tetra Tech 2002) indicated that they cannot confidently predict population demographics (spatial distribution and abundance) based on data collected before 1996 because the data collection methodology was inconsistent and non-standardized. Figure 3-12 shows the current and historical extent of occurrences of salt marsh bird's-beak at NBVC Point Mugu.

Salt marsh bird's-beak is established in habitat that generally forms a "bathtub" ring around the periphery of the salt marsh, usually in high salt marsh or hummock areas. The plant has very narrow habitat requirements: (1) it grows on the roots of specific host plants that include saltgrass, shoregrass, and pickleweed; (2) it has specific host pollinators; (3) it cannot be withstand immersion in salt water for long; (4) it usually needs fresh water to germinate, but germination is impeded by prolonged inundation; and (5) the seed wings are dispersed by floating to the marsh edge.

The 5-year review conducted in 2009 concluded that threats to salt marsh bird's-beak include hydrological changes; insect predation by the salt marsh snout moth (*Lipographis fenestrella*), destruction, modification, or curtailment of habitat or range; and trampling, (USFWS 2009a). The combination of trampling and soil compaction that results from foot traffic has a severe impact on the salt marsh bird's-beak. Evidence indicates that even moderate foot traffic can damage fragile seedlings and make it difficult for seeds to germinate (USFWS 1985b). Application of herbicides along roadways where they pass through high marsh habitat has been postulated as having a negative effect on populations of the salt marsh bird's-beak in these areas because of contact with the chemicals and overspray.

Status at NBVC Point Mugu

In compliance with Section 7 of the ESA and OPNAVINST 5090.1C CH-1, Navy owned lands must be properly managed (1) to ensure that projects carried out by the Navy do not jeopardize the continued existence of salt marsh bird's-beak, and (2) to help foster the recovery of salt marsh bird's-beak. The final recovery plan (USFWS 1985b) states that salt marsh bird's-beak can be considered recovered when 12 major marshes within the historical range of the species, and that support salt marsh bird's-beak, are protected for at least 10 years.

The plan also requires that the protected area within each secure marsh total at least 20 acres of habitat suitable for the species (based on tidal elevation). Secure populations are free from development, off-road use, hydrologic change, and other detrimental effects. The recovery plan envisioned that maintenance of these populations would be aided by procedures associated with Section 404 of the Clean Water Act to maintain tidal and freshwater flows, and through protection of watershed and pollinators. The 5-year review conducted in 2009 concluded that no change in status will occur, as recovery goals have not been met (USFWS 2009a).



Author: GK. Date: 12/30/2013 Data Source: TetraTech Databases

This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.



A majority of the populations of salt marsh bird's-beak that appear each spring are in the western portion of NBVC Point Mugu (Figure 3-12). There is the potential for the species to germinate if freshwater inundation were encouraged in areas that were previously occupied, given the seed bank is viable. Currently, the distribution appears affected by the influx of fresh water from the adjacent duck hunting clubs to the north for some populations, and by tidal inundation and rainfall levels for other populations. The hydrology of the duck ponds is actively managed to maintain water in the ponds. At times in the winter rains, the ponds overflow, which discharge to culverts that convey the water underneath Perimeter Road and into the marsh between Perineter Road and Old Magazine Road (Figure 3-12). Freshwater inputs from the duck ponds may help preserve, and perhaps enhance, the population of the salt marsh bird's-beak at NBVC Point Mugu. Suitable conditions appear to be present elsewhere within Mugu Lagoon, such as in the northern area of the Central Basin, and to a lesser degree at the eastern arm.

Appendix F details population data and trends for salt marsh bird's-beak at NBVC Point Mugu. The salt-marsh bird's-peak population has been on the decline at Point Mugu for several years. Certain sub-populations have fluctuated either in population size or shown shifts in the occupied footprint; in some cases, selected sites have either completely disappeared or have significantly reduced in density and distribution. The decrease is significant and more than expected for typical annual variation attributed to rainfall patterns. After a very poor year in 2010, the highest acreage since 2006 was mapped in 2011 but declined again in 2012. A total of 1.67 acres of salt marsh bird's-beak was located and mapped during 2011, which is the highest acreage since 2.83 acres in 2006. Surveys from 2012 recorded 1.04 acres; 2010 recorded 1.2 acres; 2009 recorded 1.35; 1.49 acres in 2008; and 1.01 acres in 2007. Mapping precision has increased since surveys began; however, the gain in precision is not likely to result in the significant decline in acreage observed. In 2011, not only did the area of salt marsh bird's-beak increase, the density of existing patches anecdotally appeared to increase as well. Salt marsh bird's-beak was found growing in several sites where it has not been documented for several years, with no apparent change in suitability of habitat. Based on the location and isolation of these populations, the reappearance is assumed to be the result of a dormant seed bank rather than recent seed dispersal. Timing and amount of rainfall is likely a significant factor in salt marsh bird's-beak recruitment. More information is needed to determine causes of the apparent population decline and fluctuation in distribution. Some populations appear to have been extirpated, unless future rainfall results in their return. Other factors such as reductions in the pollinator community cannot be discounted, as pollinators are essential to maintain salt marsh bird's-beak subpopulations.

NBVC ED has implemented efforts to establish new populations of salt marsh bird's-beak by planting seeds in suspected appropriate habitat. Germination was extremely low, therefore program has ceased until more information can be collected on how to increase germination rates.

The Mugu Lagoon represents a relatively secure germination site because current Navy management policies restrict public access. In contrast, many other potential habitat locations along the southern California coast are not formally protected. They remain vulnerable to changes that could result in loss of suitable conditions and essential habitat for successful recovery of the salt marsh bird's-beak.

The 5-year review conducted in 2009 states specifically, as a recommendation for future actions, the establishment of site specific species monitoring protocols, to identify potential impacts of sea level changes associated with climate change. The USFWS states that "This will help detection of species responses to long term changes in sea level and associated vegetation" (USFWS 2009a). Additionally the plan states the goal of working with the Service's Partners for Fish and Wildlife Coastal Programs to seek habitat restoration and enhancement opportunities.

Specific Concerns

- Reduction in distribution and abundance when compared with historic distributions at NBVC Point Mugu.
- No current knowledge of health or recent changes in the local pollinator community.
- Declines of pollinator populations due to the following factors: inadequate nesting grounds for nesting bees, their key pollinator; climate shifts and sea level rise, resulting in unfavorable habitat conditions; and regional agricultural use of pesticides.
- Low germination rates for out-planted seeds.
- Reduction in habitat caused by filling, dredging, and water diversion activities such as tidal exclusion, channelization, and construction of roads and levees.
- Modification of flooding strategies at the duck clubs may impact those salt marsh bird's-beak sub-populations that are influenced by duck club hydrology.
- Hydrological modifications from culvert maintenance and non-maintenance may result in changes to the tidal prism and impact salt marsh bird's-beak populations.
- Sea level change and its associated impacts to habitat and tidal/freshwater regimes for for salt marsh bird's-beak and its host species.
- Disturbance to existing sub-populations from trampling due to waterfowl hunting.
- Habitat degradation from non-native species, which may increase if altered habitat conditions due to climate change, favor non-native plants.
- Impacts of local climatic shifts and the associated effects on host plant biology.

Current Management

Impacts to this species and its habitat are avoided and minimized through the SA/PRB process and with implementation of this INRMP. Since listing in 1978, NBVC ED conducts annual surveys of salt marsh bird's-beak occurrence, during flowering time. Protocols are detailed in Appendix H Monitoring Protocols. Each year, potential habitat and areas of salt marsh bird'sbeak occurrence, are re-visited. To reduce potential trampling of small plants and the seed bed, adjacent patches (within 5 feet) are mapped as one patch, which results in neighboring areas without SMBB being included in the total acreage. A five-year transect study was also done in 1996-2001 to determine which host plants are present and their densities in salt marsh bird's-beak areas (Navy 2001).

During annual surveys and scheduled weed management work (Section 3.7.1 Terrestrial Invasives), invasive plants growing within salt marsh bird's-beak areas are removed by hand and/or chemical treatment, if they are at a safe distance to treat. Common invasive plants in salt marsh bird's-beak habitat at NBVC Point Mugu include iceplant (*Carpobrotus* spp.) and *Plecostachys serpyllifolia*. No spraying of herbicides occurs in the immediate areas of salt marsh bird's-beak, to avoid accidental overspray. Any impacts to salt marsh bird's-beak populations are documented, in accordance with the ESA. Any hunting blinds with significant amounts of salt marsh bird's-beak growing nearby are closed. In the past, exclusion fencing was placed around one sub-population of salt marsh bird's-beak to protect from herbivory by rabbits.

Assessment of Current Management

The salt marsh bird's-beak population is surveyed effectively at NBVC Point Mugu. Their habitats are protected from disturbance, enhanced through the removal of invasive plants, and managed effectively with implementation of this INRMP. Investigating the limiting factors for seed germination for creating new sub-populations should resume. Efforts to collect seeds of salt marsh bird's-beak and its host plants should continue if an appropriate seed storage facility is available. Physical characteristics of salt marsh bird's-beak occupied habitat should be more fully evaluated to effectively manage existing populations and to inform efforts to expand populations or introduce the species to new areas. Surveys that track surface and subsurface soil moisture and salinity, combined with plot data on plant species diversity and cover, would inform management on appropriate areas on base for re-establishment efforts. Additionally, research is also needed on the pollinator community. Determining the health of the pollinator community may lead to other management actions, as well as help determine where sub-populations should be created, based on proximity to pollinators.

Management Strategy

Objective: Maintain viable populations of salt marsh bird's-beak, in accordance with the federal ESA of 1973, as amended.

- *I.* Continue tracking population by conducting surveys (using established methodology) of salt marsh bird's-beak during flowering time.
- *II.* Investigate the characteristics of micro-habitats as they relate to plant cover and distribution.
 - *A.* Investigate limitations to salt marsh bird's-beak populations, such as herbivory, pollinator populations, soil moisture and soil salinity.

- *III*. Conduct pollinator-specific surveys to gain better understanding of the pollinator/plant relationship.
- *IV.* Identify locations of nesting pollinators in proximity to salt marsh bird's-beak areas, and determine any limiting factors or impacts that may be affecting those habitats.
- V. Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - A. Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - *B.* Partner with, and use cooperative assistance from USFWS, researchers, and research institutions, to help collect needed data.
 - *C.* Continue to integrate collected data with regional databases, to support rangewide recovery efforts.
- *VI*. Continue to use the SA/PRB to minimize potential impacts to special status species and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- VII. Conduct habitat restoration as outlined in habitat-specific goals and strategies in this INRMP.
 - *A.* Identify areas on the base where pollinators are present and restoration could promote expansion and creation of salt marsh bird's-beak populations.
 - B. Conduct invasive plant control, avoiding herbicide overspray and trampling.
 - *C.* Coordinate with USFWS and researchers or research institutions to conduct studies on seed germination, experimental seed planting, and methods to create or expand populations.
 - D. Create new populaitons of salt marsh bird's-beak.
 - *E.* Research methods to increase seed germination rates when trying to establish new populations.
 - F. Strive to store seed at an appropriate botanical storage facility.
- *VIII.* Continue to protect habitat from human disturbance and trampling.
 - A. Restrict access to protected areas.
 - *B.* Educate personnel and hunters on protected species regulations and responsibilities.

- *IX.* Ensure changes in tidal prisms would not adversely impact populations; or ensure that impacts are offset.
- *X.* Ensure pollinator-specific habitats are protected and provided for.
- *XI*. Monitor for effects of sea level rise on existing populations.

3.5.1.2 Tidewater goby (Eucyclogobius newberryi)

Background of Species



PHOTOGRAPH 3-3: TIDEWATER GOBY Credit: G. Goldsmith, USFWS

The tidewater goby (*Eucyclogobius newberryi*) was designated endangered by the USFWS on 04

February 1994 (59 FR 5494-5499). The tidewater goby (*Eucyclogobius newberryi*) has been recorded on the north end of the installation in Calleguas Creek. Tidewater goby is a fish endemic to California in the family Gobiidae. The current geographic range of tidewater goby is from northern San Diego County to Del Norte County (three miles south of the California-Oregon border). Although the range of tidewater goby across California has not changed significantly over time, their overall population has become fragmented along the coast (USFWS 2008). Presently, 23 (17 percent) of the 134 documented localities are considered extirpated and 55 to 70 (41 to 52 percent) of the localities are naturally so small or have been so degraded over time that long-term persistence is uncertain (USFWS 2005).

NBVC Point Mugu surveyed for potential habitat for tidewater goby in November of 1993 but no gobies were documented. On 22 November 2000, the USFWS published a Final Rule designating 10 coastal stream segments in Orange and San Diego Counties as critical habitat. On 31 January 2008, the USFWS published a revised Final Rule (73 FR 5920-6006) to include critical habitat within the entire geographic range. The revised critical habitat included land in Del Norte, Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles Counties (USFWS 2008). The 2008 critical habitat was recently revised (78 FR 8746-8819); however, the Calleguas Creek watershed was not included in the final revision. Tidewater goby is primarily threatened by modification and loss of habitat as a result of coastal development, channelization of habitat, and diversions of water flows (USFWS 2005).

Status at NBVC Point Mugu

Prior to 2011, the last recorded observation of tidewater goby in Calleguas Creek was on 6 June 1940 (Bonterra Consulting 2011). As stated previously it was not found during surveys in 1993 or in fish surveys occurring in the estuary from 1993 through 2011. However, on 20 July 2011, San Marino Environmental Associates with assistance from Bon Terra Consulting, California Department of Transportation, and NBVC conducted a survey of the site to fulfill endangered species survey requirements for a proposed California Department of Transportation project to

remove sediment built up adjacent to the SR-1 bridge at the Las Posas Road Interchange. A total of 11 individuals were documented during the survey conducted along a 500-foot stretch of the Calleguas Creek channel (Figure 3-11) (Bonterra Consulting 2011). The aquatic conditions of Calleguas Creek change significantly within 500 feet south of where the gobies were documented, due to proximity of the estuary mouth and tidal influence. Therefore, it is not suspected that appropriate tidewater goby habitat extends past the northern edge of Calleguas Creek and within the NBVC installation. However, individual gobies may venture further downstream in certain instances, such as during storm events when they may be pushed downstream. As water salinity increases in relation to proximity of the estuary, tidal creeks, and drainage ditches. However, drainage ditches farther north and west have some potential for tidewater gobies because of the more brackish conditions. These areas will be surveyed for presence of this species.

Specific Concerns

- Appropriate habitat may be limited to a very small area within the installation boundaries.
- Depredation from native and non-native species.
- Surveys have not been conducted to document the current distribution of the species along Calleguas Creek and within the installation.
- Distribution is likely not constant in outlying areas, as individuals may move into new areas for an unknown period of time. Therefore, presence/absence surveys may not provide adequate data for year-round use of habitat, or document future range expansion.
- Presence/absence surveys impact the species, by stressing fish during capture.
- Degradation of habitat due to water quality and Calleguas Creek sedimentation.
- Few opportunities may be available on the base, for habitat enhancement for this species.

Current Management

Project impacts to this species and habitat are avoided and minimized through the SA/PRB process and by protections described in this INRMP. NBVC ED ensures that researchers conducting fish sampling follow trapping protocol that avoids and minimizes incidental take of this species. A tidewater goby survey is planned for 2013, to determine the extent of distribution on the NBVC Point Mugu installation.

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Natural resource management and strategies outlined in this document contribute to overall recovery objectives for tidewater goby. In the event that this species is recorded on the base in areas outside its currently known distribution, NBVC ED would coordinate with USFWS to determine any appropriate management requirements of this species, to ensure the population remains stable.

Assessment of Current Management

The tidewater goby is currently managed properly at NBVC Point Mugu. Ongoing fisheries surveys throughout the estuary have demonstrated that tidewater goby presence is unlikely, with no individuals collected. Arrow gobies, a species that prefers more saline conditions than tidewater gobies, are commonly recorded at NBVC Point Mugu. NBVC protects the area known to be occupied by tidewater goby, from Navy-related disturbance. However, that habitat is significantly influenced by the entire Calleguas Creek watershed, as the occupied area is at the terminus. At the time of writing, there is currently no information on the limits of tidewater goby distribution on the installation. Surveys are planned for summer and fall 2013, to map tidewater goby distribution on the installation.

Management Strategy

Objective: Maintain viable populations of tidewater goby, in accordance with the federal ESA of 1973, as amended.

- *I.* Continue to conduct fish surveys to facilitate and guide natural resource management decisions.
 - *A.* Determine the extent of tidewater goby-occupied habitat at NBVC Point Mugu by conducting presence/absence surveys in areas that may be impacted or degraded by base or off-base activities.
 - *B.* Integrate resultant survey data into GIS database.
 - *C.* Survey tidewater goby potential habitat at intervals no less than every 10 years, to determine distribution.
- *II.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - *A.* Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - *B.* Partner with, and use cooperative assistance from, wildlife agencies, organizations, and volunteers to help collect needed data.
 - *C.* Continue to integrate collected data with regional databases, to support rangewide recovery efforts.

- *D.* Support and facilitate research by outside organizations and agencies on fisheries at NBVC Point Mugu.
- *III*. Continue to use the SA/PRB to avoid and minimize potential impacts to special status species and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs: ensure impacts are minimized for any projects that may affect known or potentially occupied habitats.
 - B. Continue to coordinate with NMFS for project activities that may result in impacts to EFH.
 - *C.* Ensure protective measures are followed by any researchers or activities involving sampling fish in Mugu Lagoon, and to avoid sampling in areas known or suspected to have tidewater gobies, unless researchers are permitted by USFWS.
 - *D.* Continue to support implementation of Calleguas Creek Watershed TMDLs, and the goals of the NBVC Water Quality Program and Environmental Restoration Program.
 - *E.* If non-natives are present, determine their potential for ecosystem damage and prioritize for their removal if applicable, especially African clawed frogs and bullfrogs.

3.5.1.3 Western snowy plover (Charadrius nivosus nivosus)

Background of Species

The western snowy plover (*Charadrius nivosus nivosus*) is a year-round resident at NBVC Point Mugu. The U.S. Fish and Wildlife Service (USFWS) designated the coastal population of snowy plovers as threatened in 1993 (58 Federal Register [FR] 12864), with critical habitat designated in 1999 (64 FR 68508), which included Point Mugu beaches. Eighty-five acres of critical habitat at NBVC Point Mugu was originally designated. The USFWS Final Rule on 29 September 2005 (70 FR 56970) and most recently in 2012 (77 FR 36728 [19 June 2012]) exempts NBVC Point Mugu from critical habitat designation, under Section 4(a)(3)(B)(i) of the ESA, due to the protections afforded to the species and habitat, from implementation of this INRMP. Critical habitat is outside the western boundary of the installation, at Ormond Beach (Figure 3-11).

The western snowy plover is a subspecies of snowy plover that breeds and winters on coastal beaches along the Pacific coastline from southern Washington State south to Magdalena Bay, Baja California Sur, Mexico. Populations consist of migrants and year-round residents depending on locality. Snowy plovers breeding in Oregon have been recorded wintering in California as far south as Monterey, while snowy plovers breeding in central California have been recorded south as far as Guerrero Negro, Baja California Sur, Mexico (Warriner and others 1986).

The western snowy plover nests on undisturbed, flat areas with loose substrate, such as sandy beaches and dried mudflats along the California coast. Sand spits, dune backed beaches, sparsely to unvegetated beach strands, open areas around estuaries, and beaches at river mouths are the preferred coastal nesting areas (Page and Stenzel 1981; Powell and others 1997; Wilson 1980). Western snowy plovers nest in depressions or scrapes and lay an average of three eggs. Chicks leave the



PHOTOGRAPH 3-4: WESTERN SNOWY PLOVER Credit: Tetra Tech 2002

nest within 24 hours after they hatch and immediately follow the male to foraging areas along the sandy shoreline, salt pannes, and, at times, mudflats. Nesting generally occurs between March 1 and September 15 of each year, though egg laying in southern California has been documented as early as mid-February, and continues through late July.

Snowy plovers forage primarily on the wet sand at the beach-surf interface, where they feed on small crustaceans, marine worms, insects, and amphipods. Adults and young forage on these invertebrates along intertidal areas, beaches in wet sand and surf cast kelp, in foredune areas of dry sand above the high tide, on salt pannes, and along the edges of salt marshes and salt ponds.

The decline in western snowy plover populations has been attributed to lower reproduction due to human disturbance, predation, and habitat loss through invasion by non-native plants. USFWS has mapped occurrences of European beachgrass that threaten western snowy plover nesting sites in Santa Barbara County and has recommended eradicating the grass from nesting habitat of the western snowy plover (Laye and Mangione 1995). The key threats to the local population are human use of nesting habitat, and disturbance and predation by domestic or feral animals such as dogs or cats.

Regionally, nesting populations occur at an inlet to the Channel Islands Harbor on Hollywood Beach, Ormond Beach, and McGrath State Beach at the mouth of the Santa Clara River.

Status at NBVC Point Mugu

The sandy beaches at NBVC Point Mugu provide both nesting and wintering habitat for western snowy plovers. The beaches and salt pannes represent relatively secure breeding and foraging sites because public access is restricted and because of current Navy management policies. In contrast, many other locations along the southern California coast are not formally protected. They therefore remain vulnerable to changes that could result in loss of essential breeding and foraging habitat for the western snowy plover.

The status of the western snowy plover at Mugu Lagoon is complex. Western snowy plovers are summer residents with birds from more northern latitudes replacing breeding birds during

migration. Consequently, western snowy plovers are present year round on the sandy beaches and salt pannes. Some western snowy plovers migrate. Evidence that breeding birds from the beaches of Mugu Lagoon move south and are replaced by individuals from more northern latitudes has been obtained from observations of color banded birds. Nesting begins in mid- to late March, with young still on the beach until late August to early September. Most nesting is completed by late July. The adult males are still caring for the young in late August to early September. During the winter, western snowy plovers have been observed foraging on the open mudflat in the central basin of Mugu Lagoon.

Western snowy plovers nest on barren to sparsely vegetated beaches, dry salt flats in lagoons, barrier beaches, and on dune-backed beaches. At NBVC Point Mugu, plovers nest on beaches and salt pannes, as well as atypical nesting areas such as the airfield, developed concrete and asphalt pads, and salt pannes far from beach habitats. They forage on open beaches, tide flats (primarily during the winter), and salt pannes. At beaches, foraging occurs above and below the mean high water line, where plovers gather food from sand surfaces, kelp, marine mammal carcasses, or low foredune vegetation. Figure 3-11 shows the extent of nesting and foraging habitat for the western snowy plover at NBVC Point Mugu. They feed on small crabs, amphipods, sand hoppers, and flies. Both unpaired males and pairs defend their territories against other western snowy plovers by posturing, chasing, or aggressive behavior. The size of the territories were always larger than 0.5 hectares at salt pannes and probably larger on the beach on the central California coast.

Male western snowy plovers take an active role in incubation as the nesting cycle progresses. The three egg clutches, well camouflaged in pebble-lined nests in depressions, appear mostly in May and July on the eastern arm and dune-backed beaches of the western arm. Some nesting occurs through August. It takes 4 to 5 days for the female to lay all three eggs, with the intervals between eggs averaging about 60 hours. While the female is laying the eggs, both male and female plovers leave the territory often, with sustained incubation beginning only after the last egg of the clutch is laid. Plover chicks are precocial, leaving the nest within hours after they hatch to search for food. Both parents may attend the brood at first. Broods rarely remain in the nesting territory until the chicks have fledged. Western snowy plover chicks require about 4 weeks to fledge. Plovers may re-nest if the nest is lost to disturbance, depending on the severity of the disturbance.

For several years the Navy has been monitoring the nesting success of western snowy plovers at NBVC Point Mugu. Appendix F details western snowy plover breeding and nesting data collected at NBVC Point Mugu. Survey data don't indicate a clear trend for how the western snowy plover population has changed since 1991. In 1991, there were 59 adults recorded during a breeding plover survey at Point Mugu, with 62 documented in 2012. However, window surveys can be very dynamic and not the best indicator of the breeding population. Adult breeding plover surveys show daily variability and number of nests documented yearly varies, based on nest loss and searcher efficiency. Nest counts, using number of known, simultaneously active nests may provide the best estimate of the breeding population. If total nest counts are used, the population may be overestimated due to re-nesting regularly throughout the season. The most effective method for population estimates is to determine the peak number of active

nests at one point in time. Using this method, there were 13 known active nests in 1999 in comparison to 35 in 2012. Some of this increase may be attributed to an increased nest searching effort. However, it is likely the plover population has demonstrated some growth at Point Mugu. The total number of nest attempts from 2006 to 2011 was highest in 2010, with 135 total nest attempts. The record high was due to an elevated nest failure rate throughout the season, resulting in multiple re-nesting attempts by the estimated 30 to 40 breeding pairs of plovers on site.

The total number of hatched nests varies from year to year, in the range between 45 and 66 nests, but the overall percentage of hatched nests showed consistency for years 2006 to 2009: hatch rates in 2006 were 79 percent; 65 percent in 2007; 77 percent in 2008; and 63 percent in 2009. A decline has since occurred, with hatch rates totaling 49 percent in 2010, 51 percent in 2011, and 40 percent in 2012. This decline is attributed mostly to depredation by common ravens. Chick banding is not currently conducted at Point Mugu, so the actual number of chicks fledged per male is unknown.

Another trend is evident if the season is split into two phases. Only 28 percent (15 of 54) of nests initiated before 9 May 2011 hatched, meanwhile 73 percent (43 of 59) of nests initiated after that date hatched. This substantial increase in hatch success may be the result of several factors. The cutoff date coincides with first California least tern scrapes being observed on beaches shared by the two species during the nesting season. Snowy plover nests in proximity to least terns likely benefited not only from the latter's vigorous defense of their colony, but also, from the abundance of neighboring nests in the area which served to distract predators. Additionally, of the nests that failed before 9 May, 46 percent (18 of 39) failed between 28 April – 2 May. The primary cause of failure during this period was predation, particularly on Ormond East. Unfortunately, during this time period, maximum wind speeds ranged from 15 -26 mph, with gusts between 22-38 mph. Therefore evidence was lost and making it difficult to determine the source of predation or potentially abandoned and buried eggs.

Reasons for reductions and threats to the western snowy plover population at NBVC Point Mugu can be linked to increased avian predation (ravens). It also may be related to natural events, such as over wash of the beach during high tide.

Near Holiday Beach is the Small Bore Range, an area where small arms are fired (Section 2.1.2.1 Military Land Use and Categories of Operation). As part of ongoing training requirements, NBVC law enforcement must undergo firearms qualification, which may take place at the Small Bore Range (Figure 2-1). The direction of fire is toward the beach, which is nesting habitat for the western snowy plover. The Small Bore Range was historically closed during the nesting season. The *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California (5090 Ser PW420/075) (1-8-99-F-24), (Appendix O), addresses restrictions and mitigation measures for a number of activities, including those conducted at the Small Bore Range. Restrictions include the closure of the range during nesting season, unless modifications were made to the size of the range (conversion to a 1,000-inch pistol range), and berms created to reduce noise intrusions into adjacent habitat. The Navy implemented the modifications and the range is now open year-round.*

Explosive ordnance disposal activities occurred in the Small Bore Range in 2012. Explosive ordnance disposal activities were addressed in the programmatic biological opinion for the area now occupied by the JIEDDO training area (Figure 2-1). The explosive ordnance disposal program has since been relocated to San Diego; most unexploded ordnance is transported to San Diego. On a rare occasion, for safety reasons, ordnance cannot be transported and must be disposed of at Point Mugu. Any future detonations of unexploded ordnance in the Small Bore Range must be closely monitored, as they may cause disruption to plovers in the immediate area if detonations occur during the nesting season (Tetra Tech 2012q).

Specific concerns, objectives and management strategies for this species are detailed at the end of the following section.

3.5.1.4 California least tern (Sterna antillarum browni)

Background of Species

The California least tern (*Sterna antillarum browni*) was listed endangered by the USFWS in June 1970 (35 FR 16047). (Note: the current name accepted by the American Ornithologists'

Union in 2006 is Sternula antillarum browni). This migratory bird species breeds mostly in coastal foredunes and in other sparsely vegetated sites with sandy or gravelly soils. One brood of 1-3 chicks is raised yearly. Females typically lay one to two eggs in scrapes, and the parents feed fish to the young. Young California least terns fledge at 3 weeks. Least terns arrive at colonial nesting locations in late April and nest from mid-May through After breeding, family groups August. regularly occur at lacustrine waters near the coast of southern California. Because this species tends to abandon nesting areas readily if disturbed, it requires nests in areas relatively



PHOTOGRAPH 3-5: CALIFORNIA LEAST TERN Credit: Tetra Tech 2002

free of human or predatory disturbance (Zeiner and others 1990a). The decline in California least tern populations has been attributed to lower reproduction due to human disturbance, predation, and habitat loss. Another key threat includes predation by other wildlife species (such as American kestrels or crows) or domestic or feral animals (such as cats and dogs) (USFWS 1985b).

Status at NBVC Point Mugu

California least terns primarily nest in two locations at Mugu Lagoon: East Ormond Beach, and Holiday Beach. The California least tern nesting population has increased significantly at East Ormond Beach. In 1998 there were 266 nests, increasing to 617 in 2004 and a high of 844 nests in 2012. Nesting on the eastern arm was first documented in 2001, when seven nests were

found. Two sandy nest islands totaling approximately 8 acres were constructed as part of the time-critical removal action at Site 4 under the Environmental Restoration Program at NBVC Point Mugu (Section 3.3.1.5 Jurisdictional Waters-Wetlands Management). The sandy islands were intended as nesting habitat for seabirds in the Laridae family, including California least terns. Construction of the sandy nest islands was completed in late April 1997. California least terns occupied these islands in 1997 and nested successfully with four nests. In 1998, the nest islands yielded eight nests. In 1999, the nest islands yielded 36 California least tern nests. In 2000, the nest islands yielded 31 California least tern nests. In 2001, the nest islands yielded 41 California least tern nests. In 2004, monitoring confirmed the created islands were deemed unsuccessful at producing fledglings, with little to no reproductive success. Intensive effort was required each year to control invasive plant species, and fledgling success was low or absent. Vegetation management at the islands was discontinued in 2005, to avoid acting as a "sink habitat," which could attract birds to nest in sub-optimal habitat with decreased nesting success (NBVC 2006). Terns utilizing this habitat would likely move back to the beach nesting colonies, where fledgling success is higher. The islands remain an option, in case a future need arises to clear habitat for nesting terns.

Appendix F details California least tern breeding and nesting data collected at NBVC Point Mugu. Factors driving hatching success at Point Mugu are nest predation, high tides, wind conditions, and predator pressures on adults. Predation pressure by raptors could lead to indirect abandonment of nests or direct abandonment when a nesting adult is taken.

Factors driving fledgling success at Point Mugu are chick predation, predation pressure on adults that may lead to abandonment, piracy both intra- and inter-specifically, which in turn is driven by prey availability, the biggest factor. Recent years have shown poor fledgling success due to depredation and seemingly, prey shortages. Nesting at the eastern arm and Holiday salt pannes also declined in 2011, likely due to predation pressure experienced in 2010. The peak number of concurrently active nests increased sharply from 440 in 2010 to 544 in 2011, suggesting the possible recruitment of over 100 additional breeding pairs to Point Mugu.

Fledgling success is closely tied with available prey as well as predation. In 2010, a total of 118 dead chicks and fledglings were found at the end of the season, nearly four times the number documented in 2009. This could be attributed to reduced prey delivery rates due to piracy by Forster's terns, first observed in 2010 and again in 2011; additionally, prey shortages may be a factor within the estuary and offshore. The high rate of attempted piracy and a large number of dead juvenile Forster's tern in their nearby nesting colony suggests prey shortage may have reduced the reproductive success of both tern species. Fledgling surveys are conducted at Point Mugu, as an index to compare years. Estimated fledglings in 2011, down from 98 in 2010, 133 in 2009, 79 in 2008, 139 in 2007, and 108 in 2006. The single largest factor impacting productivity in 2011 was an extreme wind event (28-30 May 2011), with 145 nests failing in the aftermath; basewide, over 35 percent of nests active at the time and 20 percent of nests established in the 2011 breeding season failed following the wind event. In 2012, a high tide event was responsible for flooding a significant portion of active nests.

The lagoon represents a relatively secure breeding and foraging site because public access is restricted and because of current Navy management policies. In contrast, many other locations along the southern California coast are not formally protected and remain vulnerable to changes that could result in loss of essential breeding and foraging habitat for the California least tern.

Regionally, California least terns forage occasionally in Port Hueneme Harbor, and nesting colonies occur in neighboring areas of coastline, at Ormond Beach, Hollywood Beach, and McGrath State Beach.

Specific Concerns

The issues that could negatively impact western snowy plovers and California least tern populations and their habitats at NBVC Point Mugu are:

- Impacts from depredation by native and non-native predators;
- Habitat loss and conversion due to non-native plant species;
- Loss of nesting habitat due to beach erosion and sea level rise;
- Anthropogenic disturbances to nesting birds and their habitat;
- Adequate prey availability at NBVC Point Mugu, in the form of beach wrack or fisheries in the estuary; and
- Impacts to the stability of offshore fisheries such as bait fish.

Current Management

The final *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* (USFWS 2007) states that the species can be considered recovered when the following three criteria have been met: (1) An average of 3,000 breeding adults has been maintained for 10 years, distributed among six recovery units; (2) A yearly average productivity of at least one fledged chick per male in each recovery unit is maintained in the last 5 years prior to delisting; and (3) Mechanisms have been developed and implemented to assure long-term protection and management of breeding, wintering, and migration areas to maintain subpopulation sizes and average productivity specified in criteria 1 and 2.

The final *Revised California Least Tern Recovery Plan* (USFWS 1985) states that the species can be considered recovered when the following criteria have been met: (1) The annual breeding population in California must increase to at least 1200 pairs distributed in at least 20 secure coastal management areas throughout their 1982 breeding range; and (2) Each of the 20 secure management areas must have a minimum of 20 breeding pairs with a 5-year mean reproductive rate of at least 1.0 young fledged per breeding pair. The plan also states that the species may be

considered for threatened status if 1,200 breeding pairs in California occur in 15 secure management areas, with a 3-year mean reproduction rate of one.

Natural resource management and strategies outlined in this document contribute to overall recovery objectives for both the western snowy plover and California least tern. NBVC Point Mugu monitors population and manages breeding habitat of the western snowy plover and California least tern to maximize survival and productivity. Nests are surveyed for and tracked to determine hatching success. Selected predators are removed to aid in recovery. Population surveys occur to determine any increases or decreases in population. Habitat is maintained to control the spread of invasive species. Beaches are closed to personnel year-round to reduce disturbance to listed species and for operational requirements. Project impacts to this species and habitat are avoided and minimized through the SA/PRB process.

Assessment of Current Management

NBVC ED spends an intensive effort tracking nesting success and population status, and providing for the recovery of California least terns and western snowy plovers. There is little more that can be done, that is not already being done. The western snowy plover population has increased slightly over the years due to beach closures and predator management, however, the population may be hampered by limited food resources. There are no kelp beds offshore of Point Mugu and beach wrack is minimal; as a result, the amount of food resources for plovers is smaller compared to a beach rich with wrack and kelp. California least terns have been increasing, however, the fledgling success is still low. Low fledgling success is likely attributed to poor offshore prey availability, which cannot be managed by NBVC; similarly, there is likely little potential management within the estuary that could improve offshore prey. Predation also results in lowered nest success rates, despite the Navy's predator control efforts.

Management Strategy

Objective: Maintain viable populations of western snowy plover and California least tern, in accordance with the federal ESA of 1973, as amended.

- *I.* Conduct surveys (using established methodology) of listed species during breeding and nonbreeding season, to collect data on population size and nesting success.
- *II.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - *A.* Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - *B.* Partner with, and use cooperative assistance from USFWS, researchers, and research institutions, to help collect needed data.

- *C.* Continue to integrate collected data with regional databases, to support rangewide recovery efforts.
- D. Attend snowy plover and least tern working groups.
- *III*. Continue to use the SA/PRB to avoid and minimize potential impacts to special status species and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *IV.* Conduct habitat restoration as outlined in habitat-specific goals and strategies in this INRMP.
 - A. Conduct invasive plant control and replace with appropriate native vegetation when required for sand stability and species diversity.
 - *B.* Ensure presence of flat open upper beach is available; ensure beaches are not dominated by tall dunes.
- V. Restrict access to protected areas.
- VI. Install signs to inform on sensitive species and habitats.
- VII. Educate personnel on protected species regulations and responsibilities.
- *VIII.* Enhance productivity of nesting populations.
 - *A.* Continue to manage predators to ensure viable populations and maximize nesting and fledgling success.
 - *B.* Continue to monitor the effects of piracy by nesting Forster's terns to determine significance of interactions and identify potential management actions.

3.5.1.5 Light-footed clapper rail (Rallus longirostris levipes)

Background of Species

The light-footed clapper rail (*Rallus longirostris levipes*) is a state and federally-listed endangered species that is a resident to coastal wetlands in Southern California (35 FR 16047-16048 [13 October 1970]). The light-footed clapper rail is a secretive, rarely observed resident bird, inhabiting Mugu Lagoon year round. It occupies intertidal salt marsh habitat in restricted, localized areas. The breeding distribution and call count data are archived in the GIS database for NBVC Point Mugu.

Clapper rails usually begin breeding when pairs form around mid-February. Nesting occurs from mid-March to July, with most eggs laid between early April and May. Construction of separate incubation and brood nests for chicks is typical, but may not be the norm for clapper rails at Mugu Lagoon. Young are dispersed by mid to late July. Hence, breeding or nesting season for the light-footed clapper rail is mid-February to the end of July.

Habitat for light-footed clapper rails at Mugu Lagoon is not the typical cordgrass marsh. Instead, most rails at Mugu Lagoon nest in stands of spiny rush and in isolated high marsh areas within hummocks of pickleweed. Light-footed clapper rails forage along the interface of the mudflat

and the marsh, along mud banks, and in shallow tidal creeks. At times, rails will forage in the high marsh. Their diet consists of crabs and salt marsh gastropods.

The light-footed clapper rail has become extremely limited in distribution almost entirely as a result of the loss of habitat. The California population of this endangered clapper rail was at a former high of 325 pairs in 15 marshes in 1996, the largest number detected breeding since annual surveys (including Point Mugu) began in 1980. This former record high



PHOTOGRAPH 3-6: LIGHT-FOOTED CLAPPER RAIL Credit: Tetra Tech 2002

had been exceeded in four consecutive years, 2004 - 2007 with a record high of 443 pairs in 19 wetlands in 2007 (Zembal and Nerhus 2011). In 2008 there was a range-wide population crash with only 234 pairs of clapper rails detected in 15 marshes. The state population rebounded to 320 breeding pairs in 16 wetlands in 2009 and 372 pairs in 19 marshes in 2010; in 2011 it was back nearly to the record-high count with 441 nesting pairs statewide (Zembal and Nerhus 2011).

Status at NBVC Point Mugu

Clapper rail populations have slowly increased at Point Mugu. An all-time high of 22 pairs were documented in 2012. It is suspected that winter predation by raptors may be one of the driving limiting factors of the rail population at Point Mugu. Of 10 captive-reared clapper rails radio-tagged and released, seven were depredated by raptors and three disappeared within the first month, post-release. Rails may also be dispersing outside of the area, which would affect the Mugu population growth rate: at least two captive reared clapper rails have been observed in marshes south of Point Mugu. Contaminants, particularly pesticides and heavy metals, in Mugu Lagoon may also be contributing to slow population growth of the light-footed clapper rail in otherwise suitable habitat. Recent studies however, have not found any contaminants at Point Mugu that exceed levels known to cause harm to wildlife.

As of 2012, annual censuses of light-footed clapper rails in Mugu Lagoon have occurred for 30 years. Appendix F details census data collected for this species at NBVC Point Mugu. The subpopulation fluctuated between three and seven pairs for nearly 20 years (1980-2001), until management efforts by the Navy fostered population growth. Management efforts have included predator control, release of captive reared individuals, and wetland restoration. Census data from Point Mugu for years 1996 through 1999 based on call counts, indicated three to four pairs. The Point Mugu subpopulation doubled in size between 2001 and 2003, with seven pairs in 2001, 10 pairs in 2001, and 14 pairs in 2003. From 2003 to 2007, the subpopulation fluctuated between 14 and 19 breeding pairs. However, in 2008 there was a range-wide population crash and only five pairs were detected at Point Mugu. The Point Mugu population recovered to nine pairs in 2009 and 12 pairs in 2010, mirroring the statewide recovery. The recent discovery of nesting activity in the far northwest portion of Point Mugu provided a key boost to the population. The Point Mugu subpopulation was the sixth largest subpopulation in California in 2011 (Zembal and Nerhus 2011) and seventh largest in 2012 (NBVC 2011).

In 1999, the Navy and the California State University at Long Beach, Biological Sciences Department, began to develop the protocol for a captive breeding program for the light-footed clapper rail. From 2001 to 2009 a total of 107 captive-reared clapper rails were released at Mugu Lagoon. The captive breeding program has now grown to include pairs at Sea World and San Diego Wild Animal Park. Rails released were color-banded in an attempt to document survival post release. Very few observations of banded rails have been collected, and those few observations were documented soon after release. This, along with the radio-telemetry work suggests survival post-release may be low. However, due to their secretive nature and a noticeable increase in the population once the Mugu population was likely enhanced with captive-reared birds, it is suspected that some portion of the released rails survived and remained in the Mugu population.

Ledig (1990, as cited in Fleischer, Fuller and Ledig 1995) discusses light-footed clapper rail nesting habitat as chiefly pickleweed marsh (67 percent) followed by spiny rush (20 percent). The 1999 census based on call counts found all possible nests only in spiny rush habitat. In 2009 and 2010, NBVC ED placed floating nesting platforms within the marsh for clapper rails. These platforms have been extremely successful at Seal Beach National Wildlife Refuge. At Point

Mugu, there has been one documented nest built on a platform, with a majority of the other platforms being used by rails for temporary cover or roosting.

Recent studies by Fleischer and others (Fleischer, Fuller and Ledig 1995) demonstrated low genetic variability in the four subpopulations of the light-footed clapper rail, including the three largest subpopulations. Zembal and Collins (Zembal and Collins 1998) recommended translocations from larger to small subpopulations for the inherent genetic and demographic Whether the salt marshes inhabited by small populations are poorly suited to benefits. occupation, having been so reduced and otherwise degraded, or whether the rails themselves are poorly suited to proliferate more expansively, the rails would benefit from a captive breeding program that would include translocations of eggs and juveniles. As a part of the Navy's project descriptions, and as a compensatory measure, under the NBVC Point Mugu ESA Programmatic Biological Consultation, a population enhancement study was undertaken in 1999 in concert with the captive breeding research effort at Sweetwater Marsh, in San Diego County. Two lightfooted clapper rail eggs from the Newport Back Bay population were translocated to Mugu Lagoon. Both chicks hatched and fledged successfully. Genetic diversity has also increased at Mugu Lagoon if it is found that captive-reared rails remained and survived to breed, since they originated from marshes in San Diego County. The factor or factors that are suppressing lightfooted clapper rail breeding numbers over the last decade are unclear.

The lagoon represents a relatively secure breeding and foraging site because public access is restricted and because of current Navy management policies. In contrast, many other locations along the southern California coast are not formally protected. They therefore remain vulnerable to changes that could result in loss of essential breeding and foraging habitat for the light-footed clapper rail.

Since doubling in size between 2001 and 2003, the Point Mugu subpopulation fluctuated between 14 and 19 breeding pairs, 2003 - 2007. The subpopulation had fluctuated between three and seven pairs for nearly 20 years until management efforts likely fostered some growth. In 2010, in part due to the discovery of a new epicenter of nesting activity in the far northwest portion of the marsh, the population increased again with a minimum of three nesting pairs along a drainage channel that parallels Perimeter Road.

Specific Concerns

- Impacts from depredation by native and non-native predators, specifically wintering raptors.
- Habitat loss and conversion due to non-native plant species.
- Loss of nesting habitat due to sea level rise.
- Degradation of water quality due to pollution and sedimentation.
- Anthropogenic disturbances to nesting birds and their habitat.

- Impacts from waterfowl hunting if rails expand into current hunting areas or if hunting areas are added to currently occupied habitat.
- Low population numbers could reduce genetic variability within the species, and have negative impacts on recovery of the light-footed clapper rail.

Current Management

Natural resource management and strategies outlined in this document contribute to overall recovery objectives for light-footed clapper rails. NBVC Point Mugu monitors and manages the breeding habitat of light-footed clapper rails to maximize survival and productivity. Surveys are completed, inhabited areas are protected from disturbance, habitat is enhanced, and predators are managed. Project impacts to this species and habitat are avoided and minimized through the SA/PRB process. Activities conducted in the Joint Improvised Explosive Device Defeat Organization Battle Course (JIEDDO), hereafter referred to as the "JIEDDO training area," are adjacent to potential light-footed clapper rail nesting and forage habitat. In the event that nests are established in the vicinity of the training area, NBVC ED would monitor JIEDDO activities to ensure that no impacts to nesting birds occur. There are no impacts to clapper rails from the current training in the JIEDDO training area. However, if additional training activities are requested in that area that may impact clapper rails, proper consultation with USFWS will be completed before activities begin.

Assessment of Current Management

NBVC ED effectively tracks the light-footed clapper rail population staus and breeding pairs and provides for the recovery of this species. The nesting population is intensively monitored, habitat is protected from disturbance, predator management occurs to reduce predation pressure, and habitat restoration occurs to provide for additional habitat. Navy projects and operations are monitored intensively to ensure that base operations result in minimal or no disturbance to clapper rails.

Management Strategy

Objective: Maintain viable populations of light-footed clapper rails, in accordance with the federal ESA of 1973, as amended.

- *I.* Conduct surveys (using established methodology) of listed species during breeding and nonbreeding season, to collect data on population size and nesting success.
- *II.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - *A.* Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.

- *B.* Partner with, and use cooperative assistance from, wildlife agencies, organizations, and volunteers to help collect needed data.
- *C.* Continue to integrate collected data with regional databases, to support rangewide recovery efforts.
- *D.* Survey other wetland areas in Ventura and Santa Barbara County for clapper rails, to determine dispersal patterns from NBVC Point Mugu.
- E. Attend clapper rail working group.
- *III*. Continue to use the SA/PRB to avoid and minimize potential impacts to special status species and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *IV.* Conduct habitat restoration as outlined in habitat-specific goals and strategies in this INRMP.
 - A. Conduct invasive plant control.
 - B. Install native plantings of spiny rush and cordgrass in appropriate habitats.
 - *C.* Maintain nesting platforms; if they successfully support rail nesting, install additional platforms.
- *V.* Restrict access to protected areas.
- *VI*. Install signs to inform on sensitive species and habitats.
- VII. Educate personnel on protected species regulations and responsibilities.
- *VIII.* Enhance productivity of nesting populations.
 - *A.* Continue to manage predators to ensure viable populations and maximize nesting and fledgling success.

3.5.1.6 Least Bell's vireo (Vireo bellii pusillus)

Background of Species

The least Bell's vireo (*Vireo bellii pusillus*) was listed endangered by the USFWS in 1986 (51 FR 16483 [02 May 1986]) and by CDFW in 1980. This small, gray, migratory songbird breeds almost exclusively in riparian habitats of Southern California and northern Baja California. It is a disjunct subspecies of Bell's vireo which breeds throughout the southwest and into the Midwestern U.S. Least Bells' vireos prefer riparian areas with dense understory for nest

placement, and a structurally diverse mature canopy for foraging. They are typically associated with willow scrub, cottonwood, and sycamore, but vegetative structure rather than individual species is most important in territory selection. They occur regionally in Ventura County as a resident during the spring and summer, migrating south for the fall and winter. This species could occur in the Arroyo willow thicket and mulefat habitat at NBVC Point Mugu.

Its preferred habitat is dense riparian vegetation dominated by willows (*Salix* spp.), with a lush understory (U.S. Marine Corps 1994) that is in the high quality 5 to 10 year-old, early succession stage (Franzreb 1989). The least Bell's vireo is sensitive to changes in riparian vegetation. Their decline is attributed to habitat loss and fragmentation, and loss of riparian vegetation associated with water development and flood control projects that alter natural flow regimes. They are also threatened with nest parasitism by brown-headed cowbirds.



PHOTOGRAPH 3-7: LEAST BELL'S VIREO Credit: J. Gallagher, Sea and Sage Audubon

Range-wide control of the brown-headed cowbird (trapping and nest monitoring) resulted in a nearly 10-fold expansion in the population of the vireo in the 1990s (Tetra Tech 2002). Since then, habitat restoration and cowbird trapping programs have helped the vireo recover from near extinction.

The least Bell's vireo is predominantly an insectivore. Nesting for the least Bell's vireo occurs from March 15 to September 30. During the early and middle portion of the nesting season, most foraging occurs near the nest site, predominantly in willow. Both high and low shrubs are

used as the foraging substrate. These birds use non-riparian habitats occasionally and will travel an average of 15 meters to forage. The territories for the birds that make use of non-riparian areas for foraging tend to be limited to the narrowest sections of riparian habitat (Franzreb 1989).

A low, dense shrub layer is considered essential for nesting (Franzreb 1989), and a large degree of vertical stratification is preferred. Willow is most commonly used. Most nest sites are located near the edges of thickets. Nest height on average is 1 meter above the ground (Regional Environmental Consultants 1988). Males are tenacious about nesting sites and return to the same site in succeeding years. Regional Environmental Consultants (1988) reported an average territory of about 0.8 hectare.

Status at NBVC Point Mugu

Only a few observations of the least Bell's vireo have been recorded at NBVC Point Mugu, and limited data are available regarding use of habitat for nesting and foraging. The first observation of this species was made in May 2001. At that time, a singing male was detected vocally and visually in the riparian stand located on the northwest portion of the installation adjacent to the Channel Islands Air National Guard. Because of its secretive behavior, the vireo is more easily detected by its song.

The species was not observed after 2001, until NBVC ED staff captured two individuals in mist nets placed by the Las Posas Gate willow patch in 2009. Later that day, a total of four male vireos were documented vocalizing in the area. The federally endangered least Bell's vireo has been recorded sporadically in various willow patches at NBVC Point Mugu since 2009. In 2011, USDA Wildlife personnel conducted 11 presence/absence surveys in accordance with USFWS survey guidelines, in willow habitat adjacent the airfield. Surveys were conducted in anticipation of potential willow removal to remain compliance under airfield clearance requirements and to benefit the BASH program, due to proximity to the runway. One individual was detected on two separate occasions. Additional passive surveys conducted by NBVC ED did not detect any individuals (NBVC 2011). No vireos were detected in 2012 at four willow sites surveyed. No critical habitat for this species is within NBVC Point Mugu boundaries. Surveys need to continue to document if least Bell's vireo's return to Point Mugu. It may be that previous observations were anomalies, with Point Mugu not likely having appropriate habitat. As most natural areas are dominated by salt marsh, there is little potential available least Bell's vireo habitat, and that habitat still may not be appropriate. On the adjacent Channel Islands Air Guard Station there is a patch of habitat that is also seemingly suitable for vireos. Surveys are needed to determine this species' future use of NBVC Point Mugu.

Specific Concerns

- Habitat loss and conversion due to non-native plant species.
- Loss of nesting habitat due to BASH hazard mitigation activities.
- Anthropogenic disturbances to nesting birds and their habitat.

- Impacts from nest depredation by brown-headed cowbirds.
- Impacts of sea level rise to least Bell's vireo habitat.

Current Management

Natural resource management and strategies outlined in this document contribute to overall recovery objectives for least Bell's vireo. In the event that this species is recorded on the base again, more frequently, or breeding pairs occur, NBVC ED would coordinate with the USFWS to conduct more intensive monitoring and management of this species to ensure no impacts occur and to promote the recovery of this species. Project impacts to this species and habitat are avoided and minimized through the SA/PRB process and with implementation of this INRMP.

Assessment of Current Management

In the event that least Bell's vireos return and are suspected or confirmed breeding at Point Mugu, they will be well managed under guidelines of this INRMP. Surveys to monitor for their return will continue, with an increased effort if and when they return.

Management Strategy

Objective: Maintain viable populations of Least Bell's vireo, in accordance with the federal ESA of 1973, as amended.

- *I.* Continue to conduct presence/absence surveys (using established methodology).
 - A. Track nesting success if nests are encountered.
 - *B.* Coordinate with USFWS if this species is consistently recorded on base, or if nesting activity occurs, to establish a more intensive monitoring program.
- *II.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - A. Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - *B.* Partner with, and use cooperative assistance from, wildlife agencies, organizations, and volunteers to help collect needed data.
 - *C.* Continue to integrate collected data with regional databases, to support rangewide recovery efforts.
- *III*. Continue to use the SA/PRB to avoid and minimize potential impacts to special status species and their habitats.

- A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *B.* Conduct habitat restoration as outlined in habitat-specific goals and strategies in this INRMP.
 - *1.* Conduct invasive plant control.
 - 2. Install native plantings in appropriate habitats.
- *C.* Restrict access to protected areas.
- D. Install signs to inform on sensitive species and habitats.
- E. Educate personnel on protected species regulations and responsibilities.
- *IV.* Reduce populations of known predators.

3.5.2 Other Special Status Species at NBVC Point Mugu and Special Area Laguna Peak

NBVC Special Area Laguna Peak has no special status species and will not be discussed further.

In addition to the federally listed species discussed above, numerous other plant and animal species use the Mugu Lagoon and other habitats at NBVC Point Mugu. Tens of thousands of shorebirds visit Mugu Lagoon every year, marine mammals pup on the mudflats, invertebrates and fish live in the lagoon, and estuarine habitat provides habitat essential to the survival of all the species. No known plant or animal candidate species listed by USFWS inhabit the base; however, CDFW considers several plants and animals species of special concern in the area of NBVC Point Mugu.

Sensitive species are those that (1) could become endangered in or extirpated from a state, or within a significant portion of its distribution; (2) are under status review by the USFWS or the National Marine Fisheries Service (NMFS); (3) are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution; (4) are undergoing significant current or predicted downward trends in population or density such that federally listed, proposed, or candidate status or state-listed status could become necessary; (5) typically have small and widely dispersed populations; or (6) inhabit ecological refugia or other specialized or unique habitats.

"Species of special concern," are species, subspecies, or distinct populations native to California that are of conservation concern. State requirements for mitigation of effects on special status species are not applicable on federal lands. However, documentation of potential effects on these species is required under NEPA. State listed endangered or threatened species that are also federally listed are in Table 3-5; those with no federal status, and other special status species that

have been recorded at NBVC Point Mugu are listed in Table 3-6. No federally listed species have been recorded at Special Area Laguna Peak.

Family Name	Scientific Name	Common Name	Conservation Status
VEGETATION		-	-
Asteraceae	Lasthenia glabrata subsp. coulteri	Coulter's goldfields/ Salt marsh daisy	1B.1
Chenopodiaceae	Suaeda esteroa	Estuary sea blite	1B.2
INVERTEBRATES			
Carabidae	Cicindeis sentilis frosti	Senile tiger beetle	S1
Cicindelidae	Cicindela gabbi	Gabb's tiger beetle	S1
Cicindelidae	Cicindela hirticollis gravida	Sandy beach tiger beetle	S1
Hesperiidae	Panoquina errans	Wandering (saltmarsh) skipper	S1
Hydrobiidae	Tryonia imitator	California brackish water snail	S2
Nymphalidae	Danaus plexippus	Monarch butterfly	S3
Tenebrionidae	Coelus globosus	Globose dune beetle	S1
FISH			
Cyprinidae	Gila orcutti	Arroyo chub	S2
REPTILES			
Colubridae	Thamnophis hammondii	Two-striped garter snake	SC, S2
Emydidae	Actinemys marmorata pallida	Pacific pond turtle	SC, S3
MAMMALS			
Cricetidae	Sorex ornatus salicornicus	Southern California saltmarsh shrew	S1
Otariidae	Zalophus californianus	California sea lion	MMPA protected
Phocidae	Mirounga angustirostris	Elephant seal	CDFW-FP, MMPA protected
Phocidae	Phoca vitulina richardsi	Pacific harbor seal	MMPA protected
BIRDS			
Parulidae	Icteria virens	Yellow-breasted chat	S3
Gaviiformes	Gavia immer	Common loon	CDFW-SSC, IUCN-LC
Pelecanidae	Pelecanus occidentalis californicus	California brown pelican	CDFW-FP, F and S Delisted

ABLE 3-6: OTHER SPECIAL STATUS SPECIES AT NBVC POINT MUGU

Family Name	Scientific Name	Common Name	Conservation Status
BIRDS		-	
Phalacrocoracidae	Phalacrocorax auritus	Double-crested cormorant	CDFW-WL, IUCN- LC
Ardeidae	Ardea alba	Great egret	CDFW-s, IUCN-LC
Ardeidae	Ardea herodias	Great blue heron	CDFW-s, IUCN-LC
Ardeidae	Egretta thula	Snowy egret	IUCN-LC
Ardeidae	Nycticorax nycticorax	Black-crowned night heron	IUCN-LC
Falconidae	Falco columbarius	Merlin	CDFW-WL, IUCN- LC, CITES
Falconidae	Falco mexicanus	Prairie falcon	BCC, PIF, S3, CITES
Falconidae	Falco peregrinus	Peregrine falcon	F and S delisted, BCC, CITES
Falconidae	Falco sparverius	American kestrel	PIF, CITES
Accipitridae	Accipiter cooperii	Cooper's hawk	CDFW-WL, IUCN- LC, CITES
Accipitridae	Accipiter striatus	Sharp-shinned hawk	CDFW-WL, CITES
Accipitridae	Aquila chrysaetos*	Golden eagle*	CDFW-FP, S3, CITES
Accipitridae	Buteo jamaicensis	Red-tailed hawk	CITES
Accipitridae	Buteo lineatus	Red-shouldered hawk	CITES
Accipitridae	Buteo regalis	Ferruginous hawk	S3, CITES
Accipitridae	Buteo swainsoni	Swainson's hawk	BCC, S-T, CITES
Accipitridae	Circus cyaneus	Northern harrier	PIF, CITES
Accipitridae	Elanus leucurus	White-tailed kite	CDFW-FP, CITES
Accipitridae	Haliaeetus leucocephalus	Bald eagle	CDFW-FP, S-E, F delisted, CITES
Accipitridae	Pandion haliaetus	Osprey	CDFW-WL, IUCN- LC
Gruidae	Grus Canadensis*	Sandhill crane*	S-T, CITES
Charadriidae	Charadrius vociferus	Killdeer	PIF
Haematopodidae	Haematopus bachmani	Black oystercatcher	IUCN-LC, USFWS- BCC, PIF

TABLE 3-6: OTHER SPECIAL STATUS SPECIES AT NBVC POINT MUGU (CONTINUED)

Family Name	Scientific Name	Common Name	Conservation Status
Scolopacidae	Arenaria melanocephala	Black turnstone	BCC, PIF
Scolopacidae	Calidris canutus	Red knot	BCC
Scolopacidae	Limnodromus griseus	Short-billed dowitcher	BCC, PIF
Scolopacidae	Limosa fedoa	Marbled godwit	BCC, PIF
Scolopacidae	Numenius americanus	Long-billed curlew	BCC, PIF
Scolopacidae	Numenius phaeopus	Whimbrel	BCC
Scolopacidae	Phalaropus tricolor	Wilson's phalarope	PIF
Scolopacidae	Tringa semipalmatus	Willet	PIF
Laridae	Larus californicus	California gull	CDFW-WL, IUCN- LC
Laridae	Larus heermanni	Heermann's gull	PIF
Laridae	Larus occidentalis	Western gull	PIF
Laridae	Rynchops niger	Black skimmer	BCC
Laridae	Sterna elegans	Elegant tern	BCC, PIF
Laridae	Sterna forsteri	Forster's tern	IUCN-LC
Tytonidae	Tyto alba	Barn owl	PIF
Strigidae	Asio flammeus	Short-eared owl	PIF, CITES
Strigidae	Athene cunicularia	Burrowing owl	CDFW-SSC, IUCN- LC USFWS-BCC, PIF, CITES, S2
Strigidae	Bubo virginianus	Great Horned owl	CITES
Trochilidae	Archilochus alexandri*	Black-chinned hummingbird*	PIF, CITES
Trochilidae	Calypte anna	Anna's hummingbird	PIF, CITES
Trochilidae	Calypte costae*	Costa's hummingbird*	IUCN-LC, PIF, CITES
Trochilidae	Selasphorus platycercus*	Rufous hummingbird*	PIF, CITES
Trochilidae	Selasphorus sasin	Allen's hummingbird	IUCN-LC, USFWS- BCC, PIF, CITES

TABLE 3-6: OTHER SPECIAL STATUS SPECIES AT NBVC POINT MUGU (CONTINUED)

Family Name	Scientific Name	Common Name	Conservation Status
Picidae	Picoides nuttallii*	Nuttall's woodpecker*	PIF
Tyrannidae	Sayornis nigricans	Black phoebe	PIF
Tyrannidae	Tyrannus vociferans	Cassin's kingbird	PIF
Laniidae	Lanius Iudovicianus	Loggerhead shrike	CDFW-SSC, USFWS-BCC, PIF
Vireonidae	Vireo gilvus	Warbling vireo	PIF
Vireonidae	Vireo huttoni*	Hutton's vireo*	PIF
Hirundinidae	Riparia riparia	Bank swallow	S-T
Hirundinidae	Tachycineta thalassina	Violet-green swallow	PIF
Aegithalidae	Psaltriparus minimus	Bushtit	PIF
Troglodytidae	Cistothorus palustris	Marsh wren	PIF
Timaliidae	Chamaea fasciata	Wrentit	PIF
Mimidae	Toxostoma redivivum	California thrasher	PIF
Parulidae	Dendroica nigrescens*	Black-throated gray warbler*	PIF
Parulidae	Dendroica petechia	Yellow warbler	CDFW-SSC, USFWS-BCC
Parulidae	Dendroica townsendi	Townsend's warbler	PIF
Parulidae	Geothlypis trichas	Common yellowthroat	CDFW-SSC, USFWS-BCC
Parulidae	Vermivora virginiae*	Virginia's warbler*	PIF
Emberizidae	Melospiza melodia	Song sparrow	BCC, CDFW-SSC
Emberizidae	Passerina amoena*	Lazuli bunting*	PIF
Emberizidae	Passerculus sandwichenis beldingi	Belding's savannah sparrow	S-E
Emberizidae	Pheucticus melanocephalus*	Black-headed grosbeak*	PIF
Emberizidae	Pipilo crissalis	California towhee	PIF
Emberizidae	Pipilo erythrophthalmus	Spotted towhee	BCC
Emberizidae	Spizella passerine*	Chipping sparrow*	IUCN-LC
Emberizidae	Aimophila ruficeps canescens*	Southern California rufous-crowned sparrow*	CDFW-WL
Icteridae	Agelaius tricolor	Tricolored blackbird	BCC, PIF

Family Name	Scientific Name	Common Name	Conservation Status
Icteridae	Euphagus cyanocephalus	Brewer's blackbird	PIF
Icteridae	Icterus cucullatus	Hooded oriole	PIF
Icteridae	lcterus galbula	Bullock's oriole	PIF
Icteridae	Sturnella neglecta	Western meadowlark	PIF
Fringillidae	Carduelis lawrencei*	Lawrence goldfinch*	BCC, PIF
Fringillidae	Carduelis psaltria	Lesser goldfinch	PIF
Fringillidae	Carpodacus mexicanus	House finch	PIF

TABLE 3-6: OTHER SPECIAL STATUS SPECIES AT NBVC POINT MUGU (C	CONTINUED)
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NOTES: * = One to few recent observations.

1B. 1 = California Native Plant Society Inventory of Rare and Endangered Plants, listed seriously threatened in California 1B. 2 = California Native Plant Society Inventory of Rare and Endangered Plants, listed fairly threatened in California SC = State special concern species S1 = State, Critically imperiled S2 = State, Imperiled S3 = State, Vulnerable CDFW = California Department of Fish and Wildlife FP = Fully Protected MMPA = Marine Mammal Protection Act CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora IUCN = International Union for Conservation of Nature LC = Least Concern BCC = Bird of Conservation Concern SSC = Species of Special Concern PIF = DOD Partners in Flight species WL = Watch List USFWS = United States Fish and Wildlife Service S = State E = Endangered s = Sensitive T = Threatened

Specific Concerns

- Impacts to Belding's savannah sparrow nests and habitats due to access of marsh by researchers or pest management.
- Sea level rise and climate change impacts to flora and fauna.
- Habitat degradation by invasives and anthropogenic disturbances.
- Impacts from predation.

Current Management

The management of these species is addressed under previous sections for habitat, fish and wildlife, invasive species management, and Section 6.0 Sustainability of the Military Mission. NBVC ED conducts basewide surveys for Belding's savannah sparrows every 5 years, to

monitor for changes in abundance and distribution. NBVC ED conducts other species specific surveys when possible. The recent insect surveys conducted at NBVC Point Mugu are designed to update the species inventory list, and as such, have been conducted basewide and document special status insects. Wetland monitoring also records these species when present within restoration sites (Section 3.3.1.5 Jurisdictional Waters-Wetlands Management). Bird surveys and birding trips also help identify presence and use of the installation by sensitive bird species.

Although NBVC is not required to manage for sensitive species warranting stewardship, the Navy recognizes the value of maintaining diverse ecosystems. The Navy recognizes that it is prudent to protect rare species as a proactive strategy to prevent future federal listings. Through the SA/PRB, the Navy complies with the laws pertaining to regulated species by avoiding and minimizing impacts to habitats where those species may occur. To the extent that resources are available to support the management of such species, NBVC intends to implement the following objectives and strategies.

Assessment of Current Management

The habitat-based and species-specific management measures proposed in this INRMP, in conjunction with the SA/PRB, provide a sufficient level of natural resource management to protect and conserve species warranting Navy stewardship at NBVC Point Mugu.

Management Strategy

Objective: Maintain current information on presence and distribution of special status species.

- *I.* Fund and conduct surveys for special status species, using qualified biologists certified to conduct special status species surveys.
 - A. Continue to inventory and map all existing species warranting Navy stewardship.
 - 1. Continue to conduct a basewide survey of Belding's savannah sparrows every 5 years.
 - 2. Continue to survey and track Pacific pond turtle population on base.
 - *a.* Continue to explore various site-specific trapping techniques to determine the best and most efficient method of surveying this species.
 - b. Identify pond turtle nesting areas and nesting success.
 - *c*. Reduce any limiting factors in turtle reproduction if applicable.

- *3.* Work with CDFW to partner and develop a monitoring and surveying plan for the burrowing owl.
- B. Incorporate data into natural resource management databases.
- *II.* Support ongoing and new research on distribution and ecology of species warranting Navy stewardship. Encourage academic institutions to facilitate resource data collection.

Objective: Prevent federal listings by conserving and enhancing species warranting Navy stewardship.

- *III.* Based on results of surveys, species warranting Navy consideration and the habitats that support them should be protected to the extent practicable by giving them consideration during the land use planning processes.
 - A. Continue to use the SA/PRB to minimize potential impacts to special status species and their habitats.
 - *1.* Use species information and their habitat requirements to guide the development of project-specific BMPs.
 - *B.* Maintain contact with regional specialists and regulatory agencies regarding the listing status of unique species known or thought to occur at NBVC Point Mugu and Special Area Laguna Peak.
 - *C.* Continue to participate in the USFWS/NMFS review and listing process for species known or thought to occur at NBVC Point Mugu and Special Area Laguna Peak that are being considered for listing under the ESA.
 - *D.* Stay updated on agency decisions, published material, and meetings that change the listing status of species.
 - E. Reduce potential disturbance or take of Belding's savannah sparrow nests.
 - *1.* Develop access routes and educate researchers on presence of sensitive species, and how to avoid, especially during nesting season.
 - 2. Restrict access to nesting habitats: During nesting season, avoid upper salt marsh community by requiring access only through regularly inundated areas.
 - F. Remove invasive species: Conduct invasive plant control and non-native turtles.

- G. If nesting areas for Pacific pond turtle are identified, protect from disturbance.
- *H.* Protect fringe areas of the marsh to allow for migration of salt marsh habitats due to sea level rise.
- *I.* Manage predators if they are determined to be a significant limiting factor, and reduce non-native predators when possible.

3.5.3 Other Special Status Species that Have a Potential to Occur at NBVC Point Mugu

The species described below have potential to occur at NBVC Point Mugu and are either listed under the federal ESA as threatened or endangered, or recognized by CDFW as Species of Special Concern or species at risk, and tracked through the California Natural Diversity Database (CDFW 2012a). Species with a high potential to occur at NBVC Point Mugu are detailed in Table 3-7. No special status species occur at NBVC Special Area Laguna Peak. Of the species listed in the table, the following is a brief discussion of federally listed species with the most potential to occur, based on regional surveys and habitats on base.

Family Name	Scientific Name	Common Name	Conservation Status
VEGETATION			
Fabaceae	Astragalus pycnostachyus var. lanosissimus*	Ventura marsh milk-vetch	FE
INVERTEBRATES			
Lycaenidae	Euphilotes battiodes allyni	El Segundo blue butterfly	FE
FISH			
Salmonidae	Oncorhynchus mykiss	Steelhead trout	FE
REPTILES			
Anniellidae	Anniella pulchra pulchra	Silvery legless lizard	SC, S3
MAMMALS			
Cricetidae	Microtus californicus stephensi	South Coast marsh vole	S1
	Id likely only occur if planted		

TABLE 3-7: OTHER SPECIAL STATUS SPECIES WITH A HIGH POTENTIAL FOR OCCURRING AT	
NBVC POINT MUGU	

NOTES: * = This species would likely only occur if planted.

FE= Federally endangered

SC = Special concern species

S1 = Critically imperiled

S3 = Vulnerable

Federally listed, potentially occurring species are described below.

3.5.3.1 Ventura marsh milk-vetch (Astragalus pycnostachyus var. lanosissumus)

Background of Species

Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*) was listed in 2001 as federally endangered and at the time of listing, was known to occur at only one location (Mandalay Beach), north of NBVC Pont Mugu. Prior to its listing, the last known collection of the plant was in 1967 and it was thought to be extirpated until re-discovered in 1997 at Mandalay. This species is a short-lived herbaceous perennial, belonging to the Fabaceae (pea family) and believed to have a 3 to 4-year life span. This species has a thick taproot and multiple erect, reddish stems, 40 to 90 centimeters (cm) (16 to 36 inches) tall that emerge from the root crown. The pinnately compound leaves are densely covered with silvery-white hairs and flowers are numerous, yellowish-white to cream colored and in dense clusters. This species blooms from July to October, with most flowers maturing to fruits by early September. Pollinators observed include a limited number of skippers (family Hesperidae), marine blue butterflies (*Leptotes marina*), common hairstreak butterflies (*Strymon melinus*), and honey bees (*Apis mellifera*), and bumblebees (*Bombus* spp.) (USFWS 2010a).

This species has been collected in Los Angeles and Ventura Counties, in wetlands and coastal marshes. In Los Angeles County, it was collected from near Santa Monica in 1882, the Ballona marshes just to the south in 1902, and "Cienega" in 1904, also likely near the Ballona wetlands. In Ventura County, it was collected in 1901 and 1925 from Oxnard and in 1911 from Ventura, California. This species is believed to have been extirpated south of Santa Monica. This species has been recorded in a degraded coastal dune at McGrath State Beach in Ventura County. Reintroductions of this species have occurred within its historical range at Mandalay State Beach, McGrath State Beach, and Ormond Beach, between NBVC Port Hueneme and NBVC Point Mugu. Populations have also been established in Santa Barbara County (USFWS 2010a).

Studies on naturally occurring populations show wide interannual fluctuation in the number of individuals, attributed to local precipitation patterns and recent management activities. Declines in populations are due to habitat alteration, threats from herbivory, and competition from other species (USFWS 2010a).

Critical habitat for the species is located in coastal Ventura and Santa Barbara counties. In Ventura County critical habitat occurs south of the mouth of the Santa Clara River on McGrath State Beach, and on a mix of State, County, and private land along Mandalay Beach. NBVC Point Mugu and Special Area Laguna Peak contain no critical habitat for Ventura marsh milkvetch. The nearest critical habitat is at Mandalay Beach, approximately 7.5 miles north of NBVC Point Mugu (USFWS 2010a).

Status at NBVC Point Mugu

This species has not been recorded at NBVC Point Mugu. Based on current and historic distributions, this species could occur in the habitats at NBVC Point Mugu if re-introduced. Introducing this species is unlikely, as its introduction may create additional restrictions and requirements that may impact the mission or result in additional regulatory burdens.

3.5.3.2 El Segundo blue butterfly (Euphilotes battiodes allyni)

Background of Species

The El Segundo blue butterfly (*Euphilotes battiodes allyni*) was listed in 1976 as federally endangered (Federal Register 41 FR 22041). This species is known only from the El Segundo sand dunes in Los Angeles County, and occurs in four disjunct locations in southwest Los Angeles County, with a potential remanant population (genetic testing results pending) on Vandenberg Air Force Base in Santa Barbara County (USFWS 2008c). The butterfly is endemic to coastal sand dunes that contain suitable conditions for early life stages and larval food plants. The butterfly is thought to be dependent upon coastal buckwheat (*Eriogonum parvifolium*) for each of its four life stages (egg, larva, pupa, and adult). Additional requirements are adult nectar sources, and adult feeding, perching, and courtship areas. Soil and climactic conditions, as well as ecological and physical conditions are determining factors to the maintenance of habitat within its range. Presence of loose sand is thought to be a requirement (USFWS 1998).

Threats include habitat degradation by invasive species, off-road vehicles, and overcollecting. Specific criteria for downlisting to threatened status are: at least one secure population in each of the four Recovery Units is permanently protected; each of the four populations are managed to maintain coastal dune habitat dominated by local native species including its preferred food source, coastal buckwheat; each of the four populations must exhibit a statistically significant upward trend for at least 10 years (10 butterfly generations); and a program is initiated to inform the public about the El Segundo blue butterfly and its habitat (USFWS 1998).

Actions required to meet the recovery criteria include the protection, restoration, and management of existing habitat; determination of species requirements; introductions of animals to suitable locations; monitor populations; and coordination with the public (USFWS 1998). The 5-year status review determined no change to listing should occur (USFWS 2008).

Status at NBVC Point Mugu

This species has not been recorded at NBVC Point Mugu. During the summer of 2010, as part of an ongoing coastal survey for this species, Dr. Richard Arnold conducted surveys at NBVC Point Mugu, in stands of coastal buckwheat. Appropriate habitat was searched but none were observed. A majority of the buckwheat habitat that exists at Point Mugu is the result of removal of large mats of iceplant. Based on current and historic distributions of El Segundo blue butterfly, and

these newly restored habitats, this species could occur in the habitats at NBVC Point Mugu in the future.

3.5.3.3 Steelhead trout (Oncorhynchus mykiss)

Background of Species

The steelhead trout is a member of the family Salmonidae, which includes all salmon, trout, and chars. Steelhead trout are anadromous fish, born in freshwater streams, where they spend the first 1 to 3 years of life. The smolt migrate to the ocean, where they forage until maturity (one to four growing seasons), and return to their native fresh water stream to spawn. Unlike Pacific salmon, which spawn only once before dying, steelhead can spawn more than once. Under the ESA, the USFWS has listed 10 distinct population segments of West Coast steelhead. The southern California coast population was listed federally endangered (71 FR 834 862) in 2006, and includes all naturally spawned steelhead trout populations (and their progeny) in rivers from the Santa Maria River in San Luis Obispo County, California, to Malibu Creek, Los Angeles County. For the southern California population, between 26 and 52 percent of the 65 drainages that had historical occurrence of steelhead are still occupied. Twenty-two basins are considered vacant, extirpated, or nearly extirpated as a result of dewatering or the establishment of impassable barriers below spawing habitats (71 FR 834 862). The Calleguas Creek watershed and NBVC Point Mugu are outside critical habitat boundaries for southern California steelhead (70 FR 52488-52627). The nearest critical habitats to the north are at the Santa Clara and Ventura rivers, and to the south, at Arroyo Sequit and Malibu Creek.

Status at NBVC Point Mugu

This species has not been recorded in Mugu Lagoon. Historically, this species has occurred in the Ventura and Santa Clara Rivers north of NBVC Point Mugu, but not documented in Calleguas Creek. On 26 April 2013, CDFW documented a dead gravid steelhead trout during a flow rate survey on Conejo Creek, a tributary of Calleguas Creek (CDFW 2013). Migrating steelhead adults that move through the mouth of Mugu Lagoon en route to Calleguas Creek, and smolt which may utilize the estuary before heading out to sea, could be affected by habitat conditions in the Mugu estuary.

The following are concerns and management strategies for potentially occurring special status species at NBVC Point Mugu.

- Habitat degradation by invasive species or watershed pollutants, and the continued viability of Point Mugu habitats to support potentially occurring special status species.
- Climate change and sea level rise.
- Declines in regional special status species populations.

Current Management

NBVC ED regularly conducts avian surveys to determine how often or whether listed species use habitats at Point Mugu. Surveying for harder to find fauna such as insects are a challenge, unless funding is available; however, invertebrate research is occasionally conducted on the installation by universities and other researchers. Funding is requested to do these inventories, and as funding is available, NBVC ED will conduct other faunal inventories. NBVC ED does not conduct surveys at Laguna Peak, other than occasional visits to the site in the event there is a project that may impact resources. If new listed species are recorded in NBVC Point Mugu, this INRMP addresses management of those species at the individual and community levels through avoidance, minimization, and monitoring measures developed to achieve habitat protection and conservation benefits. If presence of a new listed species occurs at NBVC Point Mugu or Special Area Laguna Peak, the NBVC ED biologist will contact USFWS and CDFW, as appropriate, to determine management strategies. Annual INRMP metric updates provide a formal means to use adaptive management and review progress made for protecting and conserving potentially occurring federally threatened and endangered species at NBVC Point Mugu and Special Area Laguna Peak.

Assessment of Current Management

The Navy's current management of potentially occurring special status species is adequate. The presence of some of these species may go unnoticed if they are secretive, small and hard to identify, or in low densities. If special status species are documented in the future, their habitats will be managed appropriately to potentially aid in their recovery. To identify the potential impacts of base activities on listed species and other sensitive species at NBVC Point Mugu, regular basewide surveys for potentially occurring sensitive species are recommended. Most species surveys are conducted by NBVC ED personnel, while other species surveys require specialist support. Intensive species-specific surveys should be conducted in the appropriate habitat on base using USFWS or CDFW protocols, to confirm whether these species occur at NBVC Point Mugu. Survey reports should expand on information in this INRMP by discussing the habitat requirements of each species and providing recommendations for their enhancement.

Management Strategies

Objective: Maintain current information on presence and distribution of special status species.

- *I.* Conduct surveys (using established methodology) of listed species to determine presence or absence of species during breeding and nonbreeding season.
 - *1.* If new listed species are found, contact USFWS to discuss recommendations on how to modify the INRMP to manage this species.
 - *B.* Promote research and information exchange, including coordinated inventory and monitoring (EO 13186).
 - *1.* Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - 2. Partner with, and use cooperative assistance from, wildlife agencies, organizations, and volunteers to help collect needed data. Integrate with regional databases.
- *II.* If listed species are recorded using habitat at NBVC Point Mugu, then support recovery in accordance with the federal ESA of 1973, as amended.

3.6 PREDATOR MANAGEMENT

Standardized predator management was identified as a required mitigation measure under the Biological Opinion (Appendix O) for NBVC Point Mugu, and is implemented through a predator management program. The purpose of the predator management program is to remove nonnative and specific native predators from the breeding, foraging, and sheltering habitat areas of the following federally listed species: the light-footed clapper rail, western snowy plover, and California least tern. The least Bell's vireo, if and when they return to Point Mugu, will also benefit from this by removing predators from their habitats.

Predator management at NBVC Point Mugu is a sensitive issue because of the need to balance native and threatened species that interact as natural elements of the ecosystem. The goal at NBVC Point Mugu is to manage the habitat in a manner that is a "natural" as possible to maintain the function of the ecosystem. As such, native predators are a part of the system. Their presence is essential to maintaining a predator-prey balance, which typically leads to an ecosystem that functions better. As is normal in the wild, this predator-prey relationship may at times favor the prey; at other times, it will favor the predator. When this balance is disrupted unnaturally or if the threat to special status listed species is detrimental to their recovery, management actions will be taken to evaluate the situation, correct the imbalance, and reestablish the predator-prey equilibrium. Mammalian species targeted for removal at NBVC Point Mugu include coyotes, raccoons, red fox, striped skunks, opossums, house rats, and ground squirrels. All nonnative predators in natural areas will be removed. Removal of native predators is selective because the ultimate recovery of listed species depends in part on their ability to survive in the face of predation. Avian predators are selectively removed at the discretion of the NBVC Point Mugu Natural Resources Manager. Avian predators are removed as part of management, with the exception of some raptors. When determined to be appropriate and possible, raptors are captured and relocated rather than removed. Some avian predators have shown a propensity to return to NBVC Point Mugu after they have been relocated. Management of native predators will be limited to individual animals that cause a known predation problem as indicated through monitoring, or to situations where a substantial threat is posed to nesting western snowy plovers, California least terns, or light-footed clapper rails.

Coyotes are a predator of waterfowl, small mammals, western snowy plovers, and California least tern nests at NBVC Point Mugu; however, as a top-level predator, they are also an important component of the base ecosystem. Additionally, coyotes control the population of nonnative red fox (and other mesopredators) through territorial exclusion and, occasionally, direct predation (Read 2001). As a native species and top-level predator at the base, non-lethal approaches to coyote predation, are implemented at NBVC Point Mugu when possible. The success of these non-lethal approaches depends on whether the coyote population on the base is stable, territorial, or transient.

Specific Concerns

- Upsetting the ecological balance from removal of top niche predators and reducing available prey.
- Increasing predator populations due to human presence and the cover provided by litter.
- Accidental removal of non-target species.

Current Management

Predators are sufficiently controlled in a manner that avoids or minimizes impacts to listed species. Control efforts are intensive from April through August, with less intensive efforts to control only non-native species during the non-breeding season. All activities are completed according to federal and state laws and regulations. NBVC ED conducts predator management under a USFWS Depredation permit. Raptor relocation required an additional MOA and state collection permit under authority of CDFW.

Assessment of Current Management

NBVC ED manages predators appropriately by removing non-native predators and being selective in which native predators are removed. This program has reduced predation rates. However, predation still has a significant impact on listed species, as certain species such as ravens and raptors are hard to remove and/or trap and relocate. Permits requirements for relocation and selection of trap types also limit the predator management program success. Once raven control and trapping can be improved and permits are again acquired for raptor relocation, the effectiveness of predator management should increase significantly.

Management Strategy

Objective: Protect federally listed species and maximize their reproduction by implementing effective predator management.

- *I.* Reduce populations of non-native predators.
 - A. Harass or remove all non-native predators as appropriate.
- *II.* Minimize lethal removal of native predators.
 - A. Always attempt non-lethal dispersal and removal techniques prior to lethal removal for native predators.
 - *B.* Selectively remove problematic native predators.
 - *C.* Relocate raptors in lieu of lethal removal.
 - *D*. Ensure non-lethal techniques are the preferred and primary method for dispersing birds.
 - E. Ensure all requirements and limits of the USFWS depredation permit are followed.
 - F. Continue to research new techniques for non-lethal removal and trapping methods.
- *III*. Ensure predator and prey are removed at levels that sustain the populations.
 - *A.* Monitor native prey to track population trends which may identify why prey changes may be occurring and predators foraging more intensely in colonies.
- *IV.* Implement adaptive management to reduce potential for accidental capture of non-target species.
- *V.* Continue to pursue appropriate raptor relocation procedures.

3.7 INVASIVE SPECIES MANAGEMENT

Non-native invasive plants and animals pose a serious threat to native ecosystems. Without the natural enemies of their original habitats, non-native invasive species can spread rapidly and outcompete California native species. Invasive plants can alter ecosystem processes, transport disease, or cause cascading impacts to native populations, potentially impacting multiple trophic levels. Whether introduced unknowingly by early settlers hundreds of years ago, or more recently by global commerce and travel, the spread of non-native invasive species throughout California is the second greatest threat to biodiversity next to direct habitat destruction. On a local level, the Navy has a high potential to spread invasive species across NBVC installations, through everyday activities such as transport of cargo and equipment by land, air and ocean. In installations, construction and military readiness activities have the potential to spread invasives from developed areas into natural areas.

Descriptions of invasive terrestrial and aquatic species documented at NBVC Point Mugu, and management objectives and strategies are provided below. A complete list of invasives recorded at NBVC Point Mugu is in Appendix G.

EO 13112 (Invasive Species) (03 February 1999) requires federal agencies to prevent the introduction of invasive species and restore native species and habitats that have been invaded. EO 13112 defines an invasive species as "an alien whose introduction does or is likely to cause economic or environmental harm or harm to human health." This EO requires federal agencies to:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a costeffective and environmentally sound manner;
- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and
- Promote public education on invasive species and the means to address them.

This EO does not authorize, fund or support actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless federal agencies determine and have made public that the benefits of such actions outweigh the potential harm caused by invasive species (National Archives and Records Administration 1999).

3.7.1 Terrestrial Invasives

Terrestrial invasive exotic species that occur at NBVC Point Mugu include invasive terrestrial plants, mammals, birds, and invertebrates.

The introduction and spread of non-native plants at NBVC Point Mugu threatens the viability and quality of habitats. The recent vegetation mapping effort conducted at NBVC Point Mugu in 2012, recorded approximately 701 acres of non-native vegetation (HDR 2013). Terrestrial invasives at NBVC Point Mugu occur at a higher frequency and cover in upland habitats; the salinity and water regime of the marsh habitats limit incursions by most invasive plants. The most problematic and widespread species currently identified at NBVC Point Mugu are myoporum, iceplant, perennial pepperweed, *Plecostachys serpyllifolia*, and European beachgrass. These species, in addition to arundo (*Arundo donax*), were specifically identified in the USFWS Programmatic Biological Opinion for removal within habitats occupied by the western snowy plover and light-footed clapper rail (USFWS 2001b). Invasive plant management is addressed in the NBVC Non-native Invasive Plant Removal Plan (NBVC 2010). The following describes some problematic species.

Giant Reed (Arundo donax): Within its introduced range, giant reed aggressively invades riparian channels, especially in disturbed areas. Seeds produced by giant reed in this country are seldom fertile; therefore, it spreads primarily vegetatively. Floods break up clumps of giant reed and spread the pieces downstream. Fragmented stem nodes and rhizomes can take root and establish as clones. The reed competes with native species such as willows, mule fat, and cottonwoods, which provide nesting habitat for least Bell's vireo and other native species. Establishment and success of giant reed within riparian habitat thus results in a decline in the diversity of native riparian plants. All evidence indicates that giant reed does not provide either food or habitat for native species of wildlife. Areas largely taken over by giant reed are therefore depauperate of wildlife. Furthermore, native flora and fauna do not offer any significant control mechanisms for giant reed (Bell 1993). Besides invading riparian areas, giant reed causes loss of habitat at NBVC Point Mugu as detritus builds up. Large amounts of detritus of the giant reed from upstream has accumulated on the sandy beaches of the eastern arm of Mugu Lagoon, making them unsuitable for nesting by the western snowy plover. In addition, the giant reed is now growing on the eastern arm in small patches, where it is invading habitat for the western snowy plover that is already reduced through the loss of sand transported from Calleguas Creek. Larger stands of giant reed are also present along the installation fenceline at the central basin adjacent to the Pacific Coast Highway, and in the northern extent of Calleguas Creek within the installation fenceline.

Myoporum or "Ngaio Tree" (*Myoporum laetum***):** This species is a coastal perennial plant that is common and abundant in disturbed areas, especially along roads. Myoporum, a broad shrub or small tree that can grow from 3 to 10 meters, was introduced to NBVC Point Mugu as a landscaping plant and, like the giant reed, has colonized large expanses of the Mugu Lagoon. The presence and distribution of myoporum at Point Mugu, prior to its introduction in landscaping materials, is unknown. Myoporum competes with other native plants, thereby reducing the space available for native species. Its growth habit includes a large canopy that

excludes growth of native herbaceous plants in its understory. By outcompeting native plants, myoporum also reduces the habitat and native food resources available to native insects, birds, and other wildlife, including special status listed species. However, the fruits it produces may be of some value to wildlife.

Iceplant (*Carpobrotus* **spp.**): This species is native to South Africa, and has been planted widely in California since the early 1900s, including at NBVC Point Mugu. Iceplant is remarkable in its ability to colonize habitats and spread rapidly, in the process excluding native plants. A variety of mammals consume its fleshy fruits, resulting in widespread dispersal of the seed. Seedlings establish taproots and then proliferate radially by stolons, forming a thick, dense mat. Single clones can cover large areas. Iceplant is a major threat to coastal strand and coastal dune scrub, and to chaparral, particularly after fire. It occupies hundreds of acres on NBVC Point Mugu, mostly in the upper salt marsh and marsh upland transition zones in the central basin and west of the runway. Significant efforts have been made to remove iceplant from certain areas at NBVC Point Mugu. Iceplant mats in western snowy plover, California least tern, and light-footed clapper rail habitats have been treated and extirpated. These habitats are regularly monitored and treated for re-sprouts.

European Beachgrass (Ammophila arenaria): European beachgrass is a perennial, rhizomatous grass that is native to sand dune areas of Europe, and was planted extensively to stabilize dunes. It was planted along the West Coast from 1869 through the 1960s, and now dominates most beaches. It spreads extensively and displaces native species, reducing diversity and the extent of open habitat. It ability to bind sand is greater than in native plants, and it modifies the topography of the dune, creating steep slopes subject to blowouts and severe Once it has become established, it can persist for long periods. erosion. USFWS has recommended eradicating European beachgrass that threatens nesting sites of the western snowy plover. All of the European beachgrass within California least tern and western snowy plover nesting sites have been treated and extirpated, with only follow-up re-treatments required. Large patches of beachgrass remain on the eastern side of Ormond East. Selected stands of European beachgrass may be left untreated: currently along Beach Road, on Holiday Beach, the dune complex created by European beachgrass serves to protect the road from coastal erosion; therefore, removing European beachgrass may put this infrastructure at risk.

Perennial Pepperweed (*Lepidium latifolium*): Perennial pepperweed is a state-listed noxious weed species, most frequently found in areas with some natural or anthropogenic disturbance, such as riparian areas, irrigation channels, and floodplains. This species has an aggressive growth pattern and forms monotypic stands that exclude native species. It reproduces by seed and vegetatively by its roots and small root fragments. Pepperweed alters soil salinity by removing salts from deep in the soil profile and depositing them on the soil surface. The altered soil conditions favor halophytes and shift plant composition and diversity. This species builds a dense organic layer on the soil surface that alters the carbon/nitrogen ratio. At NBVC Point Mugu, pepperweed was first observed in 2009 and has spread rapidly within the drainage ditches, especially Oxnard Drainage Ditch #2 and the banks of upper Calleguas Creek. This species is targeted for regular monitoring and treatment to ensure it does not establish in the western, central, and eastern arms of Mugu Lagoon (NBVC 2010).

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Other invasives targeted for treatment by NBVC ED include fountain grass (*Pennisetum* sp.), pampas grass (*Cortaderia* spp.), fennel (*Foeniculum vulgare*), castor bean (*Ricinus communis*), *Plecostachys serpyllifolia*, Brazilian peppertree, salt cedar (*Tamarix spp.*) and crystalline iceplant (*Mesembryanthemum crystallinum*). Invasive species sold as ornamentals but prohibited from landscape use in NBVC are documented in Appendix G, Species Lists and NBVC Approved Landscaping Plant List. All landscape designs and plant lists are to be reviewed and approved by NBVC ED and the NAVFAC Landscape Architect in the planning stages of project design to prevent new establishment of invasive species on the installation (Section 6.8.1). The housing communities within and adjacent to NBVC Point Mugu presents an opportunity for predatory domestic and feral cats to occur on base. Education of housing residents is provided to ensure cats and dogs are kept on property and not abandoned.

Rodents comprise a major invasive species group. The black rat (*Rattus rattus*), the Norway rat (*Rattus norvegicus*), and the house mouse (*Mus musculus*) all have a record of severely impairing ecosystems. Rodents can survive on a variety of food sources, are able to adapt quickly to new habitat, and are prolific breeders. In developed areas, rodents are controlled through the Pest Management Program (Section 3.7.3 Pests and Disease Vectors). Non-native rats are not commonly observed or captured in natural areas at NBVC Point Mugu.

Invasive exotic birds at NBVC Point Mugu include but are not limited to European starlings, house sparrows, and rock doves.

Argentine ants (*Linepithema humile*) have been recorded within transitional wetland habitat types at NBVC Point Mugu, in wetland restoration sites. They are regionally abundant and problematic. Studies have found that Argentine ants recruit rapidly and will numerically dominate and aggressively displace native ant species. This directly reduces biodiversity and alters the food web from the bottom up. Once established, Argentine ants are detrimental to other arthropods, alter the plant community and availability of food for vertebrates (Tetra Tech 2009b). They pose a threat to nesting birds and their offspring, reducing survivorship of fledglings. Argentine ants that occur in developed areas may be managed under the Pest Management Program.

Specific Concerns

- Invasive plant species threaten the integrity of NBVC Point Mugu natural communities.
- Invasive terrestrial mammals such as feral cats, opossums, and rodents pose a serious risk to avian, reptile, and mammal species.
- Argentine ants are an invasive terrestrial invertebrate species that poses a potential threat to the integrity of NBVC Point Mugu's terrestrial ecosystems and populations of nesting migratory birds.

- Source populations of invasives are in neighboring lands outside the NBVC Point Mugu fenceline.
- Habitats or communities are not regularly monitored to specifically identify new occurrences of invasive species.
- Maintain a current Invasive Species Management Plan to determine funding priorities.
- Invasive species have the potential of being transported to NBVC Point Mugu, and from the base to other locations like NBVC SNI through cargo storage and transport.
- Base activities such as new facilities may include landscaping that would not have gone through SA/PRB.
- Agriculture and California Department of Transportation maintenance practices may not eliminate roadside weeds adjacent to the installation, allowing them to seed and become a point source of plant pollution.

Current Management

NBVC ED receives funding each year to treat invasive species. Targeted areas for treatment are those habitats that support listed species. NBVC biologists also conduct invasive control treatments to supplement the annually contracted weed control treatments. Many species of weeds are close to extirpation and sensitive habitats have been significantly restored. Only habitats outside of sensitive habitats are currently stressed by invasive plants.

Implementation of EO 13112 is covered by National Invasive Species Council's 2008-2012 National Invasive Species Management Plan (National Invasive Species Council 2008). Management objectives and strategies in this INRMP build upon the framework provided by the National Invasive Species Management Plan. In addition to EO 13112, the Federal Noxious Weed Act (7 U.S.C. Section 2801 *et seq.*) explicitly provides for the control and eradication of noxious plants on land under the control of the federal government.

Pesticide use in natural resources management programs must comply with applicable requirements of Chapter 17 of OPNAVINST 5090.1C CH-1 (Navy 2011a) as identified in the NBVC Integrated Pest Management Plan (IPMP) (Navy 2011b). The control and eradication of invasive species is of primary importance to natural resources management at NBVC Point Mugu, and is a fundamental step toward recovery and conservation of natural ecosystems.

DoDINST 4150.07 (29 May 2008) provides guidance for the DoD Pest Management Program, for control of weeds, rodents, ants, and other organisms that could negatively affect ecosystems. NBVC conducts pest management activities in accordance with protocols detailed in the NBVC Integrated Pest Management Plan (NAVFAC SW 2011). The focus of the pest management

program at NBVC Point Mugu is largely on control of species bothersome to humans, in developed areas, and not necessarily invasive species having potential for ecosystem damage. Species addressed in the IPMP are rodents and other invertebrate pests, mosquitoes, and household pests. Control and eradication of invasive plant species along roadsides, fencelines, the airfield, and other developed areas at NBVC Point Mugu is conducted by NBVC Pest Control.

For weed management in natural areas, NBVC ED annually contracts weed eradication for natural areas of NBVC Point Mugu (Santare and others 2011). All treatment areas will require monitoring and potential re-treatment in the future. The Invasive Species Management Plan for NBVC Point Mugu was last updated in 2010 (NBVC 2010).

Herbicide is currently applied to control invasive nonnative and native species and noxious weeds along the shoulders of roads at NBVC Point Mugu (Santare and others 2011). Current application techniques include spraying from a slow-moving vehicle. The effects of these practices on listed species may include: (a) overspraying of herbicides into habitat for the light-footed clapper rail, Belding's savannah sparrow, and salt marsh bird's-beak, or (b) loss of potential pollinators for salt marsh bird's-beak. Application of herbicides is addressed in the IPMP. The following details guidelines for herbicide application at NBVC Point Mugu (Tetra Tech 2002).

- A map and matrix should be produced that will facilitate a reduction in the use of herbicide spraying along the shoulders of all road at NBVC Point Mugu.
- Only herbicide formulations (active and inert ingredients) and additives registered by EPA and approved by the DoD Pest Management Board will be applied on NBVC Point Mugu.
- Herbicides are applied according to label information and the need for applications in individual projects will be analyzed on a site-specific basis. The analysis will identify measures to protect the health of humans and wildlife, non-target vegetation, water, soil, and threatened and endangered species.
- Herbicides will be applied only by, or under the direct supervision of, certified applicators. NBVC Point Mugu personnel who have completed the necessary training will be certified in accordance with the DoD Plan for the Certification of Pesticide Applicators. Natural Resources personnel must be certified before they can be allowed to monitor and evaluate the performance of contractors.
- Contractor employees who apply herbicides at NBVC Point Mugu will be certified under state or EPA plans.
- The method for and timing of application will be chosen to achieve the objectives of the project while minimizing the effects on non-target vegetation and other environmental elements.

- Herbicides will be applied at the lowest rate effective to meet the objectives of the project.
- Meteorological conditions will be evaluated and accommodated before any application of an herbicide.
- Herbicides will not be discarded at NBVC Point Mugu. Contract personnel will store and dispose of all empty herbicide containers in a manner consistent with federal, state, and local laws and regulations.
- Any proposed use of herbicides in habitat for threatened and endangered species will be coordinated with USFWS. Roadside spraying should not occur at sites that are prone to erosion or with active bird nests on the shoulder.

A Biosecurity Plan for NBVC SNI has been developed that addresses strategies for prevention of the transport of invasive and pest species to SNI (Tetra Tech 2011b). Strategies include management of invasive species associated with airfield and cargo operations at NBVC Point Mugu. Implementation of the strategies outlined in the Biosecurity Plan will work to protect the natural resources of NBVC SNI.

Assessment of Current Management

NBVC ED has effectively managed problematic weeds with the funding available. Funding has only allowed for focusing on areas with endangered species, or on invasive species that may spread rapidly and are currently in small populations. Once sensitive areas have been restored, invasive removal will start occurring in outlying natural areas. The Invasive Species Management Plan for NBVC Point Mugu should be updated to include guidelines for the systematic method of identifying, prioritizing, and eradicating invasive species. The Invasive Species Management Plan should detail specific management strategies for various plant species that occur on the installation. Prevention, early detection and rapid response are necessary for the effective management of invasive introduction and spread, to avoid costly eradication of large populations. Strategic planning consistent with other government agencies' strategic plans is also necessary to address complex invasive species issues on a local and regional scale.

The Invasive Species Management Plan should include strategic goals that focus on prevention, early detection and rapid response, control and management, restoration, and organizational collaboration. Strategies should include the catalog, map and documentation of weed control efforts, to better track success of weed management activities. The plan should be revised regularly to update priority lists based on regional invasive species lists updates, and to detail current research on species, and the most up to date control practices.

Management Strategy

Objective: Minimize introduction of invasive non-native terrestrial species to NBVC Point Mugu through prevention.

- *I.* Implement the SNI Biosecurity Plan to prevent non-natives from entering NBVC Point Mugu and spreading to SNI through air and barge cargo.
- *II.* Develop and monitor standard operating procedures for base tenants that receive cargo from overseas, on procedures for opening cargo containers, checking contents, and alerting the appropriate personnel if an invasive species is detected.
- III. Revise the Invasive Species Management Plan and include prevention measures.
- *IV.* Support development of BMPs for projects in or adjacent to natural areas. For example (but not limited to):
 - A. Certify as "weed free," to the extent possible, gravel and fill materials.
 - *B.* Require that native plant species provided in Appendix G of this INRMP are used for landscaping, unless a species is specifically approved by NBVC ED.
 - C. Revegetate disturbed areas with native NBVC approved plants.
- *V.* Include in indoctrination information for NBVC Point Mugu military staff to prevent the introduction of non-native species.

Objective: Minimize the spread of invasive species through early detection and rapid response protocols and capabilities.

- VI. Establish monitoring locations to detect invasive species introduction and spread.
- *VII*. Develop a communication network as a rapid response tool to quarantine specific invaders and identify the pathway.
- *VIII.* Support rapid response by determining funding sources, contract vehicles, cooperative mechanisms that can be accessed quickly.

Objective: Evaluate control and management capabilities for established invasive non-native species populations and identify strategic gaps.

- *IX.* Develop and implement an Invasive Species Management Plan based on current needs, information, and priorities.
- *X.* Map and prioritize for treatment, terrestrial invasive non-native species populations.
- *XI.* Update GIS database to detail treatment areas, dates, species, and method of treatment.
- *XII.* Support studies that determine if there are impacts from invasive non-native species already present.
- *XIII.* Investigate and implement methods, if available, to control invasive non-native invertebrate species found at NBVC Point Mugu.

- A. Ensure funding is secured for non-native removal during all phases (including post-project), if applicable.
- *B.* Monitor projects to ensure personnel are following BMPs, conservation measures, and other guidelines and requirements.

Objective: Increase cooperative interagency efforts to collect and analyze comprehensive monitoring data, including shared funding and staffing.

- *XIV.* Support regional invasive species management initiatives and task forces, as opportunities arise.
- XV. Communicate with California Department of Transportation, NPS (Santa Monica Mountains National Recreation Area), and Coastal Conservancy (Ormond Beach wetlands), to ensure problem species that could migrate to NBVC Point Mugu from their property are treated in a timely manner.

Objective: Increase awareness of the threats and pathways of invasive species among military personnel, civilian employees, contractors, base housing, and other visitors to NBVC Point Mugu.

XVI. Prepare educational materials that include measures to prevent the introduction of invasive non-native species.

3.7.2 Aquatic Invasives

Aquatic invasives have the potential for rapid spread and colonization, smothering and outcompeting native reef, aquatic plants, and wildlife populations, decreasing native biodiversity. Their decay can rob waters of dissolved oxygen, and their presence can be a nuisance to beachgoers, an operational hazard for ships, and damaging to infrastructure such as levees, docks, and water delivery systems. Removal of aquatic invasives has proven extremely costly, with the most successful eradication efforts conducted in a rapid response manner, at the onset of identification. Eradication and control requires regional coordination on multiple levels, quick access to funding, public outreach, and efficient regulatory permitting (National Invasive Species Council 2008). Prevention of species introductions through vector management is considered the most desirable way to address aquatic nuisance species.

Targeted surveys for aquatic invasives are not conducted at NBVC Point Mugu. The Natural Resources Manager has observed the non-native red swamp crayfish (*Procambarus clarkii*) in freshwater drainage canals on base; fish surveys (Tetra Tech 2009c; Tetra Tech 2013b) have documented yellowfin goby (*Acanthogobius flavimanus*), a large non-native that preys on and outcompetes native fish, including the tidewater goby (USGS 2012). Caulerpa surveys are suggested when large-scale disruption to the sea floor occurs from operation activities. Non-native aquatic species documented at Point Mugu include a non-native mussel (*Mytilus galloprovincialis*) and Japanese oyster (*Crassostrea gigas*) in the estuary, and common carp (*Cyprinus carpio*), African clawed frog, western mosquitofish, and red-eared slider (*Trachemys scripta*) in the drainage ditches.

Specific Concerns

- Point Mugu is in the vicinity of regional harbors that receive much ship traffic, including commercial vessels, with various types of cargo that could be vectors for invasive species introductions from other parts of the world.
- Activities that disturb the lagoon floor could result in spread of existing invasives, to waters outside Mugu Lagoon.
- Vertical structures in the lagoon, such as debris along the sea floor, riprap, and pilings, provide habitat for invasive species attachment and spread.
- NBVC Point Mugu does not currently formally monitor for aquatic invasives species, other than documenting observations (including anecdotal) by researchers and Navy biologists.
- Treating invasives in an aquatic environment is costly and difficult.
- Residents on base may release unwanted aquarium organisms directly into the lagoon.
- Invasive sources outside of installation boundaries cannot be treated, making extirpation more difficult, if not impossible.

The following describes aquatic invasives recorded or potentially occurring at NBVC Point Mugu, due to regional presence:

Caulerpa (*Caulerpa taxifolia*) is a green alga native to tropical waters that has now invaded many coastal areas, including southern California. In areas where the species has become well established, it has caused ecological and economic devastation by overgrowing and eliminating native seaweeds, seagrasses, reefs, and other communities. This alga poses a substantial threat to marine ecosystems, particularly to the extensive eelgrass meadows and other benthic environments that make coastal waters such a rich and productive environment for fish and birds. Caulerpa surveys have not been conducted in Mugu Lagoon; surveys conducted in 2006 and 2008 at Port Hueneme did not report caulerpa in the harbor (Merkel and Associates, Inc. 2008). Protocol surveys for this species are typically requested by NMFS and USACE prior to initiation of dredging or other sea floor disturbance activities. If Mugu Lagoon provides appropriate habitat for Caulerpa to thrive, surveys should be conducted at some appropriate interval, to ensure Mugu Lagoon remains free of this species, to allow for early detection, and to avoid the spread of the population.

Mosquitofish (*Gambusia affinis*) is native to the Atlantic and Gulf Coast drainages and tend to outcompete native fish where it is introduced if not managed appropriately. Mosquitofish are often reared by mosquito abatement districts and released to control mosquitos. Mosquitofish have been found in the drainage channels at NBVC Point Mugu (Woodward-Clyde 1998). They were placed in the drainage channels sometime prior to 1993 for mosquito control and are

currently not monitored by the base. At times, mosquitofish are captured on base and relocated to problem freshwater mosquito areas.

Yellowfin goby (*Acanthogobius flavimanus*) is native to Asia, and the largest species of goby found in California estuaries. Introductions of individuals likely occurred through ballast water exchange, with eggs introduced via transport on hull fouling organisms (USGS 2012). This species is a benthic omnivore and consumes invertebrates such as amphipods, bivalves, chironomids, and polychaetes (among others), and small fishes such as arrow gobies and juvenile topsmelt. Research in other saltwater marshes has shown that yellowfin gobies have partially replaced Pacific staghorn sculpins, in at least one saltwater location. Studies have suggested that yellowfin gobies may outcompete and possibly eliminate freshwater populations of tidewater gobies. Introduction of this and other foreign species, coupled with environmental disturbances, alter fish communities and hasten declines of native fishes in California (USGS 2012).

Current Management

NBVC ED biologists and researchers commonly access a majority of the installation and document species presence for a variety of projects, which includes anecdotal observations. Therefore, there is potential to identify new arrivals of aquatic invasive species. However, effort could always be increased and should be, to ensure the ecosystem is protected. There is some removal (management) of invasives when they are encountered, such as removing any non-native herps or fish when encountered in traps. NBVC ED should continue to request and enforce any researchers accessing the marsh to provide any invasive species specific data in a timely manner.

The DoD supports implementation of federal aquatic invasive species laws including but not limited to EO 13112, the National Invasive Species Act of 1996, and the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.

NBVC supports CDFW as the lead agency for managing aquatic invasive species found in the nearshore waters of NBVC Point Mugu and would collaborate with the CDFW Habitat Conservation Branch and the state invasive species coordinator. The CDFW conducts a number of programs related to aquatic invasive species, including serving as the lead agency in developing the statewide aquatic invasive species management plan, and a rapid response plan The CDFW is responsible for enforcement of regulations concerning the for invasions. aquaculture industry; recreational fishing; commercial fishing; the importation and transport of live wild animals, aquatic plants, and fish into the state; and the placement of any such animals or plants in state waters. Recent programs have focused on the aquarium plant Caulerpa taxifolia, the voracious northern pike (Esox lucius), and the New Zealand mudsnail (Potamopyrgus antipodarum). All species of Caulerpa are regulated in the state of California under CDFW Division 3, Chapter 3.5, Section 2300. Other state agencies with regulatory authority over aquatic invasive species include the California Department of Food and Agriculture through the California Food and Agriculture Code, California Department of Water Resources through the California Water Code, and the State Lands Commission through the Ballast Water Management Act of 1999, and the Marine Invasive Species Act of 2003.

Intensive efforts are not made to search the aquatic environment specifically for new introductions; as such, the program should increase survey efforts to effectively monitor for aquatic invasives. Conducting regular subtidal and intertidal habitat surveys would provide data on native resources as well as provide information on invasives. The prevention of aquatic invasive species into Mugu Lagoon could be enhanced through the SA/PRB process that guides BMPs for in-water activities. Prevention measures should be incorporated into contract language, operational and transportation policies, and pest management plans. Early detection of aquatic invasives should be conducted in marine and wetland habitats at NBVC Point Mugu. The Navy should support other entities that want to survey the flora and fauna of the lagoon and nearshore environment.

Management Strategy

Objective: Maintain the ecological integrity of marine and inland waters and associated native biota, of NBVC Point Mugu.

- *I.* Prevent the introduction of aquatic invasive species into NBVC Point Mugu waters.
 - A. Continue to use the SA/PRB to proactively prevent aquatic nuisance species incursions, by incorporating BMPs and prevention measures into contract language.
- *II.* Develop and implement a standardized monitoring system to facilitate early detection and rapid response for high priority aquatic invasive species.
 - *A.* Coordinate with researchers conducting surveys in the aquatic environment, to specifically target and identify presence and extent of aquatic invasives.
 - *B.* Conduct regular aquatic surveys to identify new invasives or changes in populations of known aquatic invasives.
- *III.* Promote cooperative interagency efforts to collect and analyze comprehensive monitoring data.
- *IV.* Support the response of CDFW and California Department of Food and Agriculture in the event of an aquatic nuisance species incursion.

Objective: Promote awareness of the threats and pathways of aquatic invasive species among military personnel, civilian employees, contractors, and other visitors to NBVC Point Mugu.

V. Prepare educational materials that include measures to prevent the introduction of invasive aquatic species for tenants and residents.

3.7.3 Pests and Disease Vectors

The DoD Pest Management Program (DoDINST 4150.07 [29 May 2008]) defines pests as arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds, and other organisms (except disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; or attack or damage real property, supplies, equipment, or vegetation.

The DoD Pest Management Program (DoDINST 4150.07) defines disease vectors as organisms capable of transmitting the causative agent of a human disease; serving as an intermediate or reservoir host of a pathogenic organism; or producing human discomfort or injury.

Disease vectors and pest wildlife populations that are known or expected to occur at NBVC Point Mugu are described below, and managed according to protocol detailed in the IPMP (NAVFAC SW 2011). Pest management activities are also addressed in the Programmatic Biological Opinion (USFWS 2001b) (Appendix O).

Mosquitoes: Numerous mosquito breeding locations exist throughout the installation. NBVC Point Mugu contains the largest habitat on the Southern California coast for the most nuisance mosquito species, the black salt marsh mosquito (*Aedes taeniorhynchus*). Other species recorded at Point Mugu include *Culex tarsalis* and *Cx. pipiens quinquefasciatus*, two species that can transmit mosquito-borne encephalitis virus. These species breed in permanent and semi-permanent water bodies. *Cx. tarsalis* larvae are more likely to be found in freshwater drainage ditches, ponds, and marshes in and around the installation. *Cx. pipiens quinquefasciatus* commonly breed in backyard sources such as planters, gutters, and other human-made items that hold water (NAVFAC SW 2011). Mosquitoes recorded in Ventura County also include *Anopheles franciscanus* and *Anopheles occidentalis*. These species can be carriers of diseases such as yellow or dengue fever (*Aedes* sp.), malaria, viral encephalitis, West Nile virus (*Anopheles* sp.), meningitis, and filaria diseases (*Culex* sp.) (Tetra Tech 2009b). Hosts for these species include birds, mammals, and humans.

The IPMP for NBVC Point Mugu addresses strategies for mosquito control and includes an Emergency Vector-borne Disease Control Plan (NAVFAC SW 2011). Pesticide application management at Point Mugu historically used low-flying helicopters for application of *Bacillus thuringiensis israelensis* across the lagoon and developed areas. These methods of aerial application are no longer used at NBVC Point Mugu, as it was determined that ground surveys and treatment were more effective.

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Rodents: The deer mouse, a native species, can be a host of hantavirus, a virus often fatal to human beings. This species is primarily responsible for an outbreak of the virus in 1993 in the southwestern United States. Deer mouse populations are widespread in the United States and NBVC Point Mugu and are present on base. Hantavirus testing has occurred in the past, with no confirmed cases of hantavirus at Point Mugu.

The Norway rat (*Rattus norvegicus*), house rat (*Rattus rattus*), and house mouse (*Mus musculus*) are managed in developed areas by NBVC Pest Control. These species can cause extensive property damage and are a risk to air operation safety if they gain access onboard planes. Their introduction to island ecosystems can have devastating impacts to native wildlife and ecosystems. As such, these species are also managed at the NBVC Point Mugu airfield and storage areas, for implementation of the SNI Biosecurity Plan (Tetra Tech 2011b).

The California ground squirrel occurs at NBVC Point Mugu and is considered a pest with potential to carry the plague virus. The California ground squirrel may disturb landscaped areas by digging up vegetation. Studies have shown that ground squirrel populations decline in fields where vegetative cover is allowed to increase; decreasing field cover allows ground squirrels to detect predators more easily. They are problematic on the airfield, as their burrows undermine the integrity of paved areas and are also a BASH hazard as they attract raptors to the airfield. Ground squirrel populations are managed in the airfield and in housing under the Pest Management Program, and in sensitive listed species nesting areas by the Natural Resource Program (Section 3.6 Predator Management). Possible actions for control include live trappings, construction of raptor perches, and increasing grass heights. NBVC follows IPMP protocols, which direct that the least toxic methods for controlling pests are used. Chemicals such as fumigants or rodenticides are used as a last resort. Ground squirrels provide habitat for burrowing owls, by providing burrows for this sensitive species.

Potential Listed Species Effects: The effects of pest management on listed species may include: (a) disturbance to listed species by pest control vehicles or staff; (b) reductions in prey that result from application of pesticides; (c) adverse effects to pollinators and other benficial arthropods; (d) damage to habitat due to access of personnel or vehicles into natural areas; and (e) accumulation of pesticides in salt marsh habitat. However, as long as coordination between the pest management and natural resource programs occurs, these potential effects will be avoided or significantly reduced.

Specific Concerns

- Pest management activities may impact natural resources.
- New introductions of pests that could impact natural resources.

Current Management

Priorities and management strategies for invasive species control at NBVC Point Mugu are outlined in the NBVC IPMP. NBVC recently revised their IPMP in 2011 (Navy 2011b). Revisions recur every five years.

The position of Integrated Pest Management Coordinator is housed in the NBVC ED. This position entails coordination of all pest control activities on the installation to ensure compliance with INRMP and other mandates. Pest control activities are managed and conducted by NBVC Public Works Department and their contractors.

Numerous chemicals are used in pest management at NBVC Point Mugu, including pesticides and herbicides, as are some biological controls (*Bacillus thuringiensis israelensis*, or Bti). Chemicals and biological controls are applied by a licensed applicator under the direction of the Navy's Facility Support Contracts Office, and according to protocol outlined in the IPMP. Only pesticides on the Navy's Authorized Use List are permitted.

NBVC Point Mugu has applied for a National Pesticide Discharge Elimination System permit to apply pesticides directly into Waters of the U.S. The base complies with all application guidelines, water testing regiments, and annual reporting.

Measures to ensure that sensitive species are not affected by pest management include:

- Pesticide management activities discussed in the Biological Opinion are followed, including the avoidance of nest sites and nesting substrates. If additional affects to listed species or disturbances to habitat are proposed, USFWS will be consulted.
- Pesticides will not be sprayed in areas where drift or overspraying could enter salt marsh habitat.
- Ultra-low volume (ULV) spraying of pesticide will occur only during onshore winds, and will be limited to areas adjacent to structures. The base weather station will supply information on wind direction, and the wind direction and days pesticide is sprayed will be recorded and reported to the USFWS at the end of the mosquito season.
- Ponded areas where mosquito abatement is critical will be mapped annually, and the individual locations where mosquito controls are applied will be specified to limit the widespread use of pesticides. Field use of chemical toxicants that cause secondary poisoning is prohibited for control of birds and mammals. A common secondary poisoning effect occurs when predatory birds consume rodents that have been poisoned in a control program. Therefore, the outdoor, aboveground use of rodenticides is limited to multiple-dose anticoagulants only, and only sporadically applied in the airfield (Tetra Tech 2002).

• Non-toxic methods for controlling pest species are applied whenever feasible.

Assessment of Current Management

Pests are adequately managed at Point Mugu. There is good coordination between pest management staff and the natural resource staff. Since bats, mammals, snakes, and some birds all can be viewed as pests in certain situations, this coordination is essential. Trying to find additional ways to educate tenants on how to live with native wildlife would benefit program. Pest control is done adequately, controlling pest issues, while minimizing impacts to natural resources.

Management Strategy

Objective: Increase detection of new pests and manage current populations of existing pests.

I. Coordinate with the NBVC IPMP to establish monitoring programs and reporting of changes in populations or new detections.

Objective: Minimize adverse impacts to natural resources from pest management activities.

- *II.* Coordinate with NBVC Pest Control and IPMP to ensure conflicts do not arise between pest control objectives and natural resources management goals.
 - *A.* Work closely with pest control operators to manage mosquito populations.
- *III.* Work with housing managers to address how best to deal with wildlife in housing areas.
- *IV.* Work with NBVC Medical personnel to conduct hantavirus surveys when funding is available.

3.8 NATURAL RESOURCES LAW ENFORCEMENT

DoD police have the authority of the Installation Commander and of the Sikes Act (16 U.S.C. 670a *et seq.*) to enforce all federal laws relating to the management of natural resources at NBVC Point Mugu and Special Area Laguna Peak, including the ESA, Clean Water Act, and MBTA. NBVC law enforcement activities are addressed in the Programmatic Biological Opinion (USFWS 2001b). NBVC Force Protection is responsible for enforcing beach closures designed to protect listed species. They are on continuous patrol, 24 hours per day. On occasion, the canine unit may take police dogs onto specific areas of the beach to remove trespassers. USFWS concluded in the Biological Opinion, that these activities have no significant impact to listed species.

NBVC Point Mugu is closed to the public because of security protocols for the military mission. The NBVC Point Mugu police patrol the base and monitor the boundaries of the installation to prevent trespassers from entering through the fencelines. Visitors who come to NBVC Point Mugu to take part in natural resource activities (such as birding tours) are allowed on the base only in groups authorized by the Public Affairs Office. Once they are on the base, all visitors are expected to follow installation regulations and observe base area restrictions. Occasionally trespassers enter NBVC property from adjacent property, such as Ormond Beach to the west. Navy security is usually notified (most often by Navy biologists) and responds to trespassers.

Specific Concerns

- Instances when NBVC Force Protection may not be aware of areas used by nesting birds or marine mammals, when they should coordinate access with NBVC ED to not disrupt and to minimize disturbance to listed species.
- Gaps in communication between NBVC ED and NBVC Force Protection, related to enforcement of closure areas or other areas requiring special protection.
- Uneducated or unlawful waterfowl hunters and their impacts to species.
- The Sikes Act, as amended, requires a Natural Resources Law Enforcement Program. There is currently no formal program to enforce federal laws relating to natural resources management at NBVC Point Mugu or Special Area Laguna Peak.
- There is only minimal presence of CDFW wardens during the duck hunting season.

Current Management

Protection of natural resources at NBVC Point Mugu is currently provided through NBVC Force Protection in regards to enforcing closed areas. CDFW game wardens help enforce fishing and hunting regulations when they come aboard the installation. No Wildlife/Natural Resources Law Enforcement Program is currently in place at NBVC Point Mugu. Navy police enforce closures to protect nesting areas for listed species. NBVC ED provides NBVC Force Protection maps of closure areas. Navy biologists work closely with NBVC Force Protection when trespassers are observed and access to nesting areas is required. During the nesting season, Navy biologists flag a nest-free access path for NBVC Force Protection to enter the beach to survey the western fenceline. Newly assigned NBVC staff are provided indoctrination education that contains information on environmental closures and sensitive species.

Assessment of Current Management

Natural resources are sufficiently protected under the current program. Force Protection is aware of all the closed areas and enforce the closures. Improvements may be made in communication of protocols in regards to responding in emergency situations in which sensitive areas must be accessed. Natural resource management activities (restoration, area closures, etc.) should be

continually communicated to NBVC Force Protection, to ensure successful management and protection of resources.

Staff from the USFWS Division of Law Enforcement should train Navy police staff to enforce management guidelines and ensure compliance with the ESA and its regulations. Procedures for enforcing ESA regulations should be developed so that enforcement is consistent regardless of the personnel on duty. Additional training should be provided for new Navy police if no member of the force has completed the program presented by USFWS. Written materials should also be made available as obtained from the USFWS Division of Law Enforcement.

Management Strategy

Objective: Reduce unauthorized access, activities, or other disturbances that may cause adverse impacts to sensitive habitats or species.

- *I.* Ensure NBVC Force Protection is informed of special closures due to listed or sensitive species presence, nesting, or habitat restoration activities.
- *II.* Maintain regular communication between NBVC Force Protection and NBVC ED, to inform on sensitive area closures, areas that require regular patrol, and protocols for reporting trapped or injured wildlife and marine mammal strandings.
- *III*. Ensure regular presence of CDFW wardens during waterfowl hunting season.
- *IV.* Ensure closure areas are appropriately signed.

3.9 DATA INTEGRATION, ACCESS, AND REPORTING

Compiling planning and natural resources data into a single, accessible system provides a critical natural resources management tool, enabling managers to identify resources, conflicts, opportunities, and facilitating natural resources decision-making management.

Specific Concerns

- Natural resource management decisions could be misguided if there are information gaps in the natural resources database, or if the database is not kept current.
- A variety of historical data on the resources of Mugu Lagoon has not been digitized and is not incorporated into an accessible database.
- Some GIS maps and shapefiles may not meet Navy standards or have appropriate metadata that identifies who, when, and for what purposes the data were collected.

Current Management

NBVC Point Mugu uses an EMS program to track natural resources including coastal resources and waste products. NBVC's EMS is a conformance requirement for the Navy's environmental program and contributes to standardized methods for data integration, access, and reporting.

The GIS database for NBVC Point Mugu was developed using ArcView GIS software developed by the Environmental Systems Research Institute. The North American Datum 83 State Plane Coordinate System is used for X and Y coordinates, and the North American Vertical Datum 88 State Plane Coordinate System is used for Z coordinates. Global positioning system data collected in the field is integrated into the GIS database on a continual basis. Natural resource GIS data are housed at NBVC ED.

GIS and data management for INRMP updates and revisions are supported on the regional level (Navy Region Southwest, San Diego) by maintenance of a central database for all GIS files and associated plans and reports, for each installation.

Assessment of Current Management

The intent of the EMS data management program at NBVC Point Mugu is to provide a central clearinghouse of resource-related data that is continually systematically updated and organized. Proper use and management of the EMS will ensure resource managers, base planners, other base personnel, appropriate base contractors, and outside agencies have access to the latest information on natural resources at NBVC Point Mugu so these resources are properly protected according to the INRMP. Historical data should be included into the central database, and GIS files standardized according to the Navy protocols.

Data collected for future additions to the GIS database for NBVC Point Mugu should be compatible with the GIS software and coordinate systems, and compatible for use on Windows based computers.

Metadata for the GIS overlays at NBVC Point Mugu currently do not exist. Most of the natural resource GIS layers have been created to display data for the Natural Resource Annual Report which is prepared for USFWS; to a lesser extent, display data is used for this INRMP. The layers suit their purpose, but appropriate formats and metadata should still be incorporated. Annotation of all GIS overlays with Federal Geographic Data Committee metadata using a predefined metadata template is recommended. The National Biological Information Infrastructure biological metadata standard should be used for describing biological data (National Biological Information Infrastructure MetaMaker Version 2.20). Development of a Metadata Dictionary for all of the data developed for the GIS database at NBVC Point Mugu is also recommended.

NBVC Point Mugu was part of a Navy GIS pilot study with a few other selected installations, to standardize its layers and set new Navy standards. This is currently under development and soon NBVC will have a more clear route forward, to ensure all GIS layers are in the required format.

Management Strategy

Objective: Improve the use of technically sound, practical and appropriate library and computer technology to organize, analyze, and communicate natural resource information in support of management decisions.

- *I*. Maintain a central clearinghouse for data, reports, and publications pertaining to NBVC's EMS that addresses natural resources and that is accessible to staff.
 - a. Ensure all databases are current.
 - b. Ensure all research and reports are catalogued and filed for easy retrieval.
 - c. Ensure GIS layers are updated and meet current Navy requirements.
- *II.* Seek standardization of the approach to communicate research and monitoring results.
- III. Continue to develop and maintain NBVC Point Mugu's data management capabilities.
- *IV.* Continue to document and track NBVC ED natural resource management program activities.
 - a. Continue preparing annual natural resource management reports that meet USFWS Biological Opinion requirements.
 - b. Prepare an appendix for the annual report that contains information on all (other than listed species) natural resource management programs and activities during the calendar year.

4.0 CURRENT CONDITION AND MANAGEMENT OF NATURAL RESOURCES AT NBVC CHANNEL ISLANDS SPECIAL AREAS

The following sections detail the natural resources at NBVC Channel Islands Special Areas. NBVC ED does not manage the natural resources of San Miguel and Prince Islands; in accordance with the MOA (dated 07 May 1963, amended 20 October 1976 and supplemented December 1985 and September 1991) with the U.S. Department of Interior, NPS has been delegated these responsibilities (Appendix P). As described in Section 2.0 Military Mission and Operations, the Navy has an in-grant permit for use of lands and facilities within NPS boundaries on Santa Rosa Island, and leases lands and facilities on Santa Cruz Island from TNC (Figure 1-3). The leased and in-grant permit lands on Santa Cruz and Santa Rosa are developed, with minimal to no natural resources present on site. The Navy does not conduct natural resource management on the leased and in-grant permit lands and defers natural resource management decisions and actions to its permittor and lessor, the NPS and TNC.

Current Management

As intended in the NPS MOA, the Navy defers day-to-day natural resources management on San Miguel and Prince Islands to the NPS. As such, there are no specific concerns or management strategies detailed in this section. All NPS plans affecting Navy property will ensure consistency with general goals and objectives outlined in this INRMP. The NPS has developed a General Management Plan scheduled for public review in fall 2013 (Tetra Tech 2013c). Goals and objectives from the Final General Management Plan will be incorporated into the next INRMP update.

The National Parks and Recreation Act of 1978 requires each unit of the Park Service to have a General Management Plan, and *NPS Management Policies 2006* states "[t]he Service will maintain an up-to-date management plan for each unit of the national park system" (U.S. Department of the Interior 2006).

The purpose of a General Management Plan is to ensure that a park system unit has a clearly defined direction for resource preservation and visitor use, to best achieve the NPS mandate to preserve resources unimpaired for the enjoyment of future generations. In addition, general management planning makes the NPS more effective, collaborative, and accountable by:

- Providing a balance between continuity and adaptability in decision making: Defining the desired conditions to be achieved and maintained in a park unit provides a touchstone that allows NPS managers and staff to constantly adapt their actions to changing situations while staying focused on what is most important about the park unit.
- Analyzing the park unit in relation to its surrounding ecosystem, cultural setting, and community: This helps NPS managers and staff understand how the park unit can interrelate with neighbors and others in ways that are ecologically, socially, and economically sustainable. Decisions made within such a larger context are more likely to be successful over time.

• Affording everyone who has a stake in decisions affecting a park unit an opportunity to be involved in the planning process and to understand the decisions that are made: NPS units are often the focus of intense public interest. Public involvement throughout the planning process provides focused opportunities for NPS managers and staff to interact with the public and learn about public concerns, expectations, and values. Public involvement also provides opportunities for NPS managers and staff to share information about the park unit's purpose and significance, as well as opportunities and constraints for the management of park unit lands.

The purpose of the Channel Islands General Management Plan is to clearly define a direction for resource preservation and visitor experience at Channel Islands National Park (CINP) over the next 15 to 20 years. The approved plan will provide a framework for proactive decision making, which will allow managers to effectively address future opportunities and problems. The plan will not provide specific and detailed answers to every issue or question facing CINP.

CINP has tentatively identified five goals this planning effort will address, which may be modified after the General Management Plan is published for public review. Specifically, the goals of the General Management Plan are to:

- (1) Restore and maintain natural ecosystems and processes;
- (2) Preserve and protect cultural resources;
- (3) Provide opportunities and access for the public to experience and connect to the park;
- (4) Promote stewardship of park resources; and
- (5) Administer the park efficiently and effectively.

The park's goals articulate the ideal future conditions the Park Service is striving to attain. All of the alternatives and management zones in this management plan should be and are consistent with and support the park's purpose, significance, and goals (Tetra Tech 2013c). The MOA between the Navy and NPS (Appendix P) outlines areas of mutual support and benefit between the two parties. The five islands that comprise CINP (Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel [and Prince Island]) are within the boundaries of the Point Mugu Sea Range, and as such test operations are conducted over and around the islands. The MOA states that "[C]lose cooperation between the Navy and Channel Islands National Park will ensure non-interference between park and military activities, safety of park personnel and visitors, and protection of park resources." The following management strategies are specific to the stewardship of natural resources. The Navy complies with TNC lease requirements on Santa Cruz Island, and NPS in-grant requirements on Santa Rosa Island. The complete list of MOA requirements is in Appendix P.

Management Strategy

Objective: Ensure the natural resources requirements of the Memorandum of Agreement, ingrant permit, and lease at the NBVC Channel Islands Special Areas are followed.

- *I.* All Navy projects will be reviewed for NEPA compliance by the SA/PRB process, and the NPS' review process (Planning, Environment, and Public Comment) to minimize potential impacts to native species and habitats.
- *II.* The Navy will continue to comply with TNC lease requirements on Santa Cruz Island. The following are the natural resource-specific requirements:
 - *A.* Maintain the property in a clean and healthful condition.
 - B. Access the airstrip using only the permitted road.
 - *C.* Visit TNC-operated facilities on the TNC property, (except for the well site) only by invitation.
 - *D.* Prevent hunting or shooting by government personnel, contractors, and agents; and to prohibit and prevent entry on the island of any non-human life form (flora and fauna), as well as firearms (except those issued by the government for security purposes).
 - *E.* Prohibit the removal from Santa Cruz Island, items not brought on to the island by government personnel, contractors and agents. Prehistoric artifacts and their sites, and plants and animals on the island are protected by state and federal laws and must not be disturbed or removed (including flowers, wood, animal parts, shells, etc.).
 - *F.* Promote fire prevention, especially during the dry months by: ensuring spark arrestors are installed on all vehicles and stationary power equipment; restricting smoking to permitted areas; and educating Navy personnel on these fire prevention measures.
 - *G.* Prohibit the importation to the island, and the keeping of any pets or other animals. The Navy will prohibit the feeding of any native or feral animals on the island. The government shall also promptly notify the Lessor's preserve manager at the Preserve headquarters of any sightings by government employees, agents, and servants, of any feral animals.
 - *H.* The Navy will establish and enforce such regulations as may be required for fire protection, traffic control, use of nonexclusive areas, and similar, which will provide protection to the Lessor's property.
 - *I.* The Navy will remove all property that is not embedded into a structure, upon termination of the lease.

- *III*. The Navy will continue to comply with the NPS in-grant requirements on Santa Rosa Island. The following are the natural resource-specific requirements:
 - *A.* The Navy will return the area to its natural condition upon termination of the project or permit.
 - *B.* The Navy will not unlawfully pollute the air, ground, or water, or create a public nuisance.
 - *C*. The Navy will, at no cost to the NPS, promptly comply with present and future federal, state, and local laws, ordinances, regulations, or instructions, controlling the quality of the environment.
- *IV.* The Navy will continue to comply with the requirements of the MOA with the NPS. The following are the responsibilities of each party to the MOA, that pertain to natural resources management (Appendix P):
 - A. CINP will provide day-to-day management of San Miguel Island.
 - CINP will allow for public access to San Miguel Island through a controlled reservation system, which "shall assure preclusion of conflict between such controlled access, and planned Navy operations on San Miguel Island or in the surrounding Warding Area...or Surface Danger Zone...."
 - a. NPS Regulations are established for San Miguel under the Superintendent's discretionary authority under Title 36 CFR, as follows: (1) Landing is permitted only at Cuyler Harbor; (2) Aside from the beach at Cuyler Harbor, and the trail from the harbor to the campground and ranger station, hiking is not permitted without a ranger; (3) Hiking off-trail is prohibited; (4) Pets are not allowed ashore; and (5) The area west of the research station at Point Bennett is closed except by permit. Additionally, California Marine Reserve regulations prohibit boating in selected areas around Point Bennett to protect seals and sea lions during their pupping and breeding seasons.
 - 2. The NPS will conduct or supervise programs of scientific research, or investigations relative to the ecologic, paleontologic, archaeologic, historic, or geologic features of San Miguel or Prince Islands.
 - 3. NPS will provide for the preservation and protection of the scenery and the natural and historic objects, and the wildlife therein, and to provide for the enjoyment of the same, in such manner and by such means as will leave them unimpaired, for the enjoyment of future generations.

- B. The islands within CINP have been "...set aside by Executive Order for Naval purposes, and it is foreseeable that future use of the Islands may include other military uses and in such event, it is understood that thereafter, all activities conducted by or in behalf of the Department of the Interior...shall recognize the priority of such military uses; however, in the event the Department of the Navy determines it no longer requires the use of the Islands, the Department of the Interior, National Park Service, shall seek authorization for the Islands, to be preserved and protected indefinitely, as units within the National Park System." Public Law 96-199 Section 201 states: "there is hereby established the Channel Islands National Park, the boundaries of which shall include San Miguel and Prince Islands...." Furthermore, Section 202 states: "(a) Within the boundaries of the park...the Secretary of the Interior is authorized to acquire lands, waters, or interests therein by...transfer from any Federal agency...."
- C. The Navy and NPS will share, through cooperative efforts, scientific expertise on the natural (and cultural) resources of the park islands (Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel [and Prince Island]), and lands managed by the Navy (NBVC San Nicolas Island, and the waters of the Point Mugu Sea Range). On a case by case and reimbursable basis, scientific expertise will be made available from one agency to the other.
- *D.* The Navy will assist in early identification of fire threats and fire suppression activities for which CINP has responsibility.
- *E.* The Navy will be willing to meet with CINP to mitigate any potential damage to park resources from Point Mugu Sea Range test activities. CINP will be willing to expedite the issuance of necessary permits for test activities.
- *F.* On a case by case and reimbursable basis, the Navy and CINP will mutually avail themselves of support services such as facilities type contracting, and equipment and supply procurement, on a not-to-interfere basis with the military mission.
- G. The NPS will submit to the Navy, "a statement of management including land classification for the preservation and use of [San Miguel and Prince Islands]. The plan will be subject to concurrence and approval by the Department of the Navy."
- *H*. The Department of the Interior will submit to the Department of the Navy, a report on the resources of the islands, together with recommendations for their continued protection and management.
- *I*. The Navy and NPS will coordinate to renegotiate a new MOA (or revise and amend the existing MOA).

The following sections describe the resources on each of the islands. For resource topics where NPS provided information on current management practices, a brief summary of NPS or TNC management is presented.

4.1 ECOREGIONAL SETTING

The California Channel Islands include eight islands in the Southern California Bight, five of which are within CINP. CINP encompasses the four northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz and Anacapa) and Santa Barbara Island off the coast of Southern California. CINP also includes the surrounding waters out 1 NM. The five park islands have about 323 kilometers (176 miles) of coastline, most of which is rocky shore.

Nearshore and marine waters up to 6 NM offshore of the following islands and rocks are part of the Channel Islands National Marine Sanctuary (CINMS), protected and managed in accordance with the National Marine Sanctuaries Act, as amended 16 U.S.C. 1431 *et seq*.: Santa Cruz Island, Santa Rosa Island, San Miguel Island, Prince Island, Anacapa Island, Santa Barbara Island, Richardson Rock, and Castle Rock. Under the National Marine Sanctuaries Act, as amended, 16 U.S.C. 1431 *et seq.*, the Secretary of Commerce (Secretary) is authorized to designate and manage areas of the marine environment as national marine sanctuaries. Such designation is based on attributes of special national significance, namely conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities. The primary objective of the National Marine Sanctuaries Act is to protect marine resources. Designated in 1980, the CINMS consists of approximately 1,1282 square NM off the southern coast of California, and hosts a rich and diverse range of marine life and habitats, unique and productive oceanographic processes and ecosystems, and culturally significant resources (NOAA 2008).

In addition to the National Marine Sanctuaries Act itself, resource protection for national marine sanctuaries is carried out by regulations under the National Marine Sanctuary Program, which are codified at 15 CFR part 922. The mission of the National Marine Sanctuary Program "is to identify, designate and manage areas of the marine environment of special national, and in some cases, international significance due to their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities" (15 CFR 922.2[a]).

The park islands and surrounding waters are designated as an International Biosphere Reserve and State of California Area of Special Biological Significance. The State of California maintains jurisdiction over the marine resources and manages them through the California Department of Fish and Wildlife (CDFW).

In 2003, a network of marine reserves was established around the Channel Islands. The State of California designated the Channel Islands as Marine Protected Areas on 09 April 2003. The National Oceanic and Atmospheric Administration (NOAA) expanded Marine Protected Areas into federal waters on 29 July 2007. Within the reserves it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource, except under a permit or specific authorization from the commission for research, restoration, or monitoring purposes. There are 11 marine reserves and two conservation areas in the Channel Islands.

The Bureau of Land Management's California Coastal National Monument (CCNM) includes rocks, islands, exposed reefs, and pinnacles above mean high tide within 12 NM of the shoreline of the State of California. Rocks within 1 NM of the Channel Islands are not included in the CCNM, but are managed and protected by the NPS ("there is hereby established the Channel Islands National Park, the boundaries of which shall include San Miguel and Prince Islands...including the rocks, islets, submerged lands and waters within one nautical mile of each island..." [Public Law 96-199, Section 201]). Although many of the rock features immediately offshore of major islands are part of the CCNM, the CCNM does not include the Channel Islands themselves, or Prince Island. However, within the 3 NM zone off San Miguel Island and discussed in this INRMP is a rocky island also under the jurisdiction of the CCNM (BLM 2005).

The discussion below is focused on the NBVC Channel Island Special Areas: San Miguel, Prince, Santa Rosa, and Santa Cruz islands.

4.1.1 Topography

At 96 square miles, Santa Cruz Island is the largest of the California Channel Islands and the closest of the three islands discussed herein, to NBVC Point Mugu (25 miles offshore). Its highest point is 2,470 feet above mean sea level. Santa Cruz has the most rugged topography of the northern Channel Islands, with much physiognomic diversity (Cobb and Mertes 2002). The western 76 percent of Santa Cruz Island is privately owned and managed by TNC; the NPS owns and manages the rest. TNC donated the 8500-acre isthmus that joins the east and west sides of the island to NPS in 2001. TNC maintained ownership of the 8 acre portion of isthmus they lease to the Navy; TNC also retained Rights of Way that are part of their permit with the Navy.

The second largest of the Channel Islands, Santa Rosa Island covers 84 square miles (about 53,000 acres). Santa Rosa is approximately 48 miles west of NBVC Point Mugu and 31 miles southwest of the City of Santa Barbara. Santa Rosa Island is approximately 16 miles long and 10 miles wide. The island is geographically lower in relief than the neighboring Santa Cruz Island, but it is significantly more rugged than its western neighbor San Miguel. The Santa Rosa Island Fault trends east-west across the center of the island. The faulting has produced a predominant ridge reaching 1,590 feet above mean sea level. Topography varies from high mountains with deeply cut canyons to rolling hills and relatively flat marine terraces (Bechtel National, Inc. 2000).

San Miguel Island is approximately 8 miles long, from east to west, and ranges from 2 to 4 miles wide. San Miguel is relatively flat, when compared with the other Channel Islands. The island consists of a low tableland surrounding two rounded hills. These hills are Green Mountain and San Miguel Hill, with elevations of 817 and 831 feet above mean sea level, respectively. The tableland surface elevation averages 300 to 500 feet above mean sea level (Bechtel National, Inc. 2000).

4.1.2 Geology

The northern Channel Islands located off the coast of California make up the southernmost boundary of the western Transverse Ranges of south-central California. The islands form the surface expression of an anticline created from the collisional forces around the Big Bend of the San Andreas Fault. The Channel Islands consist of marine sedimentary rocks and volcanic rocks that formed and evolved during a complex tectonic history involving a combination of subduction, transtension, rotation, and transpression along the western boundary of the North American Plate (Atwater 1998).

The Channel Islands are tectonically linked to the Transverse Ranges block of the mainland, which was oriented north-south within the forearc region of a subduction zone until the early Cenozoic. The basement rocks that make up a significant portion of the Channel Islands are composed of volcanic and sedimentary rocks that were deposited in the forearc basin along the margin of North America during the Miocene when the Farallon plate was colliding and subducting beneath the North American Plate. Once the Farallon plate descended in its entirety and disappeared beneath the North American Plate, the collision came to a halt and a new tectonic setting of transtension developed along the Pacific-North America plate boundary. This period of separation and thinning of the crust resulted in the deposition of the Conejo Volcanics on the mainland, which can be seen in the Santa Monica Mountains. At the same time lava flows and volcanoes resulting from the transtensional tectonic setting deposited similar volcanic suites of rock that constitute a large component of the Channel Islands. Subsequent movement of the Pacific plate to the north, laterally along the coastal margin, caused rotation of the Channel Islands to their current orientation, followed by the current period of north-south shortening and east-west extension associated with the Big Bend of the San Andreas Fault (Kamerling and Luyendyk 1985).

Currently the Channel Island footprint and geomorphology is being controlled by forces of tectonic uplift, sea level change, and the destructive forces of erosion from weathering and wave action at the shorelines.

4.1.3 Climate

The California Channel Islands span the transition zone between cooler waters of the Oregonian biogeographic province and the warmer Californian waters from the south. A climate gradient occurs across the island chain, with San Miguel Island having the most precipitation, most cloud cover, and most wind. Islands to the southeast are progressively warmer and drier in relation to San Miguel. The mean monthly sea temperatures range from 55.4 °F in April at San Miguel Island to nearly 68 °F at Santa Barbara Island in August and September. Swell varies through the year with winter storms bringing high northwest wind and waves during the winter and spring, and distant southern hemisphere storms sending large swells to the south facing shores in summer (Richards and Rich 2004).

The Navy owns and operates a Remote Automated Weather Station on San Miguel Island. The NPS owns and operates Remote Automated Weather Stations on Santa Barbara, Santa Cruz and

Santa Rosa islands. The structure on San Miguel is currently powered by solar panels; it was run by a nuclear generator until 1992. Data from the stations are supplemented by data collected using weather instruments manually operated by island staff. The Navy's weather station data from San Miguel is available on-line

at: http://www.navair.navy.mil/nawcwd/weather/muguhandar.html.

Collectively, the stations provide data on weather from both the marine layer and their terrestrial climate regimes of the islands. The data are used for National Park operations and resource management including fire planning and management, Navy operations, mariner safety, and specific research needs. The NPS maintains Ranger Stations on all the islands that collect weather data. The station on Santa Cruz Island collects weather data within Navy boundaries. The Navy has weather monitoring stations on Santa Cruz Island and San Miguel Island (McEachern and others 2008).

Data for a period of record from 1981 to 2004 on San Miguel Island show the average monthly precipitation is 1.2 inches, and average total precipitation is 14.37 inches. Most precipitation occurs January through March, with February recording the heaviest precipitation, a monthly average of 6.63 inches. Temperatures range from an average high of 64.5 °F and a low of 51.6 °F, with July and August recording the highest average monthly temperatures of 70.4 °F (Western Regional Climate Center 2012).

Weather data for Santa Cruz between 1984 and 2004 show an average maximum temperature of 68 °F, and an average minimum of 51.6 °F. June through September are the hottest months, with July records showing an average high of 73.8 °F. No precipitation data was available from this period of record (Western Regional Climate Center 2012).

Santa Rosa weather data from 1988 to 2003 show an average maximum temperature of 67.5 °F and an average minimum temperature of 52 °F. Total annual precipitation for the period of record is 23.49 inches. January through March are the wettest months; the average monthly precipitation record for January is 11.22 inches (Western Regional Climate Center 2012).

The NPS is tracking weather and climate change through the development of weather monitoring protocol aimed at determining the status and trends in precipitation, temperature and wind at the Channel Islands. These protocol are part of the CINP's Long-Term Monitoring Program. The Long-Term Monitoring Program encompasses data collection on multiple parameters to detect long-term trends in the abundance and distribution of terrestrial and marine species, and their habitats. Information on the NPS monitoring programs is available on-line at http://science.nature.nps.gov/im/units/medn/im/monitoring/chismonitoring.cfm.

4.1.4 Air Quality

Air quality at the NBVC Channel Islands Special Areas, is regulated under the Santa Barbara County Air Pollution Control District. Air quality issues are related to the growing number of ships that travel up and down the California coastline and the impacts of increased air pollution in the area. Ocean-going vessels traversing the Santa Barbara channel produce over 45 percent of the nitrogen oxides emissions generated in Santa Barbara County, and projections indicate that by 2020 they could produce up to 75 percent (http://www.nps.gov/chis/parknews/monitoring-air-pollution-in-the-santa-barbara-channel.htm).

Currently, there are no specific concerns about air quality and the effects of air quality on natural resources management. NBVC ED does not manage air permitting for the NBVC Channel Islands Special Area. Air permits for activities on Santa Cruz Island are managed by the Naval Air Systems Command Environmental Division. The Naval Air Systems Command's Air Quality program effectively addresses emissions monitoring and regulatory compliance. No strategies are needed due to the lack of NBVC ED management responsibilities.

4.2 Physical Conditions and Managing the Physical and Chemical Environment

Abiotic resources at NBVC Channel Islands Special Areas are described in the following sections.

4.2.1 Soils and Soil Conservation

Soils mapped by the Natural Resources Conservation Service at San Miguel and Prince Island are shown on Figure 4-1. Santa Cruz and Santa Rosa soils are not shown; Navy facilities at those sites are located on limited acreage and disturbed land.

4.2.2 Water Resources and Water Management

The following describes water resources at NBVC Channel Islands Special Areas.

4.2.2.1 Groundwater Hydrology

Hydrogeological information for the Channel Islands is limited. The USGS evaluated the groundwater sources of San Nicolas Island in 1956-1957. It is unknown whether similar investigations have been conducted at Santa Rosa Island or San Miguel Island (Bechtel National, Inc. 2000). No data was provided by the NPS to the Navy on water resources for the Channel Island Special Areas. Limited data on San Miguel Islands water resources is presented below.



Author: GK. Date: 7/29/2013. Path: \Ecss134/501/DIV-GIS/Projects/Mugu INRMP 2013/POINT_MUGU_GISDATA_101512/POINT_MUGU_GISDATA_101512/PM_DRAFT_INRMP_072013/FIG4-1_PM_INRMP_SAN_MIGUEL_AND_PRINCE_ISLAND_SOILS_072613.mxd Data Source: TetraTech Databases. Solis Data Source: U.S. Department of Agriculture, Natural Resources Conservation Bervice 2009. This maps ig soverement property, not to be reprodued or distributed or form the Nava Base Ventura County Fruinomental Division. San Miguel Island: The NPS performed a natural resource study of the Channel Islands National Monument in late 1978 and early 1979. As part of this natural resource study, the springs and seeps were systematically investigated and determined to be seasonal, depending on climate factors. At the time of the natural resource investigation, 28 springs and seeps were identified and studied; the total flow rate was measured at 2,883 gallons per hour. Most springs tested produced water of poor quality with regard to total dissolved solids. Five springs produced water characterized as "good" based on reported total dissolved solids results (Bechtel National, Inc. 2000).

4.2.2.2 Surface Water Hydrology and Stormwater Management

NBVC Channel Islands Special Areas are required to comply with federal and state stormwater regulations under the Clean Water Act, as amended in 1987 (Section 402 [p]), and the Coastal Zone Act Reauthorization Amendments of 1990 (Section 6217). These regulations address nonpoint source pollution from urban and stormwater runoff. There are no industrial activities at NBVC Channel Islands Special Area facilities.

4.3 ECOSYSTEMS AND ECOSYSTEM MANAGEMENT

The following sections summarize the ecosystems and species on the Channel Islands, as cited from various reports, referenced herein. The islands support plants and animals that have been isolated from their mainland counterparts for thousands of years. In some cases, unique species have evolved. The discussion addresses the resources of the northern Channel Islands overall, except in instances where data is available specifically for San Miguel. San Miguel and Prince Island resources are highlighted in this document because the Navy owns these islands.

The significance of CINP stems from the islands' remote, isolated position at the confluence of two major ocean currents, a region of persistent oceanic upwelling, and the border of two tectonic plates. The park contains examples of two biogeographical provinces in the ocean, the Oregonian and the Californian, and a dynamic transition zone between them. In a remarkably small area, the park harbors the biologic diversity of nearly 1,000 miles of the West Coast of North America. In addition to this diversity, park waters are also exceptionally productive. Swirling around the islands, cool, nutrient-rich oceanic waters rise into abundant sunlight and mix with warm coastal waters, accelerating photosynthesis and growth rates of myriad forms of sea life from microscopic plankton to blue whales (Tetra Tech 2013c).

The park preserves some of the finest remnants of the coastal Mediterranean-type ecosystem in America. Among the most endangered in the world, this type of ecosystem is found in only five places. The unique suite of plants and animals that have colonized the islands and their isolation from the mainland and each other over eons has resulted in the evolution of many endemic species and subspecies. The park provides critical habitat for nesting seabirds and for five species of pinnipeds. The park also harbors a prolific paleontological record; archeological resources that record some 13,000 years of human occupation; and historical features that represent ranching, fishing, hunting, navigation, and other endeavors from a wide variety of cultures (Tetra Tech 2013c).

The Channel Islands have long been recognized for their scientific values. The extensive archeological record, the unique island ecosystems and taxa, and the isolation from development and human impacts contribute to creating an environment of great interest to researchers, the public, and park management. Additionally, CINP provides the public with almost unparalleled opportunities for solitude, tranquility, wildlife viewing, and appreciation of natural history, outdoor recreation, and education.

4.3.1 Coastal and Marine Communities

The following sections describe coastal and marine communities of San Miguel and Prince Islands. Species expected within 0.25 NM (the limits of discussion of this INRMP) off the coast are described in Section 4.4 Fish and Wildlife Management.

4.3.1.1 Intertidal

<u>Rocky Intertidal:</u> CINP includes the five northern islands off the coast of southern California and the surrounding waters out 1 NM. The approximately 176-mile coastline of the islands is predominantly rocky with stretches of sandy beach. The majority of San Miguel Island coastline is sandy beach. The diversity and undisturbed nature of the tidepools of this rocky coastline were recognized as special features of the islands in the enabling legislation. The NPS has been monitoring the rocky intertidal at the islands since 1982, and described in Section 4.4.1 Invertebrates.

<u>Sandy Beaches</u>: Sandy beach intersperses areas of rocky intertidal habitat. Sandy beach habitat is dynamic and can be easily disturbed by storm events or tidal currents. The relatively unstable environment and lack of strata for attachment by benthic organisms in the intertidal and subtidal zones supports fewer organisms than rocky intertidal or vegetated habitats (California Marine Life Protection Act Initiative 2009). Most of the sandy beach habitat occurs on Santa Rosa and San Miguel Islands. Sandy beaches provide haulout for pinnipeds, and nesting and foraging habitat for shorebirds. These species are further described in Section 4.4 Fish and Wildlife Management.

4.3.1.2 Nearshore Subtidal

A variety of substrates provide habitat in the nearshore subtidal zone: mud, sand, gravel, cobble, and bedrock. High relief volcanic reefs with walls, ledges, caves, and pinnacles, are not uncommon off the islands. Shallow subtidal areas contain assemblages of plants, invertebrates and fishes, with giant kelp (*Macrocystis pyrifera*) the dominant marine algal species.

Kelp forests are highly productive habitats that provide food, attachment strata, and shelter for a variety of invertebrates and fishes. Water temperature, storms, and natural predation contribute to temporal and spatial variation in kelp bed distribution and cover.

Eelgrass stabilizes surface sediments and provides shelter and nutrients for invertebrates. Seagrasses are sensitive to periods of increased sedimentation, coastal runoff, and pollution. Eelgrass (*Zostera spp.*) beds have not been reported off of San Miguel Island (Coyer and others 2008). The largest eelgrass and surfgrass beds lie off Santa Cruz and Santa Rosa Island (NOAA 2008).

Phytoplankton (single-celled drifting marine plants) and zooplankton (small animals that drift in the water column), form the base of the food web in the marine environment. Marine life is highly dependent on their growth and productivity, which varies both spatially and temporally.

4.3.1.3 Deep Water Benthic

Deep-water habitats extend beyond the nearshore subtidal and reach depths from 30 to 200 meters (99 to 660 feet). Over 90 percent of deep-water benthic habitats in the CINMS consist of fine sands in shallower areas, grading to silt and clay-dominated sediments in deep portions. Deep rock bottoms are found offshore of major headlands and islands, on the highest parts of undersea ridges, banks and pinnacles. The northwest end of San Miguel Island contains high relief pinnacles and ridges (NOAA 2008).

4.3.1.4 Pelagic Habitats

Pelagic habitats are discrete areas of the water column categorized based on variation of light penetration, temperature, oxygen concentration, and density. Most water column habitats within the CINMS do not extend deeper than the mesopelagic zone (from approximately 200 to 1,000 meters [660 to 3,300 feet]). Bathymetry data for 0.25NM offshore of San Miguel and Prince Island indicate depths range from 0 to 100 meters (0 to 328 feet), characteristic of the epipelagic zone (NOAA 2008).

4.3.1.5 Jurisdictional Waters–Wetlands Management

No data is available for this resource area. In accordance with Sections 404 and 401 of the Clean Water Act, drainages that have a connection to the Pacific Ocean may be jurisdictional. Streams are shown on Figures 4-2, 4-3, and 4-4. Rivers and Harbors Act (33 U.S.C. Part 403) Section 10 jurisdiction extends to the mean high water mark along the coastline.

4.3.2 Terrestrial Communities

The terrestrial flora of CINP is diverse and includes many rare, relict, and endemic species (forms that are found on the islands and nowhere else), and nonnative species. Many of the plants that are native on the California mainland do not grow on the islands; many species are rare on the islands but have a wider distribution on the mainland. A total of about 790 plant taxa, including species, subspecies, varieties, and forms, have been identified in the park, of which about 579 are native and 211 are nonnative (CINP 2012).

The CINP Wildfire Management Plan 2006 was developed according to the NPS policies for wildland fire management, and in support of the resource management goals of CINP. CINP will suppress all wildland fires and may use prescribed fire to meet resource protection objectives. The plan recommends removal of non-native mule deer and elk, or installing fencing in shrubland or woodland, in the event of a fire, to prevent herbivory of rare plants (Kirkpatrick 2006).

Santa Cruz: Santa Cruz has the most rugged topography of the northern Channel Islands and supports the widest variety of indigenous flora of any of the Channel Islands, including seven endemic species. The island is known to support approximately 650 plant species, 26 percent of which are non-native. Of the native species, 45 are endemic to the Channel Islands, eight are found only on Santa Cruz Island, and nine are federally listed (McEachern, Chess, and Niessen 2010). The following plant communities have been categorized to include: southern beach and dune, coastal bluff, coastal-sage scrub, valley and foothill grassland, coastal-bluff scrub, coastalsage scrub, covote-brush scrub, island chaparral, island woodland, southern coastal oak woodland, Bishop pine forest, intertidal and subtidal marine, coastal marsh and estuary, freshwater seeps and springs, vernal ponds, riparian herbaceous vegetation, mule-fat scrub, and southern riparian woodland (Cobb and Mertes 2002). Other mapping efforts have shown that grassland, coastal sage scrub, and chaparral cover 89 percent of the island, with grasses dominant at approximately half the acreage (Cobb and Mertes 2002). In 2005, vegetation was mapped at Santa Cruz, and based on the vegetation classification system used by the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995; Aerial Information Systems, Inc. 2007). The 2005 mapping effort was conducted to create a spatial database that could be used to track vegetation community changes over time. Vegetation communities of Santa Cruz Island are shown on Figure 4-2.

Santa Cruz Island suffered severe habitat degradation by grazing feral sheep and cattle. In the late 1980s, after TNC had acquired most of the island, approximately 1,800 head of cattle were removed and a little over 37,000 sheep were eradicated from the TNC portion of the island.

To prevent the remaining feral sheep that still occupied the east end of the island from migrating onto TNC land, TNC fenced off the western 90 percent of the island. Beginning in 1998, after acquiring the eastern end of the island, the NPS began removing the remaining feral sheep. At the end of the project in 2000, NPS removed approximately 9,200 sheep. More than 5,000 feral pigs were removed by 2007, the result of a cooperative effort between the two agencies, starting in 2005 (Cohen and others 2009; McEachern, Chess, and Niessen 2010). The removal of herbivores resulted in an increase in both native and non-native vegetative cover, with some non-native species such as fennel (*Foeniculum vulgare*) expanding greatly, along with other invasive plants (Cobb and Mertes 2002; Cohen and others 2009). Restoration activities currently focus on the eradication of invasive species.

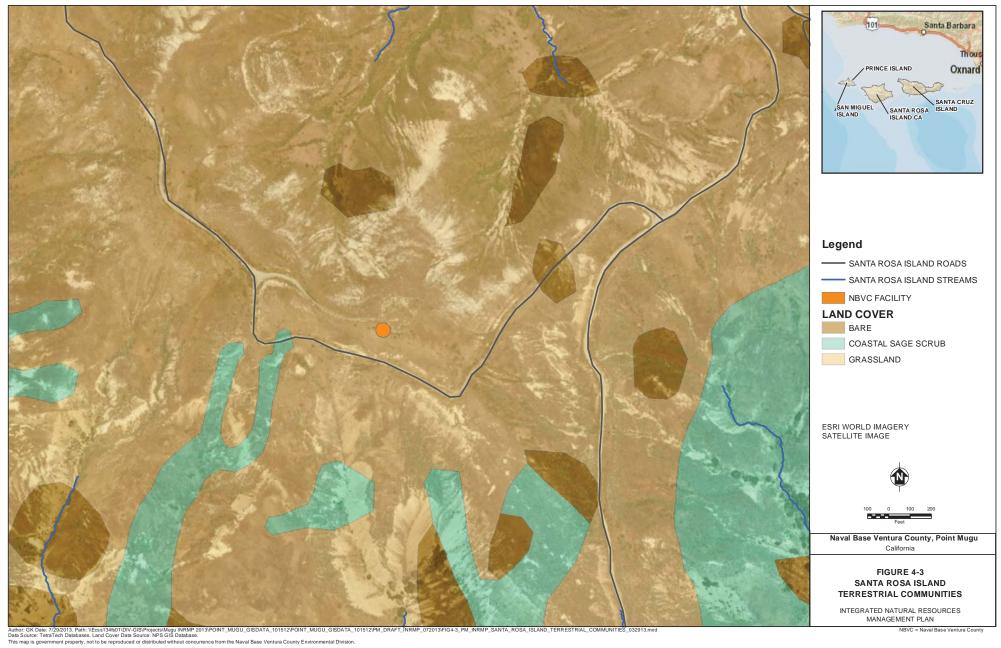


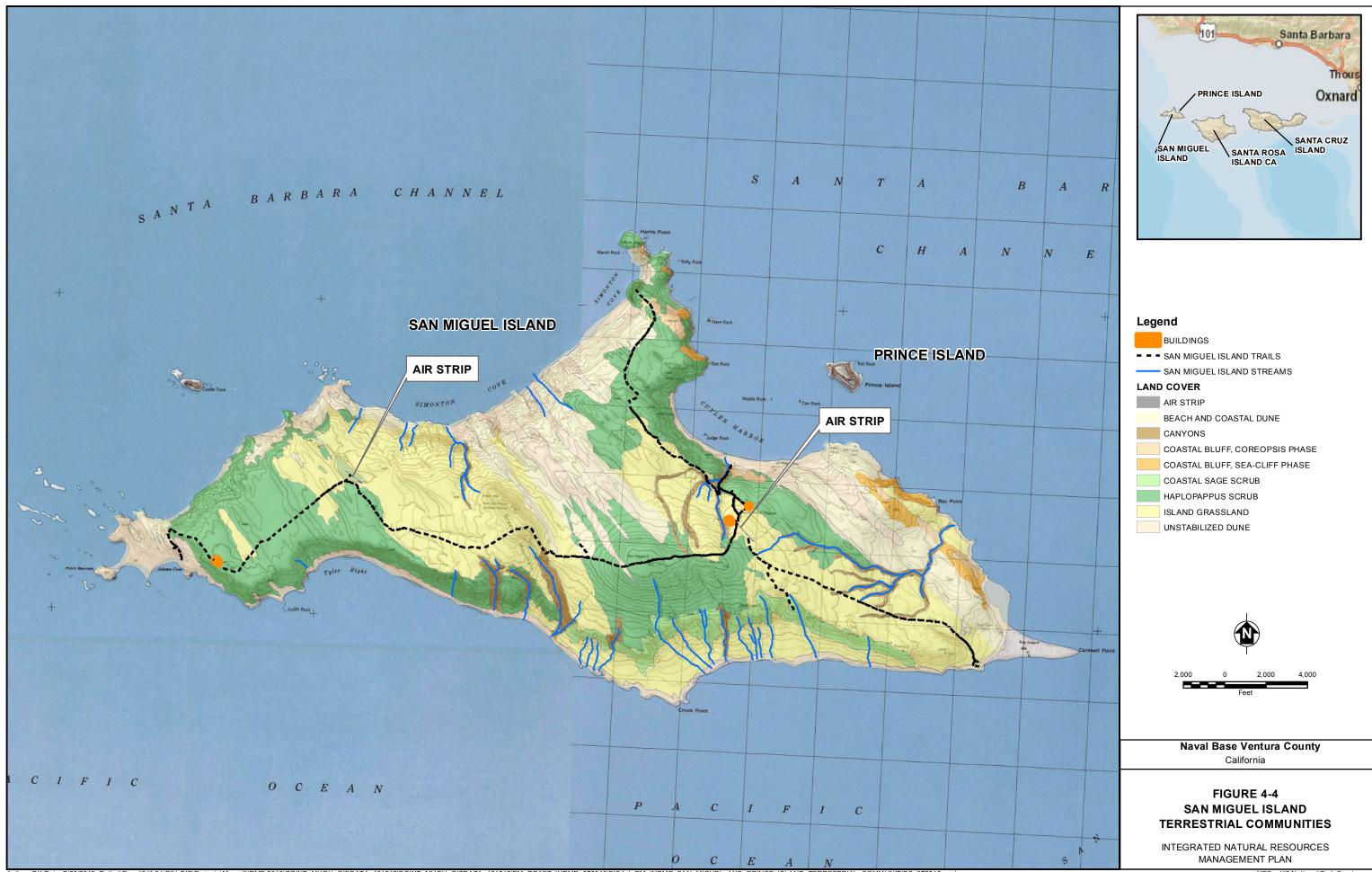
Author GK Date: 728/2013. Path: 'Ecst 34461101/GISProject/Mugu IRMP 2013POINT_MUGU_GISDATA_101512POINT_MUGU_GISDATA_ Data Source: TetraTech Databases. Vegetation Type and Streams Data Source: NS GIS Database. This map is government properly, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

INRMP = Integrated Natural Resources Management Plan NBVC= Naval Base Ventura County

Santa Rosa: Most of the plant species on Santa Rosa Island are similar to nearby geographic regions. Approximately 500 plant species and six endemic species occur on Santa Rosa (CINP 2012). An estimated 85 percent of the 53,000 acres on Santa Rosa Island are both perennial and annual grassland. Native trees include island oak (Quercus tomentella), Bishop pine (Pinus muricata), coast live oak (O. agrifolia), ironwood (Lyonothamnus floribundus ssp aspleniifolius), and two groves of Torrey pine (Pinus torreyana subsp. insularis) on the east side of the island. The CINP GIS database for vegetation includes the following communities: baccharis scrub, coastal scrub, coastal strand, mixed woodland, southern riparian woodland, marsh, island oak, grassland, eucalyptus, Torrey pine, coastal bluff, closed-cone pine, chaparral, and caliche scrub (Figure 4-3). Intensive grazing by introduced sheep, cattle, deer, elk, and pigs during the 1800s through the 20th century, drastically affected native vegetation. Sheep were eliminated from the island by the 1930s, pigs were eliminated in 1992, cattle were removed in 1998, and the deer and elk were recently eradicated in 2011. There are a few areas where riparian/deep drainage and vernal pools occur. The largest coastal marsh in the Channel Islands is on the eastern side of Santa Rosa Island. Rare vegetation types on Santa Rosa Island include Torrey pine forest, island oak groves, ironwood groves, native bunchgrass grassland, marsh, maritime chaparral, southern dune scrub, and southern coastal bluff scrub. The Santa Rosa Island subspecies of Torrey pine is considered one of the rarest pines in the world, and was once part of a more widespread Pleisotcene forest (Section 4.5 Special Status Species and Their Protection) (CINP 2012). The NPS is in the process of updating the vegetation map of Santa Rosa.

<u>San Miguel</u>: Most vegetation on San Miguel is principally grassland and low-growing depauperate chaparral, with occasional occurrence of native willows (*Salix* spp.). The only trees on San Miguel are a few survivors (ornamental palms [*Washingtonia filifera*]) planted by ranchers in the 1800s and early 1900s, at the northwest end of Cuyler Harbor. Intensive livestock grazing, especially by sheep during the 1800s and early 1900s, drastically affected natural habitats. As a result, much of the vegetative cover is non-native annual grasses. Since feral livestock have been removed, native plant communities such as lupine scrub, coreopsis, island coastal scrub, and other individual native plant species have begun to recover. Large portions of San Miguel are covered with sand dunes, and there are several springs on the island. Rare vegetation types on San Miguel Island include southern dune scrub and southern coastal bluff scrub. The NPS is in the process of updating the vegetation map of San Miguel. Figure 4- 4 shows the vegetation communities of San Miguel Island.





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4.4 FISH AND WILDLIFE MANAGEMENT

The fish and wildlife of Channel Islands are discussed below, with emphasis on species that occur on San Miguel and Prince Islands.

4.4.1 Invertebrates

4.4.1.1 Marine Invertebrates

The marine communities of the Channel Islands have been greatly altered over the last several decades by overfishing, disease epidemics and changing climatic regimes. One of the most conspicuous population-level changes in the marine environment is the near extinction of the black abalone (*Haliotis cracherodii*) in the early 1990's. Prior to the 1980's, this species was abundant in the low rocky intertidal zone of the Channel Islands. The abalone decline has been attributed to "withering foot" disease that spread through populations of abalone stressed by extremely warm water temperatures during the 1982/1983 El Nino event (Blanchette and others 2005). The black abalone is listed as a federally endangered species.

CINP samples the rocky intertidal ecosystem from March through January as part of the Rocky Intertidal Monitoring Program, (CINP 2010). Monitoring is conducted to determine the long-term population and distribution trends of key sessile organisms in the rocky intertidal ecosystem, such as black abalone (*Haliotis cracherodii*), owl limpets (*Lottia gigantean*), and sea stars (*Pisaster ochraceus*). Other key species monitored include acorn barnacles (*Tetraclita rubescens, Balanus glandula/Chthamalus spp.*), mussel (*Mytilus californianus*), rockweeds (*Silvetia compressa, and Hesperophycus californicus*), turfweed (*Endocladia muricata*), red algal turf (*Pterocladiella* spp. and *Gelidium* spp.), goose barnacle (*Pollicipes polymerus*), and surfgrass (*Phyllospadix spp.*). Coverage of naturally occurring tar from oil seeps in the Santa Barbara channel, is also monitored (CINP 2010).

In 1997, the state of California enacted a moratorium on fishing for all abalone species from San Francisco Bay to the Mexican border. The population declines of the 1970s and 1980s are attributed to a number of factors, including changes in recreational and commercial abalone fishing levels and withering foot disease (CONCUR, Inc. 2010). At the time of fishery closure in 1997, the San Miguel Island red abalone (*Haliotis rufescens*) population was the focus of commercial and recreational fishing activity. San Miguel Island continues to have the greatest abundance of red abalone in southern California due to upwelling and cold water influx (CONCUR, Inc. 2010).

In 2006, the California Department of Fish and Game (now California Department of Fish and Wildlife [CDFW]) established the Abalone Advisory Group (AAG), to consider a process for opening a limited fishery for one abalone species, red abalone, at San Miguel Island. The AAG was to develop a reasonable range of options for managing a fishery and to make recommendations on four key issues: (1) total allowable catch on San Miguel Island, (2) alternatives for allocation of recreational and commercial take of red abalone, (3) alternative

regulations to achieve the total allowable catch, and (4) potential management, enforcement, and monitoring techniques (CONCUR, Inc. 2010). The AAG completed a report that describes recommendations for potential establishment of a red abalone fishery at San Miguel Island. In the report, the AAG developed four stand-alone management options for consideration, which include: (1) a demonstration fishery; (2) conditional demonstration fishery; (3) precautionary experimental harvest; and (4) an assurance approach. The report can be found at http://www.dfg.ca.gov/marine/armp/sanmiguelisland.asp. The fundamental agreements that arose out of the AAG's collaborative process include: the use of adaptive management to ensure a sustainable abalone population; improve monitoring sensitivity and data collection to inform adaptive management of the fishery; proceed with supplemental modeling work; and collaborate with CDFW and other constituents on moving forward. The Marine Resources Committee of the Fish and Game Commission, in consultation with CDFW, will make recommendations to the Commission on the appropriate course of action for the red abalone population at San Miguel Island, and whether the AAG should continue acting in an advisory role (CONCUR, Inc. 2010). Red abalone occur greater than 0.25 NM from shore around San Miguel, outside of this INRMP's boundary.

On sandy beaches, macrophyte wrack and marine debris provide habitat for invertebrates. Amphipod abundance and macrophyte wrack cover are directly correlated (Dugan and others 2000). Dominant taxa of sandy beach habitats include mobile infauna that can bury in the sand for protection from wave action and predators. Typical species are hard shelled clams and crabs and soft bodied worms. Sand crabs (*Emerita analoga* and *Blepharipoda occidentalis*), bloodworms (*Euzonus mucronata*), beach hopper amphipods (*Megalorchestia* spp.), isopods (*Excirolana chiltoni*), polychaete worms, sea stars (*Pisaster* sp.), spiny mole crabs (*Blepharipoda occidentalis*), purple olive snails (*Olivella biplicata*), and sand dollars are common species (California Marine Life Protection Act Initiative 2009).

4.4.1.2 Terrestrial Invertebrates

Limited data are available or were provided for this resource area. The federally-threatened vernal pool fairy shrimp, (*Branchinecta lynchi*) occurs in vernal pools on the Channel Islands. Threats to the species include destruction or loss of vernal pools, flood control, agricultural development, and utility projects.

4.4.2 Pollinators

Limited data are available or were provided for this resource area. An inventory of Lepidoptera species was recently conducted at San Miguel Island; a species list is in progress, pending identification (Tetra Tech 2013d).

4.4.3 Reptiles and Amphibians

San Miguel Island supports one amphibian, the Channel Islands slender salamander (*Batrachoseps pacificus pacificus*), and two lizards, the southern alligator lizard (*Elegaria*

multicarinatus) and Island fence lizard (*Sceloporus occidentalis*). NPS monitors the population status and distribution trends of reptiles and amphibians at San Miguel Island, in lupine, grassland, rocky outcrops, and goldenbush (*Isocoma sp.*) habitats. Established transects are sampled three times per year (Fellers, Drost and Arnold 1988).

The Island fence lizard (*Sceloporus occidentalis beckii*) is endemic to Santa Cruz, San Miguel, and Santa Rosa islands. It prefers open sunny areas, including stream banks, beach driftwood, grassy hillsides, and human settlements. There are no significant conservation concerns in California for this species.

The southern alligator lizard (*Elegaria multicarinatus*) occurs on Santa Rosa and Santa Cruz islands. It prefers grassland, open forest and chaparral, but also occurs in foothill oak woodlands. Individuals can be found under rocks, logs, boards, trash, and other surface cover. Unlike other lizards, the southern alligator lizard does not bask in open sunny places.

The western side-blotched lizard (*Uta atansburinia elegans*) is widely distributed throughout the western U.S., including Santa Cruz Island. Other reptiles on the islands include Western yellowbellied racer (*Coluber constrictor mormon*), San Diego nightsnake (*Hypsiglena ochrorhyncha klauberi*), and Santa Cruz Island gopher snake (*Pituophis catenifer pumilus*).

The Channel Islands slender salamander (*Batrachoseps pacificus*) is the only endemic amphibian on any California island, occurring on Santa Cruz, San Miguel, and Santa Rosa islands. This species occurs in grassland, coastal sage scrub, chaparral, riparian, oak woodlands, and pine forest communities. Dense populations have been found in open areas near the ocean.

Other native amphibians (non-endemic) on the Channel Islands include the Baja California tree frog (*Pseudacris hypochondriaca*) on Santa Cruz and Santa Rosa and the blackbellied slender salamander (*Batrachoseps nigriventris*) on Santa Cruz (CINP 2012).

Four species of sea turtle occur in offshore waters: green (*Chelonia mydas*), loggerhead (*Caretta caretta*), olive Ridley (*Lepidochelys olivacea*), and leatherback (*Dermochelys coriacea*). Most information on sea turtle distribution in southern California is based on stranding data. Stranding data indicates that for the Channel Islands area all four species of sea turtle may be found within the CINMS at any time of year. All sea turtles are federally protected by the ESA (NOAA 2008).

4.4.4 Birds

CINP is an important breeding and resting area for a variety of landbirds, shorebirds, and seabirds. As of November 2011, 387 bird species were known to occur within 1.5 km of the shore of the five islands that comprise CINP (San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Barbara islands). Species composition and abundance varies among the islands, as the islands vary in size, topography, distance from the mainland, and mix of habitats. Adding to the diversity and abundance of birds on the Channel Islands are migrants, infrequent visitors, and

rare species that may appear briefly after being blown off course during spring and summer migrations (CINP 2012).

Landbird populations and species compositions on the islands can change from year to year, influenced by changes in habitat, anthropogenic disturbances, predation, competition, and migration patterns from the mainland. Monitoring data for landbird populations at CINP indicate species diversity is greater in diverse vegetative communities. Woodland, riparian, pine, and chaparral habitats exhibited the greatest landbird use (Coonan, Klinger and Dye 2011).

Of the 387 species of birds observed, 82 are thought to have nested on one or more of the park islands. Nine of the 44 species of land birds that have nested on the park islands are represented by endemic species or subspecies (Coonan, Klinger and Dye 2011). The island scrub-jay is the only island-specific endemic species, and most genetically distinct species of the Channel Islands, found only on Santa Cruz. Other endemics occur on more than one island, such as the Channel Island song sparrow (*Melospiza melodia graminea*) which occurs on Santa Rosa and San Miguel islands (CINP 2012).

NPS has conducted regular monitoring of landbird populations at CINP since 1993, as part of the long-term ecological monitoring program (Coonan, Klinger and Dye 2011). Records from 1993–2009 indicate high interannual variability in breeding landbird species density. Further analysis provided trend data for several breeding landbird species. Data show increased numbers of western meadowlarks (*Sturnella neglecta*) and spotted towhees (*Pipilo maculatus*) after cattle were removed from Santa Rosa. Ground-nesting northern harriers (*Cirus cyaneus*) exhibited increases during periods of fox captivity at San Miguel and Santa Rosa. On San Miguel, endemic song sparrows (*Melospiza melodia graminea*), orange-crowned warblers (*Vermivora celata sordida*), and Allen's hummingbirds (*Selasphorus sasin sedentarius*) increased or fluctuated during fox captivity. Data also show significant increases in common raven on San Miguel, thought to be a result of increased pinniped carcasses. Non-native European starling abundance decreased dramatically, from San Miguel, Santa Rosa, Santa Barbara, and Santa Cruz islands. Trend data is not available for raptors and rare species (Coonan, Klinger and Dye 2011).

Nine raptor species occur in CINP, primarily on Santa Cruz and Santa Rosa islands. Hawks and owls also occur intermittently on San Miguel Island (CINP 2012). The largest landbird native to the islands is the bald eagle (*Haliaeetus leucocephalus*). Historically, the bald eagle and peregrine falcon (*Falco peregrinus anatum*) bred on all the northern islands, but largely disappeared by 1960 due to harassment, shooting, egg stealing, and reproductive failure caused by organochlorine pesticide (DDT) pollution in the Southern California Bight (Latta 2012). The bald eagle was completely eliminated by the early 1960's. Reintroduction efforts are aiding their recovery. The peregrine falcon was reintroduced on the islands in the 1980s, with the release of captive-hatched individuals. By 2007, twelve falcons had been released at San Miguel, and four at both Santa Rosa and Santa Cruz. Surveys conducted in 2007 on San Miguel Island documented seven breeding resident pairs. Eight pairs were recorded on Santa Rosa, and seven on Santa Cruz (Latta 2012). The goal of the 2007 study was to document the status of peregrine falcons on the Channel Islands, and to collect biological samples for analyzing on-going threats from DDT contamination. The study found eggshell thinning in exceedance of the 17 percent

threshold characteristic of declining populations. San Miguel samples had thinning levels over 20 percent, and correspondingly low reproductive success. A major contributor to continued contamination in peregrine falcons is thought to be from consumption of seabirds during the nesting period (Latta 2012).

The bald eagle was reintroduced starting in 2002 (CINP 2012). This species was recently reintroduced to the islands as part of a broad program to restore the naturally functioning ecosystems of the islands. It was hoped that native bald eagles would outcompete golden eagles, which had been removed due to fox predation. Bald eagles were released on Santa Cruz Island in 2002 through 2006 as part of a study to determine the feasibility of restoring them to the northern Channel Islands off the coast of southern California. They began breeding on their own on Santa Cruz in 2006 and have also bred successfully on Santa Rosa and Anacapa islands in recent years (Coonan, Klinger and Dye 2011). The bald eagle is considered a rare visitor to San Miguel Island, and an uncommon permanent resident on Santa Rosa and Santa Cruz Islands (NPS 2011).

The Channel Islands support the largest breeding colonies of seabirds in southern California. The islands provide nesting grounds for fourteen species of seabirds, with a number of species reaching their northern or southern breeding distributional limits at the islands. San Miguel Island and its offshore islets including Prince Island, support the largest and most diverse assemblage of breeding seabirds in the Southern California Bight. The most abundant breeding species at San Miguel Island are western gull (*Larus occidentals*), Cassin's auklet (*Ptychoramphus aleuticus*), and Brandt's cormorant (*Carter and others 2008*). Large breeding populations of double-crested cormorant (*Phalacrocorax auritus*), tufted puffin (*Fratercula cirrhata*), ashy storm petrel (*Oceanodroma homochroa*), pigeon guillemot (*Cepphus columba*), black storm petrel (*Oceanodroma melania*), and Scripp's murrelet (*Synthliboramphus scrippsi*) also occur throughout CINP. Most of the world's population of Scripp's more than 50 percent of the world's population of ashy storm-petrel, and the only breeding colonies of brown pelicans (*Pelecanus occidentalis*) along the west coast of the United States, can be found at the Channel Islands (CINP 2012).

A 2008 seabird survey was conducted at San Miguel Island and its islets, including Prince Island, to determine seabird population trends, and assess impacts on seabirds from the non-native black rat (Rattus rattus). Historic impacts to nesting seabirds at Prince Island include historic bombing, guano harvesting, and murre and puffin egg collecting. The report identified conservation issues for seabird colony protection. Among the issues of concern is disturbance of breeding colonies due to sonic boom and bombing activities conducted by the military. Since the 1970s, rocket and spacecraft launches from Vandenberg Air Force Base result in sonic booms near San Miguel and its islets. Of most concern for potential impacts to seabirds and their breeding habitats is the collapse of Cassin's Auklet burrows. A trial activity and follow-up indicated that the adults rapidly re-excavate collapsed burrows. No impacts have been reported, however, sonic booms are conducted when researchers are not present in the colonies (Carter and others 2008). The report also cited potential anthropogenic disturbances from research and recreation, and potential extirpation of Scripp's murrelet from black rat predation. Conservation actions recommended include eradication of black rats, increased seabird monitoring efforts, and continuation of current CINP policies to minimize human disturbance. The report also identified

the need for development of seabird protective measures included in an oil spill/disaster response plan (Carter and others 2008).

Santa Rosa is an important wintering area and stopover for shorebirds, with thirty species recorded along its shores. CINP supported breeding and wintering populations of western snowy plovers in the 1990s, primarily at Santa Rosa and San Miguel. Breeding pairs have since dropped. On Santa Rosa, fewer than 30 breeding pairs were recorded in 2002, down from 60 in 1993. The western snowy plover is reported to no longer nest on San Miguel, although the plover historically used about 10 miles of shoreline on the island. The shoreline of San Miguel except for Culyer Harbor, is closed to public landing or entry. On Santa Rosa, where the western snowy plover once nested on 16 miles of shoreline, nesting pairs have declined dramatically; several beaches are now closed to recreational use to protect the plover (CINP 2012).

4.4.5 Mammals

4.4.5.1 Marine

A diverse community of marine mammals is found on and around the Channel Islands. Many species of pinnipeds (seals and sea lions) breed, pup, and haul out on the islands, and cetaceans (whales and dolphins) feed in the productive waters of the Santa Barbara Channel.

The six pinnipeds known to occur on Santa Rosa, Santa Cruz, and San Miguel Island include Steller's (northern) sea lion (*Eumetopias jubatas*), (federally listed threatened); California sea lion; Guadalupe fur seal (*Arctocephatis townsendi*) (federally and state listed threatened); northern fur seal (*Callorhinus ursinus*); harbor seal (*Phoca vitullina*); and northern elephant seal (*Mirounga angustirostris*) (Thomas and others 1989). The harbor seal is the most common breeding pinniped on Santa Rosa Island (CINP 2012). The federally-threatened southern sea otter (*Enhydra lutris nereis*), a member of the Mustelidae family, is occasionally observed in waters offshore of Santa Rosa, Santa Cruz, and San Miguel and Prince islands.

The California sea lion, harbor seal, and northern elephant seal breed on San Miguel Island beaches. At Point Bennett, on the west end of San Miguel Island, hundreds of thousands of northern elephant seals, California sea lions, northern fur seals and harbor seals breed at various times throughout the year, and more than 30,000 individuals may be on the beach at the same time. San Miguel Island is thought to support the greatest diversity of pinnipeds on the Pacific coast. Abundance of California sea lions and northern elephant seals increased on San Miguel Island in the 1990s, as western snowy plover nests declined (CINP 2012).

The San Miguel Island stock of Northern fur seal population is estimated at 9,968 individuals and is not considered "depleted" under the MMPA (Carretta and others 2011). Changes in sea water temperatures associated with El Nino events, such as those that occurred in 1982-1983, and 1997-1998, limit and regulate the population growth of northern fur seals (Carretta and others 2011). At San Miguel Island, the waters around Point Bennett are closed to protect pinnipeds. The shoreline is closed to landing craft except at Cuyler Harbor.

The blue whale (*Sibaldus musculus*), sperm whale (*Physeter catodo*), gray whale (*Eschrisctius robustus*), Pacific right whale, (*Eubalaena sieboldi*), finback whale (*Balaenoptera physalus*), dolphins, and porpoises occur in the Santa Barbara Channel.

4.4.5.2 Terrestrial

Faunal abundance and diversity of islands is small compared with mainland habitats of similar size. CINP supports only four native mammals: the island fox (*Urocyon littoralis*), the island deer mouse, the harvest mouse and the Channel Islands spotted skunk (*Spilogale gracilis amphiala*). The fox and the deer mouse have evolved into separate sub-species on each island, resulting in eight species endemic to the Channel Islands.

The deer mouse occurs in the natural cover of the landscape, typically alone but sometimes with a mouse of the opposite sex. Since 1992, NPS has monitored the mice on San Miguel twice a year during spring and fall, in grassland, stable dune, lupine, rocky outcrop, and goldenbush habitats (CINP 2012; Fellers, Drost and Arnold 1988).

The island spotted skunk occurs only on Santa Cruz and Santa Rosa Islands, although it existed on San Miguel Island until probably the late 19th century. The skunk populations on both islands increased during the 1990s when the island fox experienced declines due to predation by the golden eagle. As of 2011, about 3,000 skunks are reported on Santa Rosa Island, where they seem to prefer rocky canyon slopes, cactus patches, chaparral, coastal sage scrub, open woodland, other scrub-grassland communities, and riparian habitat along streams (CINP 2012). On Santa Cruz Island, the skunk is associated with chaparral-grassland, open grassland, fennel-grassland, and ravines. It consumes primarily deer mice, insects, and occasional lizards. In recent years the skunks has been observed preying on seabirds nesting in caves.

Santa Cruz Island hosts 11 species of bat, and the only colony of Townsend's big-eared bat *(Corynorhinus townsendii)* in the CINP. This rare bat has established an important maternity colony in an old building on Santa Cruz, where park management practices protect it from disturbances common in other more public areas.

The island fox occurs on six of the eight Channel Islands, including Santa Cruz (Urocyon littoralis santacruzae), Santa Rosa (U. littoralis santarosae), and San Miguel (U. littoralis littoralis). This species descended from the mainland gray fox (U. cinereoargenteus).

CINP has been conducting annual population monitoring of island foxes since 1993, initiated as a result of CINP designation as a Prototype Park for the NPS Inventory and Monitoring Program. In the mid to late 1990s, monitoring results indicated significant declines of island foxes to unsustainable levels, due to predation by golden eagles, and disease. At San Miguel Island, the population dropped from an estimated 450 individuals in 1994 to 15 in 1999; at Santa Cruz, approximately 2,000 adults were recorded in 1994, and 50-60 in 2000; and at Santa Rosa, 1,500 individuals declined to 15 in 2000. It was estimated that without recovery efforts, the fox would become extinct in 5 years at San Miguel, and in 12 years at Santa Cruz. In response, in 1999, the

NPS implemented emergency recovery measures including removal of golden eagles, captive breeding of adults, and vaccination against disease (Coonan and Guglielmino 2012). In support of fox recovery, CINP also re-established bald eagles, and removed non-native ungulates (CINP 2012). In a joint effort between TNC and CINP, the Island Fox Recovery program was initiated on Santa Cruz in 2002, also focused on captive breeding, monitoring fox populations, and vaccinating against diseases.

In 2003, CINP developed a recovery strategy for the island fox that outlined threats, and recovery goals and criteria (Coonan and Guglielmino 2012). The USFWS listed the Santa Cruz, San Miguel, Santa Rosa and Santa Catalina populations endangered in 2004. The USFWS developed a *Draft Recovery Plan for Four Subspecies of Island Fox*, May 2012 (USFWS 2012), which now supersedes the CINP plan (Coonan and Guglielmino 2012).

The captive breeding and release program ended in 2007 at San Miguel, Santa Rosa, and Santa Cruz, due to high reproductive success and survival rates in the wild. Survival rates are 80 to 90 percent on Santa Rosa and San Miguel. The 2010 island fox population estimate at San Miguel was at a level comparable to numbers recorded prior to the predator-induced population decline in the 1990s: 315 adults and 516 total foxes. The Santa Rosa population experienced a slight decline due to predation by golden eagles in 2010, with 292 total foxes, compared to 389 in 2009 (Coonan and Guglielmino 2012). In 2012, the Santa Cruz population was considered "nearly recovered" at more than 1,300 individuals and a 96 percent survival rate (TNC 2012). The NPS continues to implement recovery actions, with focus on intensive monitoring to ensure continued recovery of the species, and to document whether population data indicates attainment of federal recovery criteria, and eventual de-listing of the species (Coonan and Guglielmino 2012). Captive breeding was so successful that it was phased out after six mating seasons.

Prior to the release of the last captive foxes, the CINP Wildfire Management Plan was developed and includes protective measures for penned foxes, using fire retardant materials in the structures and reducing fuel sources around the pens (Kirkpatrick 2006). The fire management plan also calls for protecting hack towers for bald eagle chicks.

The black rat (*Rattus rattus*) is the only non-native mammal remaining on San Miguel Island (Section 4.6.1 Terrestrial Invasives), introduced in the mid-1800s. Historically, other nonnatives included horses, donkeys, sheep, and cattle. Sheep and donkeys were removed in the 1960s and 1970s, respectively. On Santa Rosa Island, feral pigs were eradicated in 1993, and cattle were removed by 1998; deer have largely been eliminated and horses are few in number, confined to one pasture. On Santa Cruz, cattle, sheep, horses, and pigs were introduced and have since been removed (Knowlton and others 2007).

4.4.6 Fish

The Southern California Bight supports at least 481 species of fish. The high diversity of species is due to the various ranges of many temperate and tropical species that extend into and terminate in the Southern California Bight. The Southern California Bight has numerous microhabitats stemming from its complex bottom topography, complex physical oceanographic

regime that includes several water masses, and a changeable marine climate. Habitats around the islands and nearshore areas include soft bottom, rock reefs, extensive kelp beds, and estuaries, bays, and lagoons. Select fishes commonly found in the CINMS include : albacore (*Thunnus alalunga*), anchovy (northern) (*Engraulis mordax*), bass (various species) (Moronidae and Centrarchidae family), cabezon (*Scorpaenichthys marmoratus*), California sheephead (*Semicossyphus pulcher*), California halibut (*Paralichthys californicus*), garibaldi (*Hypsypops rubicundus*), rockfish (various species) (Sebastidae family), salmon (king) (*Oncorhynchus tshawytscha*), sardine (Pacific) (*Sardinops sagax caerulea*), shark (various species) (Selachimorpha superorder), surfperch (various species) (Embiotocidae family), swordfish (*Xiphias gladius*), and white sea bass (*Atractoscion nobilis*).

The waters off Channel Islands are designated essential fish habitat (EFH) for dozens of federally-managed species, as described in Fishery Management Plans for Pacific Coast Groundfish (Pacific Fishery Management Council 2008), Coastal Pelagic Species (Pacific Fishery Management Council 1998), and Highly Migratory Species (Pacific Fishery Management Council 2011). In 2006 the National Marine Fisheries Service (NMFS) issued a final rule implementing the regulatory provisions of Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan (71 FR 27408). Amendment 19 provides for a comprehensive program to describe and protect EFH for Pacific Coast Groundfish and includes designation of CINMS as EFH. All waters from the high tide line to 11,483 feet (3500 meters) in depth are EFH for Pacific groundfish. The amendment also proposed the marine zones of the CINMS as Habitat Areas of Particular Concern, which have corresponding regulations to prohibit fishing. The six Habitat Areas of Particular Concern types in southern California are estuaries, canopy kelp, seagrass, rocky reefs, and submarine features such as seamounts, banks, and canyons (known as "areas of interest"). As part of the Amendment 19 regulation, NMFS prohibited the use of bottom contact fishing gear in the federal waters of the marine reserves and conservation areas within CINMS (NOAA 2008).

4.5 SPECIAL STATUS SPECIES AND THEIR PROTECTION

Special status species include those species that are federally or state-listed endangered, threatened, candidate, or California "species of special concern"; marine mammals protected under the MMPA, and plants identified by the California Native Plant Society on the Rare Plant Rank list. Candidate species are those petitioned species that are actively being considered for listing under the ESA as endangered or threatened, and those species that the NMFS has initiated an ESA status review. Proposed species are those that, after completion of a status review and consideration of other protective conservation measures, are found to warrant listing under the ESA as either threatened or endangered, and officially proposed as such in a Federal Register notice.

Appendix G identifies special status species recorded, and those having potential to occur, at NBVC Channel Islands Special Areas. In addition, some migratory bird species have been determined by the DoD to be of the highest concern and are thus included on the DoD "Partners in Flight Priority Species" list. Additionally, the USFWS identifies bird species that "without additional conservation actions are likely to become candidates for listing under the ESA"; these

The Channel Islands has a total of 38 special status species (Appendix G). Due to the developed nature of the leased and in-grant permit sites on Santa Rosa and Santa Cruz, no special status species are expected to occur on those sites. San Miguel Island has 13 special status species (Table 4-1). NPS management policies direct that "the management of candidate and state-listed species should, to the greatest extent possible, parallel the management of federally listed species" (Coonan 2003). NPS management of federally listed species includes cooperating with other agencies, states, and private entities to promote candidate conservation agreements aimed at precluding the need to list species; and conducting actions and allocating funding to address endangered, threatened, proposed and candidate species (Coonan 2003).

NPS program objectives for the management of listed and candidate species are as follows:

- *I.* "Inventory and monitor sensitive candidate and listed species.
- *II.* Manage endangered, threatened, and candidate species, and their critical habitats, in conformance with the ESA of 1973, as amended; recovery plans and other appurtenant documents.
- *III.* Ensure that park operations do not adversely affect endangered, threatened, candidate, or sensitive species and their critical habitats within the park.
- *IV.* To the extent possible, ensure that activities, projects or programs outside the park do not adversely affect endangered, threatened, candidate, or sensitive species and their critical habitats within the park.
- *V.* To the fullest extent possible, integrate park management actions with other federal, state and private recovery efforts.
- *VI.* Ensure appropriate consideration of federal and state-listed species and other special status species in all plans and NEPA documents.
- *VII.* Encourage NPS involvement on recovery teams as appropriate.
- *VIII.* Design and implement research relevant to the preservation of candidate, rare, sensitive, and listed species.
 - *IX.* Thoroughly document recovery actions and considerations (Coonan 2003)."

4.5.1 Federally Listed Species and Critical Habitat

Critical habitat is defined in Section 3.5.1 Federally Listed Species and Critical Habitat. In a final rule, effective 09 December 2005, the USFWS (70 FR 67924) found that the habitat on San Miguel, Santa Rosa, Santa Cruz, and Santa Catalina islands does not meet the definition of critical habitat for the island fox subspecies, and that a critical habitat designation would not confer additional benefits to the conservation of the foxes. Foxes are generalists and do not require specific habitat types. On 14 September 2012, the USFWS issued the *Draft Recovery Plan for Four Subspecies of Island Fox* (USFWS 2012).

The Channel Islands have 13 federally listed plant species, addressed in the USFWS *Recovery Plan for Thirteen Plant Taxa from the Northern Channel Islands* (USFWS 2000). All 13 taxa are endemic to the northern Channel Islands (Anacapa, Santa Cruz, Santa Rosa, and San Miguel) with one species occurring on Santa Catalina Island. They occur in a variety of habitats: coastal terrace, coastal bluff scrub, coastal sage scrub, and chaparral. Species and their habitats have been or are currently threatened by one or more of the following: soil loss; historic and continuing habitat degradation and grazing by non-native herbivores (pigs, goats, sheep, donkeys, cattle, deer, elk, horses, bison); habitat alteration by native seabirds; competition with invasive plant taxa such as fennel; and increased vulnerability to extinction due to reduced genetic viability, depressed reproductive vigor, and the chance of extinction from random naturally occurring events because of small numbers of individuals and isolated populations (USFWS 2000).

The species addressed in the recovery plan are federally endangered, except for Santa Cruz Island dudleya (*Dudleya nesiotica*) and island rush-rose (*Helianthemum greenei*), which are federally threatened. The recovery objective for the endangered species is to reclassify to threatened and then ultimately delist them. The recovery objective for the threatened species is to delist them.

The recovery plan presents unique recovery criteria for each species. Criteria that apply generally to all of the species include (1) provide protection and adaptive management of currently known (and in some cases historic) sites, (2) provide evidence that the populations at these sites are stable or increasing over a number of years, which is determined by the life history of the individual species, (3) preserve the genetic diversity of the species by storing seeds in cooperating facilities, and (4) develop reliable seed germination and propagation techniques (USFWS 2000).

San Miguel Island federally listed species are detailed in Table 4-1. Other special status species (state listed and rare) that occur on San Miguel Island are in Appendix G.

Family Name	Scientific Name	Common Name	Federal Status
VEGETATION			
Asteraceae	Malacothrix indecora	Santa Cruz Island malacothrix	FE
Boraginaceae	Phacelia insularis var. insularis	Northern Channel Islands phacelia	FE
Rubiaceae	Galium buxifolium	Island bedstraw	FE, SR
INVERTEBRATES			
Arthropoda	Branchinecta lynchi	Vernal pool fairy shrimp	FT
Mullusca	Haliotis cracherodii	Black abalone	FE
MAMMALS			
Carnivora	Urocyon littoralis littoralis	San Miguel island fox	FE, ST
Pinnipedia	Arctocephalus townsendi	Guadalupe fur seal	FT, ST
BIRDS			
Alcidae	Synthliboramphus hypoleucus**	Xantus's murrelet**	FC, ST

TABLE 4-1: SAN MIGUEL ISLAND FEDERALLY LISTED SPECIES

Notes:

Charadriidae

* State status is also provided ** Xantus's murrelet has been split by the American Ornithologists' Union into two species, Guadalupe murrelet (Synthliboramphus hypoleucus) and Scripps murrelet (Synthliboramphus scrippsi), both of which occur at the Channel Islands. USFWS has not yet officially recognized the name change through the Federal Register.

Charadrius nivosus

nivosus

- FC = Federal Candidate
- FE = Federal Endangered
- FT = Federal Threatened
- SE = State Endangered
- ST = State Threatened
- SR = State Rare

4.5.2 Other Special Status Species That Occur at NBVC Channel Islands **Special Areas**

Western snowy plover

FT

Appendix G details the special conservation status of plants, mammals, reptiles, and birds at the Channel Islands.

4.5.3 Other Special Status Species That Have Potential to Occur at NBVC Channel Islands Special Areas

No documents were provided on other special status species, other than what has been previously discussed. If new special status species are observed or species become sensitive, it is assumed the park would manage them in accordance with protections afforded other sensitive species.

4.6 INVASIVE SPECIES MANAGEMENT

NPS prohibits the import of certain items to the islands to reduce the risk of introducing invasive species and to protect the integrity of the island ecosystem. Prohibited items include live/potted plants, soil, cut flowers, firewood, any untreated or unfinished wood (including hiking sticks), corrugated boxes, tools or equipment with attached soil, motorized vehicles, bicycles, and domestic animals. In addition, campfires are prohibited, and visitors are encouraged to inspect their clothing and equipment for weed seeds prior to visiting the islands and before moving between campsites and islands.

The Navy is subject to NPS rules for biosecurity regarding the prohibition for importation of plants or animals to the islands. Eradication and control of invasive species is conducted by NPS and TNC.

4.6.1 Terrestrial Invasives

Terrestrial invasive plant species are controlled or eradicated by NPS staff in cooperation with private contractors, interns, and volunteer groups. Restoration planting with native species grown from locally collected and propagated seed is conducted in areas where natural recruitment or regeneration from the seed bank is limited. On Santa Cruz Island, culturally significant groves of olive and eucalyptus trees have been preserved for historical reasons. The following species are targeted for removal: fennel (*Foeniculum vulgare*) on San Miguel, Santa Cruz, and Santa Rosa islands; Eucalyptus (*Eucalyptus globulus* and *Eucalyptus camaldulensis*) on Santa Cruz and Santa Rosa islands; yellow star-thistle (*Centaurea solstitalis*) on Santa Cruz and Santa Cruz (CINP 2012).

Two separate eradication efforts on Santa Cruz Island rid the island of sheep, first from the western part of the island in the late 1980s, and then from the eastern end in 2001; pigs were removed from the island between 2005 and 2007. Golden eagles were captured and relocated to the mainland; the island has had no nesting golden eagles since 2006.

The European honeybee (*Apis mellifera*) was introduced to Santa Cruz Island in the 1880s and rapidly spread throughout the island. The other northern Channel Islands have not recorded this species, however. European honeybees were eradicated using various methods including mapping and eradication of colonies starting in 1988, biological control via introduction of a parasitic mite in the years 1994-1998, and continued monitoring through 2008. The last

observation of this species was in 2004 and it is presumed that this species is no longer present on Santa Cruz Island (Wenner, Thorp and Barthell 2009).

The Argentine ant was introduced to Santa Cruz Island, likely by Navy contractors. TNC and NPS are currently conducting research on methods to control or eliminate this species.

The black rat (*Rattus rattus*) is currently the only non-native mammal on San Miguel Island. Earlier efforts removed cattle, sheep, donkeys, and horses. The black rat, together with the Norway rat (*R. norvegicus*), and Pacific rat (*R. exulans*), have invaded over 80 percent of the world's oceanic groups and pose the greatest threat to island biodiversity and biosecurity. Approximately half of all bird and reptile extinctions recorded worldwide have been caused by rat predation. Their control and eradication are costly and difficult, especially in island ecosystems, where endemic species are at risk of harm due to control efforts (Fritts 2007).

4.6.2 Aquatic Invasives

Surveys conducted in the waters off of San Miguel Island during 2002, 2004, and 2005, recorded no presence of aquatic invasives species. Surveys conducted at other Channel Islands (Santa Catalina and San Clemente), have recorded presence of the following species: Santa Catalina waters host Asian brown algae (Undaria pinnatifida, Sargasum filicinum and S. muticum); San Clemente waters host S. filicinum. These species are quickly spreading opportunists native to Asia, and unpredictable in their pattern of spread at the Channel Islands. It is thought that these species were introduced to the islands from recreational boats. Undaria pinnatifida was discovered at Santa Catalina only one year after its establishment in Los Angeles harbor. It occurs globally, exhibiting a broad ecological tolerance, and may be limited by warm water and wave action; most occurrences of Undaria pinnatifida are reported in bays and harbors, at depths greater than 49 feet (15 meters), and in giant kelp forest. S. filicinum has a narrower depth range (19.7-62.3 feet [6-19 meters]) and is found in warmer waters, compared with S. muticum, which has a broader distribution across subtidal and intertidal habitats. It is speculated whether changing ocean conditions associated with climate change and El Nino events, may create conditions favorable for introduction and spread of aquatic invasives across the Channel Islands. Changes in density and cover of giant kelp may affect changes in herbivore abundance and in turn, affect aquatic invasive spread (Miller and Engle 2009).

4.6.3 Pests and Disease Vectors

Limited information was provided for this issue area. The decline of the fox population has been partially attributed to the introduction of canine disease (e.g., canine distemper virus) (CINP 2012). Recent analysis of potential threats to the island scrub jay population at Santa Cruz Island identified West Nile virus as a concern. This virus has not been documented at the Channel Islands, for lack of mosquitoes, its vector. The threat could increase if warming temperatures attract mosquito species to establish on the islands (Coonan, Klinger and Dye 2011).

4.7 NATURAL RESOURCES LAW ENFORCEMENT

One law enforcement ranger rotates onto the island to ensure enforcement of park rules and other enforceable state and federal regulations. Approximately 50 percent of their time is spent on San Miguel Island. Non-law enforcement NPS staff also monitors island activities. Volunteer naturalists from the Channel Island Naturalist Corps accompany visitors on concession boats, and lead tours on the island. Their presence supplements NPS staff on the island.

4.8 DATA INTEGRATION, ACCESS, AND REPORTING

Compiling planning and natural resources data into a single, accessible system provides a critical natural resources management tool, enabling managers to identify resources, conflicts, opportunities, and facilitating natural resources decision-making management. NBVC uses an EMS program to track natural resources, including coastal resources and waste products. NBVC's EMS is a conformance requirement for the Navy's environmental program and contributes to standardized methods for data integration, access, and reporting. NPS maintains their own data storage and reporting processes. Reports and GIS data received from the NPS will be housed by NBVC ED.

5.0 CURRENT CONDITION AND MANAGEMENT OF NATURAL RESOURCES AT NBVC FORT HUNTER LIGGETT SPECIAL AREA

The following sections describe the natural resources at NBVC Fort Hunter Liggett Special Area. NBVC ED does not actively manage the natural resources of this Special Area due to the lack of natural resources on Navy property; Navy inholdings (10.8 acres) are largely disturbed and developed. The resources surrounding Navy properties are managed by the U.S. Army's Environmental Division at Fort Hunter Liggett. The Army manages Fort Hunter Liggett in accordance with the objectives and strategies detailed in the *Integrated Natural Resources Management Plan/Environmental Assessment U.S. Army Garrison, Fort Hunter Liggett, California, October 2012* (hereafter referred to as the "Fort Hunter Liggett INRMP") (Fort Hunter Liggett 2012a). At this time, for most of the resource areas, the Navy has no specific concerns. Should land use or the boundaries of Navy inholdings change, this INRMP would require revisions to include or update concerns, objectives, and management strategies.

The following information is sourced from the Fort Hunter Liggett INRMP. "Fort Hunter Liggett" is used interchangeably in the following sections to mean the lands within the Army installation boundaries and also the Army at Fort Hunter Liggett. Navy properties are identified as the NBVC Fort Hunter Liggett Special Area.

5.1 ECOREGIONAL SETTING

NBVC Fort Hunter Liggett Special Area is in the California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Ecological Subregion province and Central California Coast Ranges section (McNab and others 2005). This province has a climate of hot dry summers and mild, wet winters, with most precipitation in the form of rain. The landscape is low-elevation parallel ranges with steep slopes. Vegetation is primarily evergreen shrubland with lesser areas of woodland consisting of broadleaf species, some of which are drought deciduous. The Central California Coast Ranges section has western hardwoods, annual grasslands, and chaparral-mountain shrub cover types.

5.1.1 Topography

Elevations at Fort Hunter Liggett range from approximately 232 meters (760 feet) to 1,140 meters (3,740 feet) above mean sea level; The highest point is Alder Peak at the west end of the installation, and the lowest point is at the upper end of the San Antonio Reservoir. Surrounding lands are heavily dissected rolling hills that separate two valleys. The Santa Lucia Range at the installation's western boundary rises steeply out of the Pacific Ocean approximately 8 km (5 mi) west of Fort Hunter Liggett. The eastern three-quarters of the installation has low hills and flat to rolling river valleys.

5.1.2 Geology

Fort Hunter Liggett is located within the northwest-trending Santa Lucia Range, west of the Gabilan Range. The regional geology includes the Salinian Block, the Franciscan Complex, and sediments deposited in marine and nonmarine basins. These formations date prior to the Quaternary period (2.6 million years ago to the present). The Franciscan Complex underlies the southwestern corner of Fort Hunter Liggett, along the Santa Lucia Range. The Franciscan Complex formed during the Mesozoic Era along a subduction zone, with associated ophiolitic rocks, greywacke, chert, greenstone, peridotite, and serpentinite. These rocks have undergone multiple metamorphic episodes resulting in the folding and faulting of beds. Sedimentary rocks overlying the Franciscan Complex are composed of sandstone, shale, and conglomerates that underlie the eastern two-thirds of the installation. The Salinian Block is composed of crystalline intrusive rocks and metamorphic rocks, ranging in age from the Mesozoic Era (248 to 65 million years ago) to the Precambrian Eon (4.5 billion to 543 million years ago) (Fort Hunter Liggett 2012a).

5.1.3 Climate

Fort Hunter Liggett has a Mediterranean climate characterized by warm, dry summers and mild, wet winters. Summer fog is uncommon, but coastal fog occasionally reaches the coast ridge area. Rainfall is higher in the western portion of the installation and at higher elevations. In 37 years of climate data collected in the cantonment area, temperature varied from a record minimum of 7 degrees Fahrenheit in December, to a record maximum of 116 degrees Fahrenheit in July. Twenty-four hour variations in temperature of 50 degrees are not uncommon year-round; average temperature ranges from 45 degrees Fahrenheit in December to 73 degrees Fahrenheit in July (Fort Hunter Liggett 2012a).

The Fort Hunter Liggett INRMP does not address climate change and NBVC ED does not manage for climate change at the NBVC Fort Hunter Liggett Special Area.

5.1.4 Air Quality

Fort Hunter Liggett is in Monterey County, which is within the North Central Coast Intrastate Air Quality Control Region. NBVC activities at Fort Hunter Liggett Special Area are subject to the rules and regulations developed by the Monterey Bay Unified Air Pollution Control District. The air quality in the North Central Coast Intrastate Air Quality Control Region has been characterized by the EPA as unclassified/attainment for all criteria pollutants (Fort Hunter Liggett 2012a). However, the California Air Resources Board has designated the North Central Coast Intrastate Air Quality Control Region as a nonattainment area for ozone (O_3) and particulate matter (PM₁₀) (Fort Hunter Liggett 2012a).

Currently, there are no specific concerns about air quality or the effects of air quality on natural resources management. NBVC ED does not manage air permitting for the NBVC Fort Hunter Liggett Special Area. The NBVC Air Quality program effectively addresses emissions

monitoring and regulatory compliance. No strategies are needed due to the lack of NBVC ED management responsibilities.

5.2 PHYSICAL CONDITIONS AND MANAGING THE PHYSICAL AND CHEMICAL ENVIRONMENT

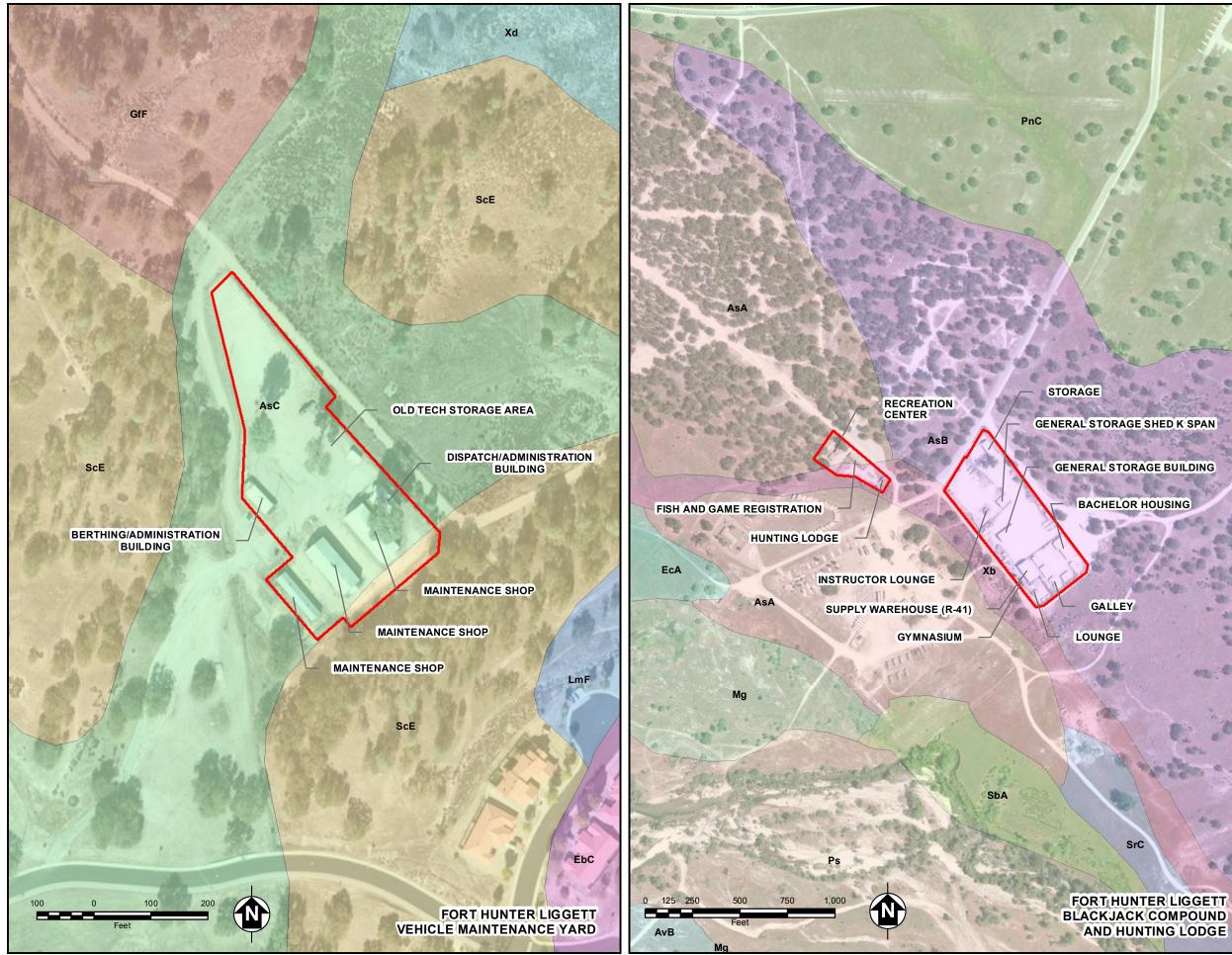
Abiotic resources at the NBVC Fort Hunter Liggett Special Area are described in the following sections.

5.2.1 Soils and Soil Conservation

The diversity of the installation's topography is reflected in the soil types mapped on base: more than 130 soil series and 57 soil associations occur at Fort Hunter Liggett, with loamy types the most common (Figure 5-1). Shallow soils indicative of the underlying parent material comprise the steep highlands in the west. Alluvial terrace soils derived from marine sedimentary rocks are in the eastern and central portions of the installation. Serpentine soils are in the southwestern corner of the installation and support vegetation adapted to their low mineral content.

The steep highlands are dominated by shallow soils and rock outcrops; the rolling hills contain deeper soils derived from alluvial terraces or underlying parent material; and river valley soils consist of alluvial deposits. The three dominant soil parent materials on Fort Hunter Liggett are sedimentary (i.e., shale and sandstone), metamorphosed sedimentary, and granitic rocks. Metamorphosed and granitic rocks are concentrated in the northwestern portion of Fort Hunter Liggett. Granitic and sandstone parent materials have given rise to coarse, sandy soils, while shale and fine sandstone have given rise to finer soils. The San Antonio River valley cuts through all major parent materials of the area and exhibits a full range of soil textures and associations. Soils are coarse and of granitic origin upstream of Mission Creek, while downstream they are finer and of sedimentary and alluvial origin. In lower reaches of the river valley, soils are richer in clay due to shale erosion on the valley's southern side.

Alluvial soils of the cantonment area are derived from sedimentary parent materials. Textures of these soils range from gravelly sandy loams to clay loams. Soils that formed from granitic parent materials make up the Placentia, Chualar, and Arroyo Seco series. Soils that formed from sedimentary parent material make up the Lockwood, Rincon, and Metz series. Soils that formed from both of these parent materials form the Tujunga and Elder series. All of these soil series are greater than 60 inches deep and are well-drained. The Elder series can have gravel or cobbles at a depth of 24 inches. Fort Hunter Liggett soils on slopes are classed as moderately to highly erodible. As the topography becomes more extreme on the slopes of surrounding mountains, the erosion potential increases. Within the San Antonio River watershed, the surface texture of soils is commonly sandy loams, with large areas of clay loams and silty clay loams. There is a distinct corridor of sand and loamy sands along the San Antonio River, particularly evident in the cantonment and areas south where arroyo toads have been found; outside this corridor, sandy soil types are scarce.



Author: GK Date: 7/29/2013. Path: \\Ecss134fs01\DIV-GIS\Projects\Mugu INRMP 2013\POINT_MUGU_GISDATA_101512\POINT_MUGU_GISDATA_101512\PM_DRAFT_INRMP_072013\FIG5-1_PM_INRMP_FORT_HUNTER_LIGGETT_SPECIAL_AREA_SOILS_072913.mxd Data Source: TetraTech Databases; Soils Data Source: US Department of Agriculture, Natural Resources Conservation Service 2009. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

Legend

INRMP BOUNDARY
FHL OLD TECH SOILS
SOIL NAME
Arroyo Seco gravelly sandy loam, 5 to 9 percent slopes
Elder very fine sandy loam, 2 to 9 percent slopes
GfF Gazos silt loam, 30 to 50 percent slopes
LmF Los Osos clay loam, 30 to 50 percent slopes
San Andreas fine sandy loam, 15 to 30 percent slopes
Xd Xerorthents, dissected
FHL BLACKJACK COMPOUND SOILS SOIL NAME

AsAArroyo Seco gravelly sandy loam, 0 to 2 percent slopesAsBArroyo Seco gravelly sandy loam, 2 to 5 percent slopesAvBArroyo Seco gravelly loam, 2 to 5 percent slopesEcAElder loam, gravelly substratum, 0 to 2 percent slopesMgMetz complexPnCPlacentia sandy loam, 2 to 9 percent slopesPsPsamments and Fluvents, frequently floodedSbASalinas clay loam, 0 to 2 percent slopesSrCSorrento clay loam, 2 to 9 percent slopesXbXerorthents, sandy

ESRI WORLD IMAGERY SATELLITE IMAGE

Naval Base Ventura County California

FIGURE 5-1 FORT HUNTER LIGGETT SPECIAL AREA NRCS SOILS

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

INRMP = Integrated Natural Resources Management Plan

The Nacimiento River watershed also has large areas with a sandy loam surface texture, substantial areas of bedrock in the western, mountainous areas, and more loam than is apparent in the San Antonio River watershed. There is a narrow strip of sand and loamy sand associated with portions of the Nacimiento River. However, these sandy soil types are scarce.

Biological soil crusts such as cryptogamic, cryptobiotic, microbiotic, or microphytic soil crusts reduce soil erosion and can be found in undisturbed areas of Fort Hunter Liggett. These crusts are typically found in arid and semi-arid lands throughout the world. Biological soil crusts are a complex mosaic of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria. In rangelands, biological soil crusts function as living mulch by retaining soil moisture and discouraging annual weed growth. They reduce wind and water erosion, fix atmospheric nitrogen, and contribute to soil organic matter (Fort Hunter Liggett 2012a).

Specific Concerns

• Erosion control measures may be eliminated from projects as a cost-cutting measure.

Current Management

Federal agencies must manage lands to control and prevent soil erosion and conserve natural resources by conducting surveys and implementing soil conservation measures. The Sikes Act, the Clean Water Act, DoDINST 4715.03, and Chief of Naval Operations Instruction 5090.1C CH-1 require best management practices (BMP) for soil and water resources on federal lands. The Clean Air Act also restricts particulate matter emissions that result from soil disturbance.

Any project on Navy property that may disturb the soil must go through the Navy's SA/PRB process for NEPA compliance, to receive a site approval from local and regional Navy. This includes any soil disturbing activities such as digging, grading, stockpiling, dumping, staging, or establishing a laydown area. As necessary, BMPs are required to protect the soil from erosion by wind and water. This project screening process is a streamlined means for project sponsors to comply with NEPA, and the laws, regulations and guidelines described above.

Assessment of Current Management

The SA/PRB process adequately addresses soil erosion issues during project review if activities occur on Navy property.

Management Strategy

Objective: Implement best management practices to prevent and control soil erosion.

- *I.* Ensure enforcement of the SA/PRB requirements to prevent erosion and repair any damage from construction or maintenance activities.
- *II.* Use the specific guidance for selecting BMPs presented in the *California Stormwater Best Management Practices Handbook*, including project planning and design guides, Stormwater Pollution Prevention Plans, Water Pollution Control Programs preparation manuals, Construction Site BMPs Manual (Caltrans 2000), other specifications in use on island projects, and other proven techniques.
- *III*. Minimize disturbance by continuing to locate staging areas and construction training activities in disturbed areas only.

5.2.2 Water Resources and Water Management

Water resources are discussed in this section. NBVC ED does not conduct management activities for water resources, so no strategies are needed at this time.

5.2.2.1 Groundwater Hydrology

Two aquifers, separated by the Jolon Fault, underlie Fort Hunter Liggett: the Lockwood groundwater basin to the east of the fault and the San Antonio basin to the west. Groundwater flow is to the southeast following the geologic structure of the Coast Ranges in confined and unconfined conditions. Three wells provide an average of about 37 to 43 hectare-meter (300 to 350 acre-feet) per year of groundwater for domestic consumption (Fort Hunter Liggett 2012a).

Numerous monitoring wells have been and are being established to monitor confirmed sources of groundwater contamination with petroleum hydrocarbons, as part of the Army's Defense Environmental Restoration Program. The Fort Hunter Liggett INRMP states that "although military activities within the cantonment and field training areas have the potential to impact groundwater, data available to date suggest that water quality on Fort Hunter Liggett has not been impaired" (Fort Hunter Liggett 2012a).

5.2.2.2 Surface Water Hydrology and Stormwater Management

Fort Hunter Liggett is within the headwaters of the Nacimiento River and San Antonio River watersheds, which cover 1,830 square km (705.3 square mi). Both rivers originate north of Fort Hunter Liggett on U.S. Forest Service property, feed into reservoirs, then flow east to the Salinas River and empty into Monterey Bay. The San Antonio River and Nacimiento River are linear subparallel drainages that flow approximately 8 km (5 mi) apart from the northwest to the southeast across Fort Hunter Liggett. Both rivers are primarily ephemeral. The Nacimiento

River lies west of the installation and flows through the post from the northwest to the southeast; the San Antonio River lies east of the hills separating the two watersheds. The San Antonio River watershed includes all or major portions of the northeastern half of the installation. Much of the Nacimiento River is dry during summer months. Numerous creeks, the Lake San Antonio shoreline, and 14 impoundments provide aquatic and riparian habitat on Fort Hunter Liggett (Fort Hunter Liggett 2012a).

Surface water quality depends on seasonal flow regimes and is dependent upon environmental factors including amount and timing of rainfall, retention, recharge, and runoff; soil conditions; and influences by humans. During summer, rapid evaporation of surface waters results in increased mineral concentrations and subsequent microbial blooms. Data on Fort Hunter Liggett surface water quality indicate that military activities within the cantonment and in field training areas have not impaired surface waters (Fort Hunter Liggett 201a2).

NBVC Fort Hunter Liggett Special Area is required to comply with federal and state stormwater regulations under the Clean Water Act, as amended in 1987 (Section 402 [p]), and the Coastal Zone Act Reauthorization Amendments of 1990 (Section 6217). These regulations address nonpoint source pollution from urban and stormwater runoff. There are no industrial activities at NBVC Fort Hunter Liggett Special Area facilities. Vehicle maintenance is conducted in a covered facility, and is not exposed to stormwater. During the SA/PRB process, construction projects are reviewed for consistency with the Clean Water Act, and those projects that require a construction stormwater pollution prevention plan are identified.

5.3 ECOSYSTEMS AND ECOSYSTEM MANAGEMENT

A variety of soil and geological conditions on Fort Hunter Liggett support diverse plant communities. More than 1,000 species of vascular plants are found in the following communities: wetland communities and chaparral, coastal shrub, oak, mixed evergreen forest, grassland, riparian, coniferous forest, rare natural, biological crust, landscaped areas, and rock outcrop terrestrial communities. The western side of the installation is dominated by steep hillsides covered with chaparral, scrub, and live-oak forests (42 percent of the total area). The hills are intersected by flat rolling river valleys and grasslands, oak savannas, and oak woodlands (55 percent of total area). The following section describes habitats and typical species at Fort Hunter Liggett (Fort Hunter Liggett 2012a).

5.3.1 Wetland Communities

No wetland communities or jurisdictional Waters of the U.S. are on NBVC Fort Hunter Liggett Special Areas. Outside of Navy property boundaries, USACE has designated 146.3 acres of jurisdictional and non-jurisdictional wetlands at Fort Hunter Liggett. Wetlands at Fort Hunter Liggett are characterized by relatively shallow, slow-moving, or stationary water, or moist to wet soils with hydrophytic plants in landscape depressions. Jurisdictional Waters of the U.S. are the San Antonio and Nacimiento Rivers, and a network of tributaries throughout their respective watersheds. Wetland habitat types include vernal pools, wet meadows, swales and drainages, freshwater marshes, and seasonal wetlands. No installation-wide wetland delineation has been conducted at Fort Hunter Liggett. Delineations are conducted as needed. Isolated wetlands with no hydrological connection to a river also occur on the installation. Isolated wetlands are generally not jurisdictional. However, if the isolated wetland supports threatened or endangered species, it can be regulated by the USFWS.

Wetlands on Fort Hunter Liggett include perennial and ephemeral hydrology regimes. Perennial wetlands, such as streams, reservoirs/lakes, and freshwater marshes, maintain some level of saturation throughout the year. Most of the wetlands on Fort Hunter Liggett are associated with the two watersheds, but some wetland sites are found in training areas. Additional information on wetlands is provided in the Fort Hunter Liggett INRMP (Fort Hunter Liggett 2012a).

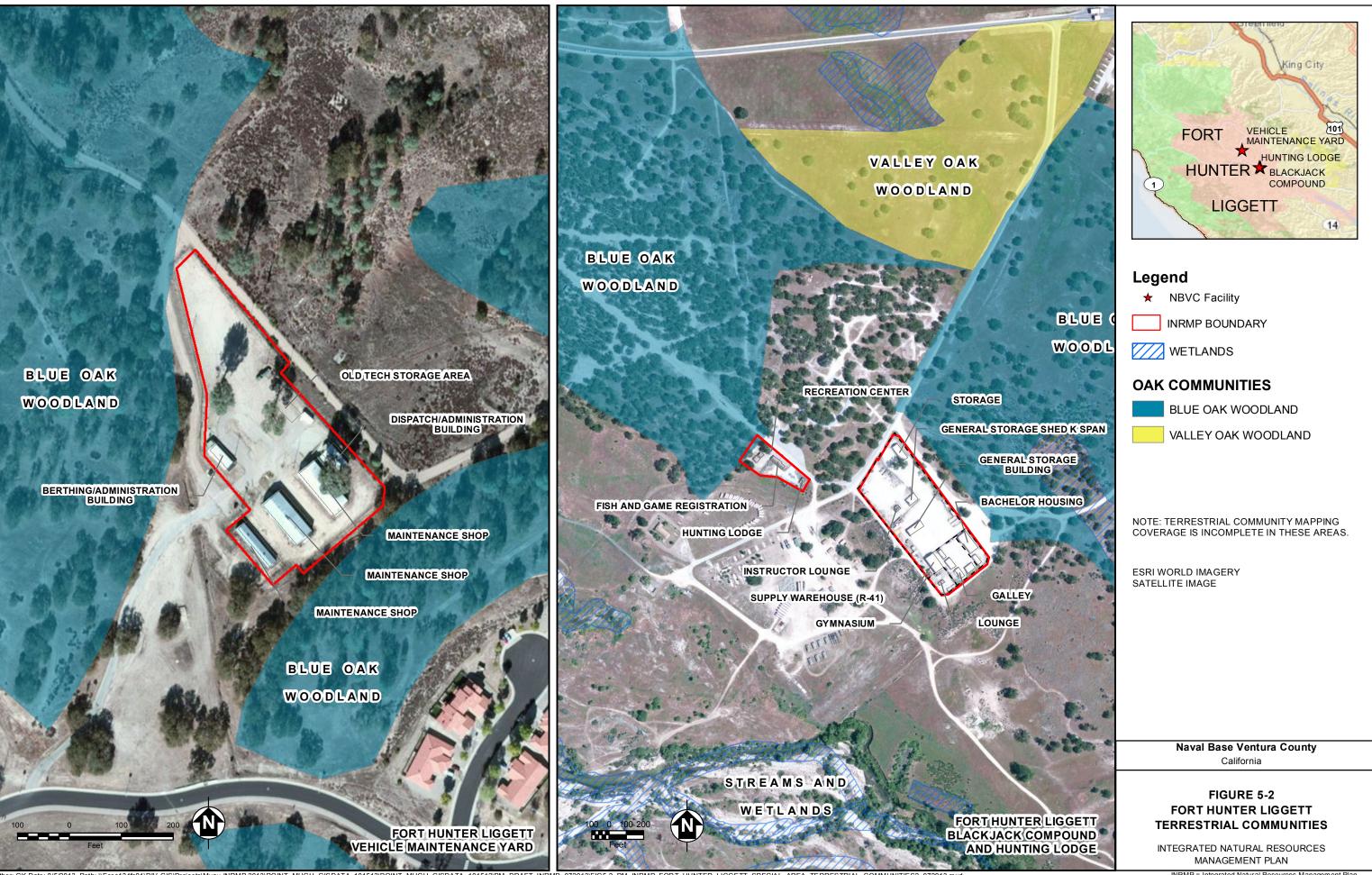
Ephemeral wetlands have two phases, a wet season phase that is dependent on fall and winter rains to fill pools and depressions, and a dry season phase brought about by a lack of rain in the summer. On Fort Hunter Liggett, ephemeral wetlands include vernal pools, wet meadows, and vernal swales. Vernal pools at Fort Hunter Liggett are difficult to detect because of their small size and seasonal inundation. The pools support zooplankton, phytoplankton, and macroinvertebrates. The federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*) was found in 65 vernal and seasonal pools on Fort Hunter Liggett in 2000 (Fort Hunter Liggett 2012a).

5.3.1.1 Jurisdictional Waters–Wetlands Management

The Fort Hunter Liggett INRMP identifies the need for a planning level survey of jurisdictional wetlands on base, with the goal of completing a basewide wetland delineation sometime in the fiscal years 2011-2015 (Fort Hunter Liggett 2012a).

5.3.2 Terrestrial Communities

The following terrestrial communities are grouped and described according to their presentation in the Fort Hunter Liggett INRMP, and shown on Figure 5-2. Vegetation communities at Fort Hunter Liggett ranked "rare and most worthy of consideration for protection" by the California Natural Diversity Database include sycamore alluvial woodland, valley needlegrass grassland, and valley oak woodland, as described below. Specific concerns, current management, assessement of management, objectives, and strategies are grouped at the end of the terrestrial communities section.



Author: GK Date: 8/5/2013. Path: \\Ecss134fs01\DIV-GIS\Projects\\Mugu INRMP 2013\POINT_MUGU_GISDATA_101512\POINT_MUGU_GISDATA_101512\PM_DRAFT_INRMP_072013\FIG5-2_PM_INRMP_FORT_HUNTER_LIGGETT_SPECIAL_AREA_TERRESTRIAL_COMMUNITIES2_072913.mxd Data Source: TetraTech and NBVC GIS Databases. This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division. INRMP = Integrated Natural Resources Management Plan NBVC= Naval Base Ventura County

5.3.2.1 Oak Communities

Oak communities (woodlands, forests, and savannas) are the most widespread vegetation type on Fort Hunter Liggett, covering an estimated 46 percent of the installation (Fort Hunter Liggett 2012a). Dominant communities include blue oak (*Quercus douglasii*), valley oak (*Q. lobata*), and live oak. Blue oak communities are the most prevalent at Fort Hunter Liggett, occurring in pure stand woodlands to foothill woodlands where the blue oak is mixed with other oak species and foothill pines, or in more open blue oak savannas with a grassland understory. Valley oak woodlands are rare on Fort Hunter Liggett and are considered a rare vegetation community by the California Natural Diversity Database. The valley oak is the largest of the California oaks and is associated with deep alluvial soils of valley bottoms, forming savannas with a grassland understory. Live oak communities consist of coast live oak (*Q. agrifolia var. agrifolia*), interior live oak (*Q. wislizeni var. wislizeni*), and canyon live oak (*Q. chrysolepis*). Most restoration plantings at Fort Hunter Liggett include valley oaks. The slow-growing and long-lived oaks provide important wildlife habitat.

The NBVC Fort Hunter Liggett Special Area facilities contain the oak communities described below.

The Hunting Lodge on Navy property has seven blue oaks within its fenceline (as well as two non-native Italian cypress trees [*Cupressus sempervirens*]). Due to the developed and disturbed nature of the site, any use by fauna other than commonly occurring wildlife would be unlikely. The understory at the Hunting Lodge contains a mix of native and non-native grasses and forbs. Native species include coyote brush (*Baccharis pilularis*), horseweed (*Conyza* sp.), cudweed (*Gnaphalium canescens*), horehound (*Marubium vulgare*), dock (Rumex sp.), vervain (*Verbena lasiostachys*), and pincushion (*Navarretia* sp.). Non-natives include brome grasses (*Bromus* spp.), mustard (*Brassica* sp.), and yellow star thistle (*Centaurea solstitialis*), a noxious weed.

The Blackjack complex has two mature valley oaks and one blue oak (as well as the native Fremont cottonwood [*Populus fremontii*]). The understory at Blackjack contains a mix of native and non-native grasses and forbs, including California buckwheat (*Eriogonum fasciculatum*), yerba santa (*Eriodictyon* sp.), wooly bluecurls (*Trichostema lanatum*), and non-native grasses such as brome and wild oats (*Avena* spp.). Due to the developed and disturbed nature of the site, any use by fauna other than commonly occurring wildlife would be unlikely.

The Vehicle Maintenance Yard has no oak woodland on site.

5.3.2.2 Grasslands

Approximately 10 percent of Fort Hunter Liggett is covered by grasslands dominated by nonnative species, typically on open, level, or moderately sloped areas. About 2 to 5 percent of grasslands on Fort Hunter Liggett are native, characterized by *Nassella pulchra*, *Nassella cernua*, *Deschampsia danthonioides*, *Melica imperfecta*, and *Poa secunda*. Non-native grasslands are dominated by *Bromus hordeaceous*, and other species such as *Bromus diandrus*, *Bromus madritensis*, wild oat , and yellow star-thistle. Native grasses are protected under California Fish and Game Code in Native Plant Protection (Fish & Game Code 1900–1913), Native Species Conservation and Enhancement (Fish & Game Code 1750–1772), and Natural Community Conservation Planning Act (Fish & Game Code 2800–2835) (Fort Hunter Liggett 2012a). Navy properties at Fort Hunter Liggett have no grassland or potential grassland habitat.

5.3.2.3 Coniferous Forest

Coniferous forest on Fort Hunter Liggett includes closed-cone, pine-cypress forest, and yellow pine forest. Closed-cone, pine-cypress includes Sargent cypress (*Cupressus sargentii*), generally found on serpentine soils. Sargent cypress is included in the rare California series listed by Sawyer and Keeler-Wolf. Yellow pine forest is dominated by ponderosa pine (*Pinus ponderosa*) and Coulter pine (*Pinus coulteri*). Small stands of Santa Lucia fir (bristlecone fir) occur in the western mountains on Fort Hunter Liggett (Fort Hunter Liggett 2012a).

Three gray pines (*Pinus sabiniana*) grow on the Vehicle Maintenance Yard site. The understory is a mixture of non-native plants, including mustard (*Brassica* sp.), brome grasses, and yellow star thistle. Other species include coyote brush), horseweed (*Conyza* sp.) and cudweed. Due to the developed and disturbed nature of the Vehicle Maintenance Yard site, any use by fauna other than commonly occurring wildlife would be unlikely.

5.3.2.4 Other Vegetation Communities of Fort Hunter Liggett

The following discussion summarizes vegetation communities found on Army property at Fort Hunter Liggett. These communities are not present on Navy properties.

Chaparral covers 39 percent of Fort Hunter Liggett and is most abundant in the Nacimiento River watershed. The two most widespread chaparral types on Fort Hunter Liggett are mixed chaparral and chamise chaparral. Typical woody chaparral species on Fort Hunter Liggett include several species of oak (*Quercus* spp.), ceanothus (*Ceanothus* spp.), manzanita (*Arctostaphylos* spp.), toyon (*Heteromeles arbutifolia*), black sage (*Salvia mellifera*), mountain mahogany (*Cercocarpus betuloides*), and others. Mixed chaparral is typified by a codominance of several species, while chamise chaparral, called chamisal, is dominated by chamise (*Adenostoma fasciculatum*). On the Fort Hunter Liggett installation, chaparral is generally found on south-facing slopes and along the western mountain areas and the ridges and slopes between the San Antonio River and Nacimiento River watersheds (Fort Hunter Liggett 2012a).

Coastal scrub communities are not differentiated from chaparral communities in the Army's GIS plant community data layer (Figure 5-2) but are a distinct plant community. Northern and southern phases of coastal scrub can be found in both Monterey and San Luis Obispo counties. Evergreen shrubs dominate the northern coastal scrub plant communities. Southern coastal scrub communities are dominated by drought-tolerant species that are typically resinous and produce scented volatile oils. Southern coastal scrub contains shrubs, subshrubs, and herbs; dominant species are California sagebrush and sages (*Salvia* spp.). The Army uses periodic prescribed

burns to prevent the establishment of large, even-aged stands and reduce the risk of wildfires in chaparral and scrub communities at Fort Hunter Liggett. The resultant mixed stands provide valuable wildlife habitat.

Mixed-evergreen forest along a portion of the Fort Hunter Liggett border includes broad-leaved and coniferous evergreen tree species, with occasional deciduous tree species. Dominant species include coast live oak, black oak (*Q. kelloggii*), canyon live oak, California bay laurel (*Umbellularia californica*), madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), and bigleaf maple (*Acer macrophyllum*).

Riparian communities cover an estimated 3 percent of Fort Hunter Liggett and consist of alluvial woodlands composed of sycamore (*Platanus racemosa*), cottonwood, and willow (*Salix* spp.). Other common riparian species include mule fat; willow species (*Salix laevigata, S. lasiolepis, S. goodingii*, and *S. exigua*); and herbaceous understory species including rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), and nut sedges (*Cyperus* spp.). Sycamore alluvial woodlands are considered a rare vegetation type by the California Natural Diversity Database. Riparian areas are not typically used for military activities; vehicle travel is prohibited within 20 meters (66 feet) of streams and limited to established crossings (Fort Hunter Liggett 2012a).

Rock outcrops, where underlying rock is exposed at the surface, provide a unique substrate for several obligate plant species; outcrops are also used by raptors as roost and nesting sites. Rock outcrops are most common in the Nacimiento River watershed. Military activities at rock outcrops are limited to a few sites in the Palisades area where training exercises involve rock climbing and rappelling. Recreational rock climbing is not permitted.

Specific Concerns

- Facility upgrades or maintenance and development could have impacts on individual trees, including native oaks and conifers.
- Oak communities are a rare vegetation type and recruitment of oak trees is poor throughout California.
- If weeds and non-native grasses are only on Navy properties, they could spread to natural areas on Army property.

Current Management

Projects on Navy sites are reviewed through the SA/PRB process to minimize impacts to native vegetation. Navy grounds maintenance staff occasionally cut or mow grassy areas.

Assessment of Current Management

The cutting or removal of live oaks and conifers is addressed through the SA/PRB process. NBVC ED should ensure oak protection regulations that are in place installation-wide are conveyed to tenants and grounds maintenance staff at NBVC Fort Hunter Liggett Special Area to ensure oaks are not disturbed. Disturbance should be avoided and if not possible, mitigated by restoration with oak seedlings.

NBVC grounds maintenance staff at NBVC Fort Hunter Liggett Special Area occasionally mows non-native grassy areas. To minimize spread of invasives to adjacent properties, NBVC ED should determine if the grass is a threat to the surrounding areas, and if so, manage accordingly.

Management Strategy

Objective: Minimize impacts of development, maintenance, and military activities or other disturbances on Navy properties on Fort Hunter Liggett.

- *I.* Continue to use the SA/PRB to minimize potential impacts.
 - A. Ensure that projects incorporate appropriate native vegetation in landscape design.
 - *B.* Include reseeding of disturbed areas with appropriate native grasses and forbs as a contract requirement for construction projects.
 - *C.* Ensure projects are designed to avoid impacts to oak and conifer trees.
 - *D.* If avoidance is not possible, require mitigation for oak disturbance or loss and ensure such mitigation is incorporated into project costs.
 - *E.* Ensure NBVC Fort Hunter Liggett Special Area tenants and grounds maintenance staff are aware of precautions to take for protection of oak trees and associated root zones. Trampling or storage of materials within the canopy drip-line should not be allowed because the root zone in this area is vulnerable to soil compaction and release of contaminants.
- *II.* Coordinate with grounds maintenance staff to remove and control grass if deemed a biological threat to the area.

5.4 FISH AND WILDLIFE MANAGEMENT

The following sections describe fish and wildlife at Fort Hunter Liggett and NBVC Fort Hunter Liggett Special Area. More than 300 animal species including 223 birds and many special-status species inhabit Fort Hunter Liggett (Fort Hunter Liggett 2012a). No special status species inhabit any of NBVC's special areas at Fort Hunter Liggett.

5.4.1 Invertebrates

Data for this resource area are limited. The federally-threatened vernal pool fairy shrimp occurs at Fort Hunter Liggett in vernal and seasonal pools (Section 5.5 Special Status Species). The ephemeral vernal pools that occur west of the Blackjack compound support this species (Tetra Tech 2012j). No vernal pools are on Navy properties; however, there are pools nearby the Blackjack Compound.

Beehives constructed and inhabited by native bees at the Hunting Lodge are addressed in Section 5.4.2 Pollinators. Other invertebrates of interest are those non-native species that are considered pests (such as the cockroaches and Argentine ants).

Current Management

Facilities at NBVC Fort Hunter Liggett Special Area are developed; most invertebrates at the facilities are managed by NBVC Pest Management (Section 5.6.3 Pests and Disease Vectors).

Assessment of Current Management

NBVC Pest Management manages non-native invertebrates such as Argentine ants in the developed areas at NBVC Fort Hunter Liggett Special Area. However, due to the distance to the Fort Hunter Liggett installation, pest management surveys need to be improved or coordinated with the Army's pest management staff. Coordination should occur with Pest Management to ensure behives are protected and that relocation activities are conducted in a manner that conserves the hive.

Management Strategy

Objective: Conserve native invertebrates and their habitats.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species and habitats.
- *II*. Coordinate with the NBVC Pest Management Program to ensure minimal impacts to pollinators such as bees and their hives: encourage bee and wasp relocation as opposed to eradication.

5.4.2 Pollinators

No data are currently available for this resource area other than the presence of beehives at the Hunting Lodge. Other Navy facilities at Fort Hunter Liggett may also support the non-native hive-constructing honeybee, as well as the native bumblebee that lives in groups. However, most of the 1600 bees native to California do not form hives but live alone; many of them nest in the ground and can be adversely affected by landscaping and grounds maintenance practices. Native bees include leafcutting bees, sweat bees, digger bees, mining bees, mason bees, carpenter bees, and cuckoo bees (Powell and Hogue 1980). Virtually all native bees are pollinators of at least one plant species.

Specific Concerns

Potential impacts to pollinator populations and their habitats at NBVC Fort Hunter Liggett Special Area include:

- Improper use of pesticides and herbicides can directly harm pollinators and their habitats;
- Invasive species and anthropogenic disturbances can degrade pollinator habitat;
- Invasive species can directly compete with and transmit diseases to native pollinators;
- Landscaping and grounds maintenance practices may degrade habitat for native ground-nesting bees;
- Pest management program response to beehives and swarms are often in conflict with the goals of pollinator protection; and
- Climate change may reduce or alter pollinator habitats and populations.

Current Management

Pollinators are not specifically managed at NBVC Fort Hunter Liggett Special Area due to the lack of natural resources on site. Their habitats are managed through the SA/PRB. The implementation of management strategies detailed in this INRMP, and specifically in Section 5.3 Ecosystems and Ecosystem Management, Section 5.4.1 Invertebrates, Section 5.6 Invasive Species Management, and Section 6.8 Landscaping and Grounds Maintenance, support pollinator populations.

Assessment of Current Management

Due to lack of natural resources, no management currently occurs. NBVC ED should ensure, through the SA/PRB process, that landscaping plans are designed to support pollinator populations, including native ground-nesting bees. Coordination should occur with Pest Management to ensure behives are protected and that relocation activities are conducted in a manner that conserves the hive.

Management Strategy

Objective: Conserve and enhance pollinator populations and their habitats when not in conflict with the military mission.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species and habitats.
- *II.* Identify opportunities to create pollinator friendly landscapes; integrate flowering native plants into any NBVC Fort Hunter Liggett Special Area landscape plans. Take care to provide access to bare areas for ground-nesting bees.

5.4.3 Reptiles and Amphibians

Four special status amphibians occur at Fort Hunter Liggett: the foothill yellow-legged frog (*Rana boylii*), western spadefoot (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), and California newt (*Taricha torosa*) (Section 5.5 Special Status Species and Appendix G). A hybrid tiger salamander (*Ambystoma* spp.) also occurs. Reptiles observed at Navy properties include the gopher snake, rattlesnake, alligator lizard, whiptail lizard, and Coast Range fence lizard (*S.o. bocourtii*) (Tetra Tech 2012j).

NBVC ED does not manage reptiles and amphibians on Navy properties at Fort Hunter Liggett. Project impacts to reptiles and amphibians are minimized through the SA/PRB process.

5.4.4 Birds

Migratory birds are present at Fort Hunter Liggett, with nesting populations present in late spring and summer, overwintering populations in the late fall and winter, and migrating populations transiting the region in between those periods. Common species include the western meadow lark (*Sturnella neglecta*), western scrub jay (*Aphelocoma californica*), California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), turkey vulture (*Cathartes aura*), acorn woodpecker (*Melanerpes formicivorus*), and red-tailed hawk (*Buteo jamaicensis*). Golden and bald eagles nest and winter at Fort Hunter Liggett. The federally-endangered California condor has been recorded foraging at Fort Hunter Liggett (Fort Hunter Liggett 2012a). Popular game species hunted in the fall at Fort Hunter Liggett include upland birds such as California quail and mountain quail (*Oreortyx pictus*), mourning dove, and band-tailed pigeon (*Columba fasciata*); wild turkey (*Meleagris gallopavo*); and waterfowl such as mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), and Canada goose (*Branta canadensis*).

The California quail is found primarily in scattered shrub, open woodlands, and transition zones between dense vegetation and open areas; it uses brush piles and thickets for escape cover and is common in lower elevation areas of Fort Hunter Liggett. The mountain quail inhabits live oak woodland and mixed chaparral on steeper slopes. The mourning dove typically nests either in trees or on the ground in open areas.

NBVC ED does not conduct monitoring of migratory birds at NBVC Fort Hunter Liggett Special Area properties. Due to the developed and disturbed nature of the sites, use of the sites by anything other than common birds of the area, would be unlikely. The Army regularly monitors migratory birds and participates in various regional monitoring programs to track populations on Fort Hunter Liggett, including the Monitoring Avian Productivity and Survivorship program and state and national programs such as the Tricolored Blackbird Portal and the U.S. Nightjar Survey Network. The Army maintains and monitors more than 100 wood duck nesting boxes each year.

Specific Concerns

- Facility maintenance and development could remove a small amount of migratory bird habitats.
- Pesticide and herbicide use could negatively impact nesting birds.
- Difficulty in educating building tenants on protocols for responding to the discovery of nesting birds, in their facilities.

Current Management

NBVC ED does not actively manage migratory birds at NBVC Fort Hunter Liggett Special Area, due to the lack of significant natural resources and developed nature of the sites. Project impacts to migratory birds are minimized through the SA/PRB process.

Assessment of Current Management

The SA/PRB process effectively manages for potential impacts to nesting and migratory birds.

Management Strategy

Objective: Ensure conservation of bird species at NBVC Fort Hunter Liggett Special Area.

- *I.* Continue to use the SA/PRB to avoid and minimize potential impacts and "takes" of migratory, resident, and special status bird species and their habitats.
 - A. Incorporate project-specific BMPs for migratory birds. BMPs should include protective measures such as timing projects to avoid the nesting season, when active nests may be present in NBVC Fort Hunter Liggett Special Area trees or structures.
 - *B.* Conserve natural habitats, especially primary roosting, foraging, and nesting areas, from human induced disturbance and invasive species.
 - 1. Provide training and information to facility managers regarding protection of migratory birds in compliance with laws to avoid and minimize take, and conserve and restore habitat (EO 13186).
 - 2. Ensure that NBVC ED has provided approval for any projects on Navy property that may lead to disturbance, if there are nesting birds in the area that may be disturbed.
 - 3. Ensure tree trimming occurs outside the nesting season, except for instances where health and safety are a concern; in this instance, coordinate with NBVC ED prior to tree trimming activities to conduct a nest survey.
 - 4. Reduce pesticide use (see Section 6.8, Landscaping and Grounds Maintenance).
 - 5. Limit the use of rodenticides. Remove any dead or dying rodents from a treated area to reduce the possibility of secondary poisoning through raptor consumption of poisoned rodents.
 - 6. Ensure surveys are conducted prior to building maintenance, restructuring, or demolition activities, if occurring during the nesting season.
 - 7. Ensure tenants are aware of protocols for responding to birds injured or trapped inside buildings and warehouses.
 - 8. Support cleanup efforts to reduce contaminants and toxic buildup in the ecosystem, including monitoring and reducing nonpoint sources.
 - C. To comply with the Defense Reauthorization Act, use the best scientific data available to assess through the NEPA process, or other environmental

requirements, the expected impact of proposed or ongoing military readiness activities on migratory bird species likely to occur in action areas.

D. Promote research and information exchange between the Army and Navy for species occurring in, or in the vicinity of, Navy facilities.

5.4.5 Mammals

Plant communities at Fort Hunter Liggett provide a wide range of habitats for mammals. Typical mammal species include the California ground squirrel, tule elk (*Cervus canadensis nannodes*), California black-tailed deer (*Odocoileus hemionus californicus*), American badger, coyote, bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), deer mouse, pocket mouse (*Perognathus californicus*), and kangaroo rat (*Dipodomys spp.*).

Fort Hunter Liggett has an active hunting program. Deer, tule elk, pig, coyote, bobcat, jackrabbit, cottontail, tree squirrel, dove, quail, pigeon, turkey, duck, and geese may be hunted at Fort Hunter Liggett, in accordance with DoD and California Department of Fish and Wildlife (CDFW) regulations. The Army manages the hunting program out of the Navy's Hunting Lodge area. Army activities conducted at the Navy facility includes selling and issuing permits, registering users into training areas, customer service, and conducting drawings for military deer and elk tags.

Harvested animal biological data collection and skinning are conducted outside the Hunting Lodge, in an outdoor wash and hang facility.

Deer are found throughout the installation in diverse habitats. Tule elk were nearly extirpated in California after the gold rush but were maintained on one ranch in Kern County. In 1978 and again in 1981, tule elk were relocated onto Fort Hunter Liggett. Tule elk use grasslands and oak savannas during the winter and spring, and oak woodlands and riparian zones during summer and fall. In late spring, elk calve in chaparral, near water. During the breeding period, from late July to mid-October, elk form several herds.

Feral pigs are most common in areas near the San Antonio River. They compete with native wildlife species, prey upon amphibians and ground-nesting birds, and cause damage to native plants. Recreational hunting is used to manage the feral pig population at Fort Hunter Liggett.

Due to fenced boundaries of Navy facilities, large mammals do not occur at NBVC Fort Hunter Liggett Special Areas. Mammals that may occur include mice, squirrels, and bats. Bats have been observed roosting at the Hunting Lodge. A list of bat species recorded at Fort Hunter Liggett is in Appendix G.

Specific Concerns

- Conflicts with residents when wildlife are in housing (barracks) areas.
- Competition with non-native species.
- Conflicts with bats occupying buildings.
- Habitat loss or degradation.

Current Management

Potential impacts to the habitats of terrestrial mammals are managed and minimized through the SA/PRB.

Assessment of Current Management

Fencing of the NBVC Fort Hunter Liggett excludes larger mammals. The SA/PRB process is adequate at avoiding impacts to other mammals that may occur.

Management Strategy

Objective: Conserve mammals and their habitats at NBVC Fort Hunter Liggett Special Area.

- *I.* Continue to use the SA/PRB to minimize potential impacts to native species.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.
- *II.* Coordinate with pest control staff on management of small mammals in housing areas.
- *III*. Educate tenants on measures they can take to prevent the occurrence of mice and rats in living and dining quarters.
- *IV.* Educate tenants on the benefits of bats and protocols for responding to bat occurrence in buildings.
- V. Potentially place a bat house on site, if the species present is known to use such a structure.

5.4.6 Fish

There are no aquatic features at NBVC Fort Hunter Liggett Special Area; NBVC ED does not manage fish at this installation.

5.5 SPECIAL STATUS SPECIES AND THEIR PROTECTION

No special status species are on Navy properties at Fort Hunter Liggett. It is extremely unlikely that they would have potential to occur on Navy property based on the developed nature of the land and the lack of habitat. In the event that special status species occur on Navy property, NBVC ED would coordinate with the Army and USFWS to coordinate ESA Section 7 requirements. Additionally, this INRMP would be updated to include management provisions for those species. Navy projects at NBVC Fort Hunter Liggett Special Area will go through the SA/PRB review process for NEPA compliance and will consider the proximity of projects to special status species that may occur on Army property, outside Navy boundaries.

The following sections present federally listed threatened and endangered species that occur outside of Navy properties that are managed by Fort Hunter Liggett under the Army's Fort Hunter Liggett INRMP and programmatic Biological Opinion issued by USFWS in 2010 (USFWS 2010b). The Biological Opinion addresses long-term training and future planned development in accordance with the *Environmental Assessment Addressing Installation Development and Training at Fort Hunter Liggett*. Actions that may affect federally listed species that are not addressed by the Biological Opinion require additional informal or formal consultation with USFWS (Fort Hunter Liggett 2012a).

5.5.1 Federally Listed Species and Critical Habitat

No federally listed species occur at NBVC Fort Hunter Liggett Special Area properties. Federally listed species on Army property are detailed in Appendix G. USFWS proposed critical habitat on Fort Hunter Liggett for purple amole (*Chlorogalum purpureum* var. *purpureum*) (2001), arroyo toad (*Bufo californicus*) (2000 and 2004), and vernal pool fairy shrimp (2002 and 2004). In the most recent final designations for each species, Fort Hunter Liggett was excluded from critical habitat designation based on conservation benefits to the species through Army actions, which are addressed in the Fort Hunter Liggett INRMP and have been reviewed and cosigned by USFWS (Fort Hunter Liggett 2012a).

Navy properties at Fort Hunter Liggett are developed areas with compacted soils and sparse vegetation. Only the federally listed vernal pool fairy shrimp (*Branchinecta lynchi*), and California condor (*Gymnogyps californianus*) that occur on Army properties and that could potentially occur on Navy properties are described below. Navy facilities that are closest to arroyo toad habitat (as delineated by the Fort Hunter Liggett Environmental Division [Fort Hunter Liggett 2012b]), are approximately 265 meters away, with disturbed land and Army facilities in between. Navy properties at Fort Hunter Liggett are fenced, preventing entry by the federally endangered (and state threatened) San Joaquin kit fox (*Vulpes macrotis mutica*). No

riparian habitat is present on the Navy properties, so the federal and state endangered Least Bell's vireo is unlikely to occur. Purple amole was not recorded during the June site visit, and Army records indicate no occurrence of this species on Navy property (Fort Hunter Liggett 2012b).

The federal and state endangered California condor was federally listed on 11 March 1967. The California condor prefers foothill rangeland and forest in remote areas, where the birds can roost and nest in tall trees and on cliffs. The Navy properties at Fort Hunter Liggett do not provide their preferred habitat. Condors do not nest at Fort Hunter Liggett, but forage in the area on medium to large mammals, including deer, elk, and coyote carcasses. It is possible that condors could be attracted to the game processing facility located on Navy property. To date, they have not been recorded at the facility. If California condors are observed at or near Navy property, the Navy would revise this INRMP to include protections such as BMPs for this species.

The vernal pool fairy shrimp was listed federally threatened on 19 September 1994. The vernal pool fairy shrimp occur in vernal pools in the Central Valley, Coast Ranges, and a limited number of other sites. Threats to the species include destruction of vernal pools from urban development, flood control, agricultural development, highway, and utility projects. At Fort Hunter Liggett, most vernal pool fairy shrimp sites are in the San Antonio Valley in the cantonment area, Nacimiento Valley and various training areas (Fort Hunter Liggett 2012a). No natural vernal pools occur on Navy properties. However, fairy shrimp are known to occupy anthropogenic disturbances such as compacted depressions in the soil surface from machinery or vehicles. Occurrences of fairy shrimp on Navy properties would be from translocation of cysts to man-made depressions within developed and disturbed ground. These types of pools are considered poor-quality habitat (USFWS 2010b). In the event that fairy shrimp are detected on Navy property, NBVC ED (through the SA/PRB process) would apply project-specific BMPs to avoid disturbance to this species, if operationally feasible.

Objective: Maintain coordination with the Army at Fort Hunter Liggett concering special status species.

- *I.* Coordinate with the Army at Fort Hunter Liggett to conduct presence/absence surveys of potentially occurring federally listed species if the need arises within Navy properties.
 - A. If listed species are recorded using habitat at NBVC Fort Hunter Liggett Special Area, then support recovery in accordance with the federal ESA of 1973, as amended.
- *II.* Promote information exchange between the Army and Navy.
 - A. Increase communication and coordination between land managers and specialists hired to implement specific projects or conduct monitoring.
 - *B.* Regularly integrate data collected by the Army into the Navy natural resource database.

- *III*. Continue to use the SA/PRB to avoid and minimize potential impacts to special status species and their habitats.
 - A. Use species information and their habitat requirements to guide the development of project-specific BMPs.

5.5.2 Other Special Status Species That Occur at NBVC Fort Hunter Liggett Special Area

No other special status species occur at NBVC Fort Hunter Liggett Special Area properties. Other special status species that occur outside Navy boundaries, at Fort Hunter Liggett are detailed in Appendix G.

5.5.3 Other Special Status Species that Have Potential to Occur at Fort Hunter Liggett

Other special status species that have potential to occur outside Navy boundaries at Fort Hunter Liggett are detailed in Appendix G.

5.6 INVASIVE SPECIES MANAGEMENT

The following sections describe invasive species and their management at Fort Hunter Liggett.

5.6.1 Terrestrial Invasives

Invasive species at Fort Hunter Liggett include mustard (*Hirschfeldia incana* and *Brassica nigra*), cheatgrass (*Bromus tectorum*), saltcedar (*Tamarisk parviflora*), and yellow star-thistle (*Centaurea solstitialis*). The presence and spread of saltcedar and yellow star-thistle are the most widespread and severe Fort Hunter Liggett natural resources issues.

Saltcedar is a non-native shrub that occurs in patches along the San Antonio River between the San Antonio Mission and the San Antonio Reservoir. It is also used as an ornamental shrub in portions of the cantonment area. Saltcedar can form dense, low-growing thickets that displace native vegetation and negatively alter riparian soil chemistry.

Yellow star-thistle is estimated to occupy approximately 20,015 acres of Fort Hunter Liggett, predominantly in lowlands of the San Antonio and Nacimiento valleys. It is extremely dense in areas historically cultivated or highly disturbed, such as the San Antonio and Nacimiento valley floors. Yellow star-thistle adversely affects the integrity of ecosystems, encroaches on rare native plants and provides fuel to intensify wildfires. It reduces upland habitat quality for the arroyo toad, tiger salamander, and San Joaquin kit fox. Yellow star-thistle reduces the quality of lands for military training: dense stands of yellow star-thistle obscure ditches, and tear parachutes in military training drop zones. Fort Hunter Liggett actively controls this species

with a yellow star-thistle control program. The Army conducts regular weed maintenance on their property, according to guidelines detailed in the Fort Hunter Liggett Integrated Pest Management Plan (IPMP) (Army 2010). Herbicides are sprayed along main paved roads, near buildings, power poles, and other property to reduce the chance of damage by fire.

Yellow star thistle is in the Hunting Lodge and Vehicle Maintenance Yard grounds.

Specific Concerns

• Invasive species that spread to natural areas degrade habitat.

Current Management

The Navy periodically conducts weed maintenance within Navy fencelines as needed for facilities maintenance. The Army conducts regular weed maintenance on their property, according to the Fort Hunter Liggett IPMP.

Assessment of Current Management

NBVC ED should ensure that NBVC Fort Hunter Liggett Special Area facilities are not a seed source for invasive spread into adjacent natural areas. NBVC ED should coordinate with NBVC grounds maintenance staff to focus their weed control efforts on targeting eradication of noxious species such as yellow star thistle.

Management Strategy

Objective: Minimize introduction of invasive non-native terrestrial species to NBVC Fort Hunter Liggett Special Area through prevention.

- *I.* Support development of BMPs for projects. For example (but not limited to):
 - A. Certify as "weed free," to the extent possible, gravel and fill materials.
 - *B.* Require that native plant species specifically approved by NBVC ED be used for landscaping.
 - *C.* Revegetate disturbed areas with native NBVC approved plants.

Objective: Support control and management of established invasive non-native species.

II. Coordinate with Army grounds maintenance staff and the NBVC Pest Management Coordiantor for noxious weed removal at Navy facilities at Fort Hunter Liggett, when required.

III. Support regional invasive species management initiatives and task forces, as opportunities arise.

5.6.2 Aquatic Invasives

No aquatic resources are on Navy properties. NBVC ED does not manage for aquatic invasives at NBVC Fort Hunter Liggett Special Area.

5.6.3 Pests and Disease Vectors

NBVC is responsible for pest control at NBVC Fort Hunter Liggett Special Area; however, at the time of this INRMP, there have been no control efforts supported by NBVC. Under the next revision of the NBVC IPMP, NBVC will include pest management activities and requirements for the NBVC Fort Hunter Liggett Special Area properties. Integrated pest management is a comprehensive approach to pest control, using compatible methods that avoid damage and minimize adverse side effects on nontarget organisms and the environment. Pest control activities that would be conducted at NBVC Fort Hunter Liggett Special Area facilities include application of insecticides to facilities, to kill ants and spiders, and trapping of rodents in living areas. Pest control staff would also respond to wildlife in facilities such as bats or rattlesnakes.

Specific Concerns

• Pest management activities may impact natural resources.

Current Management

Currently, NBVC ED does not manage pest control at NBVC Fort Hunter Liggett Special Area. Pest control has been supported by the Army's pest control program, which responds to Navy tenant pest control needs using civilian contractors. The NBVC IPMP does not address pest management at NBVC Fort Hunter Liggett Special Area. Revisions recur every five years. The next revision will address priorities and management strategies for invasive species control at NBVC Fort Hunter Liggett Special Area.

The position of Integrated Pest Management Coordinator is housed in the NBVC ED. This position entails coordination of all pest control activities on the installation to ensure compliance with the INRMP and other mandates. Pest control activities are managed and conducted by NBVC Public Works Department and their contractors.

Assessment of Current Management

Pests and disease vectors are currently managed as best as possible, given the difficulty of managing a remote site. However, more frequent visits by the pest management coordinator

should be done. For general pest species, pest control in the future should remove all non-native pest species from NBVC Fort Hunter Liggett Special Area. Native pest species should continue to be controlled in developed facilities.

Management Strategy

Objective: Ensure pest management activities do not adversely impact natural resources.

- *I.* Update the NBVC IPMP to include pest control strategies for NBVC Fort Hunter Liggett Special Area properties.
- *II.* Coordinate with NBVC Pest Control and the IPMP to ensure conflicts do not arise between pest control objectives and natural resources management goals.

5.7 NATURAL RESOURCES LAW ENFORCEMENT

There is no natural resources law enforcement at NBVC Fort Hunter Liggett Special Area. However, it is likely there is a significant presence of CDFW wardens that may at times patrol the NBVC Fort Hunter Liggett Special Areas, specifically the Hunting Lodge, as that houses the hunter check station.

Specific Concerns

• Impacts to resources may result from conducting project activities that were not reviewed by NBVC ED to ensure all environmental laws were considered.

Current Management

NBVC ED does not manage natural resources law enforcement. Force protection is provided by the Army.

Assessment of Current Management

NBVC ED should coordinate with Force Protection to ensure that natural resources are protected at the Navy facilities.

Management Strategy

Objective: Conserve natural resources at NBVC Fort Hunter Liggett Special Area by avoiding or minimizing impacts of unauthorized access, activities, or other disturbances.

- *I.* Ensure Fort Hunter Liggett Force Protection is informed of any environmental regulations applicable for protection of resources at NBVC Fort Hunter Liggett Special Area facilities.
- *II.* Ensure Fort Hunter Liggett Natural Resource Staff respond to reported trapped or injured wildlife, or work with pest management to ensure resources are managed correctly.

5.8 DATA INTEGRATION, ACCESS, AND REPORTING

Compiling planning and natural resources data into a single, accessible system provides a critical natural resources management tool, enabling managers to identify resources, conflicts, opportunities, and facilitating natural resources decision-making management.

Specific Concerns

• Natural resource management decisions could be misguided if there are information gaps in sensitive species presence in areas adjacent NBVC Special Areas boundaries.

Current Management

In preparation for the development of this INRMP, NBVC ED coordinated with the Army for GIS data sharing on facilities, infrastructure and natural resources information for Fort Hunter Liggett. The Army conducts regular monitoring of various species and habitats, and can inform NBVC ED on species distributions and population trends, among other natural resource issues.

GIS and data management for INRMP updates and revisions are supported on the regional level (Navy Region Southwest, San Diego) by maintenance of a central database for all GIS files and associated plans and reports, for each installation.

Assessment of Current Management

Through site surveys and the preparation of this INRMP, the NBVC Fort Hunter Liggett Special Areas are now managed accordingly, as NBVC natural resources staff is now familiar with the limited resources of the site, and resources in the surrounding area. Data sharing and coordination with the Army should continue to occur, to inform NBVC ED on natural resources at Fort Hunter Liggett. Data should be integrated into the EMS data management program managed at NBVC Point Mugu. The intent of the EMS data management program is to provide a central clearinghouse of resource-related data that is continually systematically updated and organized. Proper use and management of the EMS will ensure resource managers, base planners, other base personnel, appropriate base contractors, and outside agencies have access to the latest information on natural resources at NBVC Fort Hunter Liggett Special Area so

resources are properly protected according to the INRMP. Historical data should be included into the central database, and GIS files standardized according to the Navy protocols.

Data collected for future additions to the GIS database should be compatible with the GIS software and coordinate systems, and compatible for use on Windows based computers.

The GIS data provided by the Army may contain metadata that differs from the Navy template. Annotation of all GIS overlays with Federal Geographic Data Committee metadata using a predefined metadata template is recommended. The National Biological Information Infrastructure biological metadata standard should be used for describing biological data (National Biological Information Infrastructure MetaMaker Version 2.20). Development of a Metadata Dictionary for all of the data obtained for the GIS database at NBVC Fort Hunter Liggett Special Area is also recommended.

Management Strategy

Objective: Ensure the technically sound, practical and appropriate use of library and computer technology to organize, analyze, and communicate natural resource information in support of management decisions.

- *I.* Set up a central clearinghouse for Fort Hunter Liggett data, reports, and publications applicable to Navy sites, pertaining to NBVC's EMS that addresses natural resources and that is accessible to staff.
 - a. Ensure all databases are current.
 - b. Ensure all research and reports are catalogued and filed for easy retrieval.
 - c. Ensure GIS layers are updated and meet current Navy requirements.
- *II*. Continue to coordinate with the Army in the development of data that will inform natural resource management decisions for NBVC Fort Hunter Liggett Special Area grounds and facilities.

6.0 SUSTAINABILITY OF THE MILITARY MISSION AND COMPATIBLE USE

Sustainability takes a long-term view of natural resources stewardship, Navy mission accomplishment, social responsibility, and economic prosperity into the future. For this INRMP, the topic of sustainability includes the following elements:

- Sustainability of the Navy mission at NBVC Point Mugu and Special Areas with respect to how natural resources support this mission.
- Resource-specific best practices, consistent with the Navy's EMS for the use of renewable and non-renewable resources and how pollution and wastes are prevented and processed. The practices may address energy, water, water quality, air quality, greenhouse gas management, natural and human threats, and habitat for special status and indicator species. This topic is more fully developed in specific INRMP sections including, but not limited to "Water Resources", and "Adaptive Management: Annual Update, Review and Metrics."
- Preparing for climate change and regional growth.
- Using resources in the built environment.

6.1 INTEGRATED MILITARY MISSION AND SUSTAINABLE LAND USE DECISIONS/OPERATIONS PLANNING AND REVIEW

A successfully implemented INRMP will fulfill two basic purposes:

- 1. It will promote the sustainability of all natural resources at an installation, and,
- 2. It will ensure no net loss of the capability of installation lands to support the DoD mission.

These two purposes are closely related and not mutually exclusive. Healthy ecosystems support realistic military training and testing needs by providing large open space, buffers, stable soils, clear air, clean water, and a range of natural conditions available for the indefinite future.

To facilitate sustainable land use decisions during operations planning and review, opportunities and constraints at NBVC Point Mugu and Special Areas have been identified and mapped, as required in the INRMP Template (DoD 2010). Figure 2-3, "Opportunities and Constraints," are intended to show all the areas with little to no restrictions where training can occur, and also illustrate potential encroachment partnering areas. The map shows areas on NBVC that may be considered for potential buffer areas and corridors. Figure 2-3 also shows locations of resources that may require regulatory permits or coordination ("Constraints"), as required in the INRMP Template (DoD 2010). Constraints shown on the map are all areas on the installations where training or mission may be limited by natural resources such as wetlands or listed species.

6.1.1 Mission Sustainability and the INRMP "No Net Loss" Requirement

The common principal between national security and public land stewardship is the concept of sustainability. The most widely used definition of sustainability was developed by the World Commission on Environment and Development (also known as the Brundtland Commission [United Nations World Commission on Environment and Development 1987]): "Sustainable resource management is...the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs." Sustainability is a relative condition of the ecosystem and the military mission that can be measured; however, measures of sustainability are scale-dependent.

Sustainability may be considered as having at least several measurable components in the context of this INRMP: military use facilitation, soil and water resource protection, ecological integrity, cultural resource protection, and base safety for current and future use. For this INRMP, an impact to mission accomplishment has occurred when any of the above are constrained or when one of these conditions occurs:

- Quality of military training is impacted by natural resource restrictions.
- Environmental issues hamper scheduled operations: training qualification objectives to deploy are not accomplished without significant delay or conflict.
- Conflict resolution impacts training intensity or tempo and the target resource condition is impacted.
- Soil and water resources are impaired such that compliance has become a problem and irretrievable damage has occurred. Managing for sustainability means preventing damage that will eliminate the use of an area for the foreseeable future, or for which restoration or mitigation is excessively costly.
- Ecological integrity is irretrievably harmed. Compliance under the Sikes Act for mission sustainability ("no net loss") is also defined in this INRMP to include the ecological integrity of training lands, since this integrity will carry these lands into the long-term with all the elements that allow self-recovery to remain intact. Keeping all the pieces (habitats and species) that allow the ecosystem to function at various scales and at the highest level possible, given the mandate for land and water use, is one component of protecting sustainability.
- Base safety for current and future use is impaired. The ability to keep the base free from hazardous material aids in assuring the safety of the base for current training purposes and any potential alternate future uses.

In keeping with the principal use of military installations to ensure the preparedness of the U.S. Armed forces, the Sikes Act mandates that the INRMP shall provide for no net loss of the capability of the installation's lands to support the military mission. Management of natural resources can support the military mission by avoiding unnecessary conflicts between mission

requirements and legal mandates regarding natural resources, promoting positive public relations, and enhancing the quality of life for site personnel. NBVC is achieving no net loss of training lands or reduction in operational flexibility and growth through the implementation of the revised 2013 Point Mugu INRMP. Similar to NBVC's 2002 INRMP, all projects and actions included in this INRMP to manage listed and sensitive species, flora, and fauna are compatible with NBVC's current mission requirements and should allow for any new operations without additional encumbrances.

Specific Concerns

- Conflicts may arise between training requirements and natural resources.
- Habitat may be lost or impacted by training or development.
- Sustainability in siting and resource use is only beginning to be considered a metric of successful project design.

Current Management

Sustainable land use and the protection and enhancement of the remaining habitats on base are mutually compatible. To date, sustainability on military installations has focused mostly on the built environment in areas such as energy consumption and recycling. It is beginning to be applied to stormwater management through low impact development (LID) approaches. Ecological sustainability of habitats, species, and functions are also becoming better understood and considered during project planning and implementation.

Future land use planning at NBVC Point Mugu and Special Areas incorporates sustainability concepts with its emphasis on confining facility renovations to existing footprints. This practice also has an economic benefit, as using existing facility sites enables the re-use of existing instrumentation and infrastructure and avoids economic and environmental costs associated with establishing new areas. A change in mission could lead to degradation or development of natural resource areas, but the Navy prefers to incorporate sustainable principles whenever practicable. In support of sustainability, the SA/PRB is used to manage environmental compatibility with the military mission. Sometimes the natural resources staff provides on-site monitoring of a military operation to ensure environmental compliance. NEPA and the SA/PRB process are further addressed in Section 6.4, Regulatory Compliance.

Each year the Commanding Officer of NBVC must answer the following questions as part of the INRMP metrics review:

- Does the natural resources team coordinate with operators when making changes to the INRMP to keep it current? Coordination examples include: maps, signs, pamphlets, other communications, orientations, meetings, training, etc.
- To what level do natural resources compliance requirements support the installation's ability to sustain the operational mission?

- Has there been a net loss of training lands?
- Does the INRMP process effectively consider current mission requirements?

Assessment of Current Management

Based on the current mission at NBVC Point Mugu, there are minimal conflicts between Navy mission sustainability and natural resources management. The management of natural resources is done in a way that is compatible with the Navy mission. Through the USFWS *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California (5090 Ser PW420/075) (1-8-99-F-24),* and the *Biological Opinion for the Bird/Animal Aircraft Strike Hazard Program at Naval Air Station Point Mugu, Ventura County, California (1-8-06-F-13) (see Appendix O), all Navy activities can occur without being affected by the protective measures prescribed in the Biological Opinions (Section 6.4 Regulatory Compliance).*

Sikes Act guidance indicates the need to focus on improving the ties between natural resource management and military readiness. The "no net loss" policy of the Sikes Act and DoD guidance is accomplished through the land planning and NEPA process of the SA/PRB, interdepartmental coordination, and adherence to DoD guidance and regulations. There remain unfulfilled opportunities to facilitate the connection between natural resources and the mission. More locally specific planning criteria such as landform, soil recoverability, plant community condition and sensitivity, and timing and intensity of use could enhance site selection criteria. Evaluating sustainability within smaller management units rather than across the entire base helps focus priorities and reconcile conflicts. Natural areas, as grouped and described in the various Terrestrial, Marine, and Wetland Communities sections above, could be the basis for delineating management units.

Management Strategy

Objective: Achieve no net loss of military mission by aligning current and future land and water use (location, extent, timing, and intensity) with protection of environmental value.

- *I.* Maintain and enhance existing land uses to support core RDAT&E, training, and mission-support capabilities; use the SA/PRB process to coordinate all facilities siting, relocation, expansion, or change in use.
- *II.* Continuing and new military land uses should be concentrated, to the extent practicable, in previously disturbed areas to fully use existing operational areas and minimize potential effects on sensitive resources.
- *III*. Ensure compliance with statutes and regulations to protect sensitive natural resources, to maintain environmental quality and to exercise responsible stewardship of public lands.

- *IV.* Maintain and enhance coordination and cooperation with neighboring communities, agencies, and organizations to ensure compatibility of base natural resource uses with the Navy's mission.
- *V.* Provide reasonable accommodation of compatible nonmilitary land use to the extent practicable.
- *VI.* Maintain healthy and intact habitats that self-recover from disturbance, using principles of ecosystem management and sustainability to balance short-term projects with long-term goals.
 - *A.* Ensure water quality improvement and protection measures are fully implemented, which will contribute to overall ecosystem health.
 - *B.* Manage land use compatibility by adopting management units that consider operational control.
 - *C.* Consider using management units to provide a finer spatial scale for analyzing military mission needs and conserving high-value, scarce habitats and species.
 - *D*. Align infrastructure to contribute to the military mission, concentrating it in operations areas, and integrating it with the environment with proper siting and sustainability practices.
 - *E.* Set restoration priorities using criteria in each natural habitat area to define the resilience of the area to various types of use or disturbance patterns.
- *VIII.* Address long-term threats to the stability of the natural environment including but not limited to soil erosion, invasive exotic species, climate change, sea level rise, and habitat fragmentation.
 - *A.* Assess the hydrology of the base and existing condition of natural areas, for opportunities to create or enhance natural area buffers and to allow for shifts in habitats and percolation, storage, or drainage of flood waters.
 - *B.* Avoid the addition of hardscape. Continue to develop in existing footprints and use LID concepts in all facility renovations.
 - *C.* Avoid and minimize road or traffic characteristics that promote plant invasions, or result in significant habitat fragmentation for animals.
- *IX.* Continue to use NEPA documentation, including cumulative effects analysis, to guide specific projects and document choices.
- *X.* Ensure the Commanding Officer's preparedness to answer the questions identified above (in Current Management) as part of the INRMP metrics review.

6.2 Environmental Awareness

Specific Concerns

- Selected environmental awareness brochures are distributed by housing and MWR staff, and for various reasons, may cease to occur because of the printing effort, time, and money to maintain copies for distribution.
- Staff turnover may impede communication about the natural resources of NBVC Point Mugu and Special Areas, environmental regulations, protocols for responding to trapped, injured, or unwelcome wildlife.
- Habitats and species may be harmed when people do not follow environmental rules and regulations.

Current Management

The Sikes Act requires each military service to support environmental education for personnel and for the public where and when it is compatible with military safety and security needs.

Conservation awareness on NBVC Point Mugu and Special Areas is implemented by multiple basewide environmental programs. The conservation effort on site will continue to expand as this INRMP and subsequent natural resource management programs are undertaken to ensure efficient and thorough management of the natural resources on base. Specifically, conservation efforts at NBVC Point Mugu address energy, water resources, recycling, pollution prevention, and public outreach and education. The following conservation programs are currently in place on NBVC Point Mugu:

- Indoctrination program for newly stationed military personnel, presenting an overview of the Environmental Program, from hazardous waste to wetlands and endangered species.
- Natural resource brochures are made available on sensitive and natural resources at Point Mugu.
- New housing residents are given natural resources brochures and information on how to live with wildlife in the housing area.
- Signs are placed in appropriate places that indicate closure areas and provide environmental education.
- A self-guided nature trail at Point Mugu describes natural resources and how to participate in their protection.

- Through the EMS, contractors and federal employees are required to review a presentation on the natural resources at Point Mugu.
- Tent and Recreational Vehicle campers are given brochures on Point Mugu natural and sensitive resources upon checking in.
- Recycling program for materials used in basewide operations, including metals, oil, oil filters, cardboard, white paper, glass, and aluminum.
- Environmental Coordinator Program designates department lead and unit environmental coordinators to promote installation ownership of environmental programs. NBVC ED provides guidance and training for this program, which outlines appointment directives and specifies the responsibilities of an environmental coordinator for each NBVC organization including tenant and geographically separated units. This program has been established to fully deploy the NBVC EMS and pollution prevention program. The Environmental Coordinator Program also provides additional oversight of environmental compliance, recycling, and remediation activities; gives strategic direction for environmental management and compliance; and ensure conformance with the NBVC EMS on a continuing basis (Tetra Tech 2011d).
- Brochures for NBVC SNI BioSecurity are available at the Point Mugu air terminal, and provide information on the importance of not introducing invasive species to the island.

Assessment of Current Management

There is currently an effective environmental education program, with information on sensitive resources readily available to most personnel. Regular coordination must continue with MWR and the housing administrator to ensure environmental education continues to be distributed. The indoctrination program should continue to instruct personnel, civilian staff, and housing residents on the natural resources of NBVC Point Mugu. Topics covered should include protocols for responding to trapped or injured wildlife and birds nesting in base facilities. Applicable goals and directives of this INRMP should be communicated to new staff in indoctrination materials and through personnel training programs. Natural resources education information, including rules and regulations, should be posted in MWR facilities. Adequate signage should alert personnel to environmentally sensitive areas.

General conservation awareness and education could be enhanced through projects such as a demonstration water conservation garden using native or low water usage plants, or a demonstration bioswale.

Management Strategy

Objective: Increase natural resources outreach to military and civilian staff and contractors.

- *I.* Continue to support and develop the indoctrination program for new staff.
- *II.* Identify opportunities on base for enhanced natural resource education and awareness of military and civilian staff and contractors.
 - A. Ensure that adequate signage is posted in environmentally sensitive areas, and closure areas.
 - *B.* Develop and post environmental educational materials and rules and regulations in community housing areas and MWR facilities.
 - *C.* Ensure all housing residents receive information on the natural resources of NBVC Point Mugu, emphasizing the importance of following regulations.
 - D. Promote environmental awareness at all applicable large base functions.

6.3 BENEFICIAL PARTNERSHIPS AND COLLABORATIVE RESOURCES PLANNING

Ecosystem conservation is best accomplished through cooperative ventures because habitats and species do not conform to administrative boundaries. "Preserving all the parts" with an emphasis on habitats is central to the ecosystem management approach mandated by DoD. The ecosystem approach involves going beyond addressing short-term approaches for a single species. Regional planning processes are a means to address natural resource management using an ecosystem approach. Partnerships among private, local, state, tribal, and federal interests are vital to help realize ecosystem management, which is the basis for management of Navy lands and waters.

Cooperative management of terrestrial and marine flora and fauna at NBVC Point Mugu and Special Areas is required under the federal Sikes Act and the Fish and Wildlife Coordination Act. Like NEPA, the Fish and Wildlife Coordination Act is essentially procedural, as no specific outcome is mandated. The USFWS and CDFW have a statutory obligation to review and coordinate on INRMPs.

Recognizing this three-way partnership, the DoD, U.S. Department of the Interior/USFWS, and state fish and wildlife agencies signed an MOU in January 2006. The CDFW and other state fish and wildlife agencies were represented by the International Association of Fish and Wildlife Agencies. By working together to prepare, review, and implement the INRMPs, all parties promote the "synchronization of INRMPs with existing fish and wildlife service and state natural resource management plans" and "mutually agreed-upon fish and wildlife service conservation objectives to satisfy the goals of the Sikes Act."

It is Navy policy to encourage local and regional partnerships to implement an INRMP. Other potential DoD and non-DoD organizations that could provide support with INRMP implementation include Partners-In-Flight, Legacy Resource Management Program, USACE, Armed Forces Pest Management Board, EPA, Natural Resources Conservation Service, U.S. Department of Agriculture, U.S. Geological Survey, California Department of Water Resources, California EPA, California Biodiversity Council, colleges, universities, non-profits, and contractors.

Specific Concerns

- Increased partnerships with research institutions and the associated increase in foot access through the marsh could affect natural resources.
- Liability issues and a new requirement for Memorandums of Agreement, which are time consuming and may limit partnership opportunities.
- NBVC would be liable for any environmental violations by researchers
- Multiple entities and projects may affect the Calleguas Creek watershed and result in impacts to Mugu Lagoon.

Current Management

INRMP coordination and metric reviews are a beneficial partnership mandated by the Sikes Act, for collaborative resource planning at NBVC Point Mugu and Special Areas. Coordination and communication among Navy commands and personnel are vital for ensuring that site activities are implemented as planned under the INRMP. Navy policy also calls for its installations to expand involvement in regional ecosystem planning, management, and restoration initiatives. NBVC Point Mugu is a stakeholder in the Calleguas Creek Watershed Management Committee. Additional partnerships and collaborative relationships have been formed with the Ormond Beach Task Force and the Channel Islands working groups. The NBVC Natural Resources Manager also resides on the Ormond Beach Restoration Scientific Technical Committee, which guides restoration efforts on Ormond Beach; the restoration of Ormond Beach will complement Point Mugu's resources and provide a larger coastal wetland complex in Ventura County. If the opportunity arises, NBVC would participate in any Landscape Conservation Cooperatives and Population Vulnerability Assessment (Section 1.7 Integrating Other Plans and Documents). Information Landscape Conservation Cooperatives be found on can at: http://www.fws.gov/science/shc/.

The Navy also sees partnerships as a means to manage encroachment pressure on the Navy mission. The instruction (DoDINST 4715.03) defines encroachment to be any lack of action by the Navy to coordinate with local jurisdictions, monitor the development plans of adjacent communities, or adequately manage facilities and real property.

Agricultural, open space to the northwest, and developed lands surround NBVC Point Mugu and Special Area Laguna Peak, limiting the opportunities for encroachment partnering. However, the Navy is currently attempting to partner with the Coastal Conservancy to purchase property adjacent to Point Mugu. This property will be part of the Ormond Beach Wetland Restoration project, which will also aid the Navy's encroachment program. Likewise, encroachment partnering is limited at NBVC Channel Islands Special Areas because the land is owned or managed by the NPS and TNC. At NBVC Fort Hunter Liggett, opportunities for encroachment partnering in the form of land exchanges or cooperative land use agreements are possible because surrounding lands are owned and managed by the DoD.

Assessment of Current Management

There is active cooperation and communication between NBVC and universities, local environmental groups, regulatory agencies, and selected land owners (environmental non-profits). The establishment of cooperative planning efforts with surrounding land agencies and individuals throughout the region will benefit natural resources at NBVC Point Mugu. Cooperative planning can also reduce the costs of actions such as biological monitoring that require management across boundaries. Partnerships with universities and other natural resource agencies that are seeking research opportunities at NBVC Point Mugu and Special Areas would support the natural resource management objectives for protection of resources. Effective communication about protecting environmentally sensitive periods and areas is critical to avoid impacts to resources during research activities.

Management Strategy

Objective: Be proactive in cooperative resources planning partnerships to create regional conservation, ecosystem-based solutions of mutual benefit while also protecting the military mission.

- *I.* Continue to participate in conservation and encroachment planning.
- *II.* Participate in regional conservation and ecosystem planning, by relating priorities to local and regional initiatives, in collaboration with other government agencies (Section 1.7 Integrating Other Plans and Documents).
- *III*. Seek planning partnerships for invasive species and feral animal removal with adjacent landowners if compatible with mission activities.
- *IV.* Meet annually with USFWS, NOAA, and CDFW to fulfill Sikes Act provisions and related inter-agency cooperative agreements.
- *V.* Continue to meet with local environmental and agency working groups.
- *VI.* Foster relationships with university research programs to increase knowledge base of NBVC Point Mugu and Special Areas natural resources.

- A. Facilitate access to NBVC Point Mugu and Special Areas for researchers.
- B. Ensure data and reports are shared with NBVC ED for integration into the EMS.
- *C.* Conduct outreach to universities.
- *D*. Identify data gaps that limit current environmental planning and management (such as habitat requirements or life history traits of species of interest) and actively seek individuals to conduct focused research in these areas.
- *E.* Maintain awareness of research conducted in similar habitat types, and of research projects that could incorporate Mugu Lagoon.

6.4 REGULATORY COMPLIANCE

This INRMP supports NBVC's compliance with federal and state laws, such as those related to environmental documentation, wetlands, endangered species, and land and wildlife management. Table 6-1 presents an overview of federal laws and regulations that must be considered when managing NBVC Point Mugu and Special Areas natural resources. This table identifies the federal agencies and applicable laws guiding oversight of natural resource management. A law may appear more than once in Table 6-1 if it guides the management actions of more than one federal agency.

The most relevant federal, state, and local laws and regulations that can pertain to projects that occur at NBVC Point Mugu and Special Areas are listed in Appendix B. Natural resources consultation requirements, including any current or planned consultations, consistency with ESA Recovery Plans, Wildlife Action Plans, Regional Water Quality Control Board Basin Plans, and with Essential Fish Habitat permit and consultation processes are all discussed below.

A Strategic Action Plan (03 February 2005) was developed by the DoD, USFWS and CDFW, for improving the quality and consistency of INRMPs, and ensuring compliance with two amendments to DoD responsibilities under the MBTA and the ESA. These amendments are described below, in the "Migratory Bird Treat Act" and "Endangered Species Act" sections.

Federal Agencies and Applicable Laws	Authority and Activities
U.S. Army Corps of Engineers (USACE)	
Clean Water Act, Section 404	Responsible for issuing Section 404 permits for placement of dredge and fill material into waters of the U.S. (up to higher high water line in tidal waters) and into wetlands in compliance with EPA regulations.
Clean Water Act, Section 401	Provides state authority to issue certification that a proposed dredge and fill disposal activity will not violate applicable state water quality standards.
Rivers and Harbors Act of 1899, Section 10	Regulates construction, excavation, and deposition in navigable waters (up to mean high water in tidal waters).
National Environmental Policy Act	Commenting or lead agency authority for environmental review of proposed projects.
U.S. Environmental Protection Agency (EPA)	
Clean Water Act, as amended	Develops Section 404 regulations and may veto USACE Section 404 permits. Regulates waste disposal in coastal waters. Administers National Estuary Program.
National Environmental Policy Act	Commenting authority on proposed projects.
U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)	
Fish and Wildlife Coordination Act	Reviews/comments on federal actions that affect many habitat-related issues, including wetlands and waters considered under Clean Water Act Section 404 and Rivers and Harbors Act Section 10 permit applications.
Federal Endangered Species Act	Regulates, monitors, and implements programs for protecting the ecosystem on which freshwater and estuarine fishes, wildlife, and habitat of listed species depend. Enforces international treaties and conventions related to species facing extinction. Shares jurisdiction with NOAA/NMFS over listed sea turtles and some marine mammals.
Migratory Bird Treaty Act	Enforces prohibition against the taking of migratory birds, their eggs, or their nests.
National Environmental Policy Act	Commenting authority on proposed projects.
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS)	
Fish and Wildlife Coordination Act	Reviews and comments on federal actions that affect marine fishery resources and many habitat related issues, including Clean Water Act Section 404 and Rivers and Harbors Act Section 10 permit applications.
Federal Endangered Species Act	Jurisdiction over most threatened or endangered marine species and some anadromous fishes.
Magnuson-Stevens Fisheries Conservation and Management Act	Responsible for maintaining and conserving fisheries and rebuilding overfished stocks. Responsible for determining whether projects or activities adversely impact essential fish habitat (those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity).
Marine Mammal Protection Act	Enforces protection provisions for marine mammals.
National Environmental Policy Act	Commenting authority on proposed projects.

TABLE 6-1: FEDERAL REGULATIONS TO BE CONSIDERED IN NBVC POINT MUGU AND SPECIAL AREAS NATURAL RESOURCES MANAGEMENT

At NBVC Point Mugu and Special Areas, proposed projects, operations, or other actions are scrutinized for potential environmental impacts through a formal review process for NEPA compliance (the SA/PRB, codified in NBVC Instruction 11010.1A). The INRMP is used as a tool to identify at an early stage, the potential impacts of planned Navy action on natural resources and provide a basis for altering the action to prevent or minimize those impacts.

Mitigation is the process of minimizing impacts to protected habitats or species. As defined by the Council on Environmental Quality in 1978, it includes measures to avoid, minimize, rectify, reduce, eliminate, or compensate for the impact. In most cases, mitigation is undertaken in that order or "sequence" of preference, that is, from avoidance as a first priority to compensation as a last resort. Most mitigation policies and measures are agreed to as a result of protection under the NEPA, ESA, or the Clean Water Act.

National Environmemental Policy Act (NEPA)

NEPA (Public Law 91-190, 42 U.S. Code [U.S.C.] 4321-4347 as amended) was enacted to prevent environmental damage by ensuring that federal agency decision makers give environmental factors appropriate weight before taking any discretionary actions. NEPA requires the preparation of a report that studies the effects of a proposed federal agency action and evaluates whether the action "significantly affects the quality of the human environment" (42 U.S.C. 4332). Elements of the report include an analysis of project alternatives and analysis of cumulative effects on each resource topic. The analysis is used as a decision making tool on whether to proceed with the proposed action. The SA/PRB process (NBVC Instruction 11010.1, 04 June 2003) guides NEPA implementation and permitting procedures, as described below.

Each year, approximately 100 to 300 Categorical Exemptions are prepared under NEPA for activities at NBVC installations. The Navy prepared 101 Categorical Exemptions for activities at NBVC Point Mugu during fiscal year 2011, and 145 in 2012. In the other Special Areas, one Categorical Exemption was prepared for Laguna Peak, and two for Fort Hunter Liggett, during 2011; no Categorical Exemptions have been prepared for fiscal year 2012. At the time of this INRMP, Environmental Assessments are being prepared for four proposed projects at NBVC Point Mugu: (1) "Navy Broad Area Maritime Surveillance Unmanned Aircraft System Developmental Test Program"; (2) "Point Mugu Sea Range Countermeasures"; (3) "Expansion of Unmanned Systems Operations on the Point Mugu Sea Range"; and (4) "West Coast Homebasing of the MQ-4C Triton Unmanned Aircraft System" (Tetra Tech 2012r).

ENDANGERED SPECIES ACT (ESA)

The National Defense Authorization Act for Fiscal Year 2004, Public Law 108-136, amended Section 4 of the ESA. Under new Section 4(a)(3)(B)(i) of the ESA, the Secretary of the Interior or the Secretary of Commerce, as appropriate, "shall not designate as critical habitat any lands or other geopgraphical areas owned or controlled by the [DoD], or designated for its use, that are subject to an [INRMP] prepared under Section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."

Section 7 of the ESA requires all federal agencies to enter into consultation with the USFWS or the NMFS whenever proposed actions might affect listed TES plants and animals. The USFWS policy does not use the term "mitigation" because it is not language used in the ESA. In the context of consultation under the ESA, conservation measures are voluntary actions proposed by the project proponent to avoid and minimize impacts to listed species and provide alternative or protected habitat that promotes conservation.

Section 7 consultations will be initiated if warranted; otherwise, written documentation that there are no effects on threatened or endangered species will be generated by NBVC ED and kept in project files. At present, two Biological Opinions are active at NBVC Point Mugu : military activities are in accordance with the USFWS *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California (5090 Ser PW420/075) (1-8-99-F-24), issued 06 June 2001; and activities conducted for the Bird/Animal Aircraft Strike Hazard program are covered under the <i>Biological Opinion for the Bird/Animal Aircraft Strike Hazard Program at Naval Air Station Point Mugu, Ventura County, California (1-8-06-F-13), issued 20 December 2006 (see Appendix O). Under Section 4(a)(3)(B)(i) of the ESA, NBVC Point Mugu is excluded from critical habitat designation for the western snowy plover as this INRMP provides a conservation benefit for the species (70 FR 56970-57119) (Appendix F).*

The programmatic biological consultation for Navy activities at NBVC Point Mugu was initiated to evaluate ESA issues related to current and proposed future activities at NBVC Point Mugu. The resulting *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California* addresses the effects on federal listed species of past, current, and future activities at NBVC Point Mugu and addresses mitigation measures necessary to avoid and minimize impacts to listed species from the following activities:

- Target drone launches;
- Aircraft over-flights;
- Maintenance of roads and facilities;
- Boundary fence maintenance;
- Utilities;
- Beach missile launch operations and associated activities;
- Police operations;
- Pest management;
- Traffic;
- Recreation; and
- Research, including monitoring and predator management.

Five of the 11 activities identified may cause impacts to listed species by producing high levels of noise. The effects of the activities on listed species are discussed in detail in the Biological Assessment and Biological Opinion presented in Appendix O.

NBVC must follow the conservation measures the Navy included in the project descriptions for the Biological Opinion (Appendix O, pages 9-12), reasonable and prudent measures (Appendix O, page 31-32), and terms and conditions (Appendix O, pages 32-37) established in the programmatic Biological Opinion. The management strategies presented in this INRMP are intended to supplement the programmatic Biological Opinion and to support the installation's efforts to comply with the ESA and other federal and state laws and regulations.

The BASH Biological Opinion addresses mitigation measures necessary to avoid and minimize impacts to listed species from the following categories of activities that occur with implementation of the BASH Management Plan: habitat modification, wildlife exclusion, wildlife dispersal, and lethal control.

USFWS has issued the following permits to the natural resource manager for the activities associated with management of threatened and endangered species and species protected under the MBTA: USFWS Depredation at Airports permit, USFWS Special Purpose Salvage permit for collecting carcasses, USFWS Depredation permit for endangered species management, and USFWS Recovery permit for listed species monitoring. U.S. Geological Survey has also issued a banding permit, however, no banding of listed species is currently approved.

CLEAN WATER ACT

Regulatory authority for Section 404 and Section 10 of the Clean Water Act has been delegated by the EPA to the USACE. Section 404 regulates the discharge of dredge or fill material into the Waters of the U.S. and adjacent wetlands. Regulatory authority for Section 401 of the Clean Water Act has been delegated by the EPA to the states. Section 401 provides the state authority to issue certification that a proposed dredge and fill disposal activity will not violate applicable state water quality standards. Section 10 of the Clean Water Act regulates all structures and work in navigable waters. The USACE has set up the Nationwide Permit Program to streamline the 404 permit process for activities similar in nature and with minimal impacts. Nationwide Permit Program is re-evaluated every 5 years; NEPA is performed and each Nationwide Permit Program is re-evaluated. If the proposed action exceeds the thresholds determined for the Nationwide Permit Program or conditions cannot be met, the Nationwide Permit Program does not apply and the proposed action will require application for an Individual Permit. An Individual Permit requires a public notice, an alternatives analysis (the 404(b)(1) analysis), and a NEPA document specific to the proposed project. USACE is currently implementing a National policy for "no net loss of values and functions" for wetlands and Waters of the U.S.

The USACE regulation provides that "all mitigation will be directly related to the impacts of the proposal, approximate to the scope and degree of those impacts, and reasonably enforceable." It also states "Consideration of mitigation will occur throughout the permit application review

process and includes avoiding, minimizing, rectifying, reducing or compensating for resource losses. Losses will be avoided to the extent practicable. Compensation may occur on-site or at an off-site location" (33 CFR S 320.4[r]).

USACE has a three-step sequencing procedure for evaluating impacts to wetlands (Memorandum of Agreement between USACE and EPA dated 07 February 1990): (1) avoid, (2) minimize, and (3) compensate. First, the project proponent must first demonstrate avoidance and minimization of impacts to Waters of the U.S. to the maximum extent possible. Avoidance includes demonstrating that there is no practicable alternative which would have less adverse impacts. Minimization requires that consideration be given to redesigning or staging a project to reduce impacts. Compensatory mitigation is only authorized for unavoidable impacts and must replace the loss of values and functions of the Waters of the U.S. proposed for impact. Compensatory mitigation includes creation, restoration, enhancement or preservation. All impacts must be avoided or minimized before compensating mitigation will be considered. In some cases, mitigation banking is the appropriate approach to compensating mitigation (33 CFR S 320.4[r]). The NBVC Point Mugu Wetland Mitigation Bank is discussed in Section 3.3.1.5 Jurisdictional Waters-Wetlands Management.

The need for Section 404 permitting at NBVC Point Mugu varies year to year, and in recent years, zero Section 404 permits have been required. As of the date of this INRMP, NBVC ED secured three Section 404 USACE permits in 2013, for activities at NBVC Point Mugu (Tetra Tech 2012s).

COASTAL ZONE MANAGEMENT ACT

The Coastal Zone Management Act of 1972 (16 U.S.C. Section 1451-1464) encourages coastal states to be proactive in managing coastal zone uses and resources. Coastal Zone Management Act established a voluntary coastal planning program; participating states submit a Coastal Management Plan to the National Oceanic and Atmospheric Administration for approval. Under the Coastal Zone Management Act, federal agency actions within or outside the coastal zone that affect any land or water use or natural resource of the coastal zone shall be carried out in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved state management programs. Each state defines its coastal zone in accordance with the Coastal Zone Management Act. Excluded from any coastal zone are lands the use of which by law is subject solely to the discretion of the federal government or which is held in trust by the Federal government (16 U.S.C. 1453). Accordingly, although NBVC Point Mugu land is federal government property and therefore excluded from the coastal zone, the Navy conducts an effects test as part of its determination of an action's effects for purposes of federal consistency review under the Coastal Zone Management Act, to factually determine whether that action (even if conducted entirely within a federal enclave) would affect any coastal use or resource. As this INRMP Revision is a programmatic document, no consultation with the California Coastal Commission is required at this time. There are, however, specific actions or projects discussed in this INRMP Revision for possible future implementation that may require additional environmental effects analysis, as required through NEPA, prior to being implemented. If and when such projects are to be carried forward, the Navy would engage in consultation with the

California Coastal Commission to the extent necessary and appropriate under the Coastal Zone Management Act.

ESSENTIAL FISH HABITAT (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265; 16 U.S.C. 1801-1884) as amended (P.L. 109-479), provides for the conservation and management of fishery resources. The Magnuson-Stevens Act defines EFH as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. These waters include aquatic areas and their associated physical, chemical, and biological properties used by fishes and may include areas historically used by fishes. The NMFS is given responsibility for identifying EFH for all federally managed marine and anadromous fish species. Many marine fish that are federally managed by the Pacific Fishery Management Council and NOAA/NMFS rely on shallow coastal habitats during part of their lives. The Pacific Fishery Management Council and NMFS are responsible for designating EFH for each life stage of federally managed marine fish species.

Within the limits of discussion of this INRMP, two EFH designations occur: Coastal Pelagic and Groundfish. Both EFH zones extend from the coastline out to 200 miles offshore along the entire length of the west coast of the U.S. The Coastal Pelagic EFH includes surface waters or more specifically, waters above the thermocline where sea surface temperatures range between 50° F to 79 °. The Groundfish EFH includes surface waters and benthos, encompassing all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths seaward to the 200 mile boundary (DoD 2002).

EFH that is considered to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, may also be identified by NMFS as Habitat Areas of Particular Concern. Designating areas of EFH that are also Habitat Areas of Particular Concern is a measure to provide those habitats extra management protection, and meant to give the fish species within Habitat Areas of Particular Concern extra buffer against adverse impacts. Habitat Areas of Particular Concern designated for groundfish include all waters, substrates, and associated biological communities falling within estuaries, canopy kelp, seagrasses, rocky reefs, and other habitat areas of interest (Pacific Fishery Management Council 2008). As such Mugu Lagoon is a designated Habitat Areas of Particular Concern (estuary) for groundfish, and the waters offshore of San Miguel Island (rocky reef and canopy kelp) are Habitat Areas of Particular Concern for groundfish.

Any project with potential to demonstrate observable impacts to EFH requires consultation with NMFS. The Navy is recommended to incorporate EFH conservation practices into project plans that minimize, offset, or avoid impacts to EFH. At the time of this INRMP, no EFH consultations are in place.

MIGRATORY BIRD TREATY ACT (MBTA)

The MBTA (16 U.S.Cl 703-712) protects all migratory birds and prohibits the taking of migratory birds, their young, nests, and eggs, except as permitted by the USFWS. The MBTA implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking killing, or possessing migratory birds is unlawful. Unless permitted by regulations, the MBTA provides that it is unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture or kill; possess, offer to sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or receive any migratory bird, part, nest, egg or product, manufactured or not.

The list of migratory birds protected under the MBTA is published in the CFR (Title 50, Part 10.13). On March 15, 2005, the USFWS published in the Federal Register (FR 70[49]:12710-12716) a list of bird species to which the MBTA does not apply. Species not protected are those not native to the United States, and which have been introduced by humans, everywhere they occur in the nation. The list was required by the Migratory Bird Treaty Reform Act of 2004. The Reform Act excluded from the protections afforded by the MBTA, any species not specifically listed on the Title 50, Part 10 list.

The National Defense Authorization Act for Fiscal Year 2003 directed the Secretary of the Interior to promulgate regulations to exempt the Armed Forces from the prohibitions on incidental take of migratory birds during military readiness activities. This task was delegated by the Secretary of the Interior to the USFWS. In signing the Act, Congress declared that the incidental take of migratory birds during military training exercises did not contradict the prohibitions under the MBTA. Congress also indicated that the Armed Forces should give due consideration to the protection of migratory birds during the planning of such military readiness activities, to the extent that such protections did not diminish the value of those activities. On 28 February 2007, the USFWS issued a Final Rule (referred to as "The Migratory Bird Rule") in 50 Code of Federal Regulations (CFR) Part 21 that authorized the incidental take of migratory birds as the result of military readiness activities. These regulations are discussed in Section 3.4.4 and Appendix E. The DoD will give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities and migratory bird conservation will be incorporated into INRMPs, where applicable, to protect migratory birds. If the Armed Forces determine that the proposed military readiness activity has the potential to result in significant adverse effects on a population of migratory birds, then they are required to confer with the USFWS to develop conservation measures to minimize, or mitigate the significant adverse effect. Currently there are no military readiness activities that threaten migratory birds, in which the Migratory Bird Rule may apply or be sought.

Congress defined military readiness activities as all training and operations of the Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Congress further provided that military readiness activities do not include:

- 2. The operation of industrial activities.
- 3. The construction of demolition of facilities used for a purpose described in 1 or 2 above.

In July 2006, the DoD and USFWS entered into an MOU to "Promote the Conservation of Migratory Birds," and in accordance with Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds." This MOU describes specific actions that should be taken by DoD to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure DoD operations other than military readiness activities are consistent with the MBTA. The MOU also describes how the USFWS and DoD will work together cooperatively to achieve these ends. The MOU does not authorize the take of migratory birds; the USFWS, however, may develop incidental take authorization for federal agencies that complete an Executive Order MOU.

In accordance with the regulations of the MBTA, the USFWS recommends that impacts to birds protected under the MBTA are avoided by surveying for nesting birds in areas proposed for disturbance, and if protected birds or active nests are present, re-scheduling activities for outside the nesting season, until the young are fledged. Alternatively, the USFWS recommends that activities that have the potential to impact protected birds or their nesting habitat are conducted outside the migratory bird nesting season, to avoid impacts. A majority of migratory birds nest from mid-February and continues until the end of August however, some species may start earlier or extend their nesting activities through September.

At the time of writing, there are no MBTA nest take permits issued to NBVC Point Mugu or Special Areas, other than taking of nests in or near the airfield for the BASH program.

MARINE MAMMAL PROTECTION ACT (MMPA)

All marine mammals are protected by the MMPA of 1972, as amended. The MMPA prohibits the take (hunting, killing, capture or harassment) of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products. The USFWS is responsible for the following marine mammals: sea and marine otters, walrus, polar bear, three species of manatees, and dugong. The USFWS may authorize and permit take (with limitations and mitigation measures) of marine mammals under their purview. Those mammals that are truly marine inhabitants, cetacean and pinnipeds, other than walrus, are the responsibility of NMFS.

NBVC ED complies with the MMPA through requesting Incidental Harassment Authorization, for the potential harassment of pinnipeds at marine mammal haul out locations during any projects, activities, or naval readiness training activities at Point Mugu. For activities that may result in serious injury or mortality, and there are no mitigating measurements that could be

taken to prevent this form of take from occurring, the Navy would pursue a Letter of Authorization. Two Incidental Harassment Authorizations have been requested over the last 12 years: one was requested to cover a building demolition project near a seal haul-out; the other was to cover an oil spill response exercise in the estuary. At the time of writing this INRMP, the Navy has no IHAs in place, and no Letter of Authorizations. A current list of active consultations can be obtained from the NBVC ED, NEPA Planner.

Current Management

All proposed projects for NBVC must be planned in accordance with the SA/PRB (NBVC Instruction 11010.1, 04 June 2003). During the SA/PRB process, NBVC ED reviews project plans to determine if there are any regulatory issues regarding MBTA, ESA, MMPA, EFH, and other natural resource regulations. The SA/PRB guides NEPA implementation and permitting procedures; the primary responsibility for NEPA implementation is NBVC ED. The steps for the SA/PRB process are described below:

- 1. The project proponent must first submit all project plans, and a SA/PRB Request Form, to the Public Works Department which enters the project into e-Projects (a web-based tracking tool) and sends an announcement to the PRB Manager and Asset Management Branch.
- 2. The Asset Management Branch decides whether the plan is consistent with the Regional Master Plan and whether the proposed project requires a Safety Site Approval (Explosive Safety, Electromagnetic Radiation, or Airfield Safety Waiver).
- 3. The PRB Manager makes the proposed project available to an interdisciplinary team for review. Either the environmental coordinator for the proponent organization or an NBVC ED representative performs an initial review. The interdisciplinary team includes environmental specialists, security officers, safety officers, firefighters, and industrial hygienists. The PRB reviews the proposed project for compliance with NEPA, assesses potential project impacts to natural resources, and determines whether the proposed project is suitable for a Categorical Exemption, an Environmental Assessment, or an Environmental Impact Statement.
- 4. If a planned project is determined to have the potential to adversely impact the environment, the proponent will generate a request for formal environmental analysis by the NBVC ED.
- 5. The team will review the proposed project and fill out the PRB Checklist with applicable conditions related to their specific media or program area (i.e. air quality, water quality, cultural resources, etc.).
- 6. The PRB Manager will include all project conditions in the Categorical Exemption memorandum and forward the memorandum to the NBVC Commanding Officer for review and signature. The final signed Categorical Exemption will be returned to the

requestor along with a "Statement of Understanding Form" which increases the project proponents' accountability for reviewing and complying with all conditions of the Categorical Exemption. The Statement of Understanding Form is signed and returned to the PRB Manager within two weeks of receipt. After the project has been completed, changed or cancelled, the requestor must complete and submit to the PRB Manager a Project Closure Form, which closes the start-to-finish loop for projects on NBVC.

NBVC ED's responsibilities for NEPA implementation include the following:

- Ensuring each action proposal is reviewed in a timely manner;
- Completing and forwarding documentation for Categorical Exemption and continuing action determinations to the action proponent;
- Coordinating consultation and document preparation with the proponent for actions requiring an Environmental Assessment or Environmental Impact Statement;
- Assisting action proponents in development of an Environmental Assessment or Environmental Impact Statement;
- Serving as a member of the Project Review Board (NBVC Instruction 11010.1);
- Forwarding Environmental Assessment and Environmental Impact Statement documents to Office of the Chief of Naval Operations via the chain of command; and
- Serving as a single point of contact with regulatory agencies while engaged in the NEPA process.
- Ensure communication and coordination between the natural and cultural resource management programs when natural resource management program activities have the potential to impact cultural resources.

Assessment of Current Management

NBVC ED effectively uses NEPA to ensure its activities (as described in this INRMP) are properly planned, coordinated, and documented. It also uses NEPA to identify issues associated with other organizations' projects that affect Point Mugu's natural resources, when it has the opportunity to review such projects. Project and mitigation planning at NBVC Point Mugu will continue to avoid, minimize, rectify, reduce, eliminate, or compensate for any identified environmental impact while not impacting the Navy mission. In most cases at NBVC Point Mugu mitigation will continue to be undertaken in that order of preference, that is, from avoidance as a first priority to compensation as a last resort.

An important offshoot of proper NEPA implementation is that projects are often enhanced by the effort. When natural resources managers understand mission and project requirements in terms

of land features and requirements, they often not only offer more potential site options to mission or project planners but also offer alternatives to avoid future environmental conflicts.

6.5 Environmental Restoration Program

The Defense Environmental Restoration Program, created under the Superfund Amendments and Reauthorization Act, has two site cleanup programs: Installation Restoration Program (IRP), for sites with past releases of hazardous substances; and Munitions Response Program, for sites with munitions and explosives of concern. Information on Navy's Environmental Restoration Program is available at:

 $http://www.navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration.html$

The installation recognizes that adverse impacts to natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The Navy's Environmental Restoration Program is responsible for identifying releases; considering risks and assessing impacts to human health and the environment, including impacts to endangered species, migratory birds, and biotic communities; and developing and selecting response actions when a release may result in an unacceptable risk to human health and the environment (Navy 2006).

When appropriate, the regional or installation's natural resources management staff will help the Environmental Restoration Program Remedial Project Manager identify potential impacts to natural resources caused by the release of contaminants (Navy 2006).

Regional or installation natural resources staff will also participate, as appropriate, in the Environmental Restoration Program decision-making process by communicating natural resource issues on the installation to the Remedial Project Manager, attending Restoration Advisory Board meetings, reviewing and commenting on Environmental Restoration Program documents (e.g., Remedial Investigation, Ecological Risk Assessment), and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to natural resources on the installation (Navy 2006).

When appropriate, the regional or installation natural resources staff will make recommendations to the Environmental Restoration Program regarding cleanup strategies and site restoration. During initial monitoring protocols, the natural resources manager may suggest sampling and testing be accomplished so as to not impact sensitive or critical areas. Also during site restoration, the natural resources manager has the opportunity to recommend site restoration practices that are outlined within the INRMP. Examples include, landfill caps restored to grasslands, excavation areas restore to wetland/pond areas, and treated water located to enhance a pond area (Navy 2006). The Navy Environmental Restoration Program is required to comply with the substantive provisions of applicable or relevant and appropriate requirements (ARARs) identified prior to performing remedial or removal actions. CERCLA Section 121(d) requires

compliance with state and federal ARARs for wastes left on site at the conclusion of a remedial response. Overall, protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived) are threshold requirements that a remedial alternative must meet in order to be selected. In cases where removal actions will be performed, ARARs shall be attained to the extent practicable. ARARs are identified on a case-by-case site-specific basis, considering but not limited to factors such as the hazardous substance present, the site's physical features and the actions being considered as remedies. Coordination with agencies regarding listed species and critical habitats during the normal CERCLA process through document review and agency input is sufficient to satisfy the substantive requirements of the ESA as well as the CERLCA/ National Oil and Hazardous Substances Pollution Contingency Plan requirements to coordinate with natural resource agencies.

The following sections detail Environmental Restoration Program sites at NBVC Point Mugu and Special Areas.

6.5.1 NBVC Point Mugu and Special Area Laguna Peak

No Environmental Restoration Program sites have been identified at Special Area Laguna Peak. There are 15 IRP sites at NBVC Point Mugu are in various phases of the CERCLA process; active CERCLA sites are identified on Figure 6-1. The IRP sites at NBVC Point Mugu consist of former industrial waste treatment waste, landfill or disposal areas, improper storage or maintenance areas, contaminated soil or sediment, underground storage tanks, above ground storage, and a former fire training area. The largest site with abundant natural resources is IRP Site 11, which encompasses Mugu Lagoon and all drainage ditches on base. IRP Site 11 contains contaminated sediments resulting from the following sources: non-point source pollution draining into Mugu Lagoon; storm water runoff conveyed to the lagoon through irrigation ditches; and runoff from other IRP sites on base.

A remedial investigation ecological risk assessment identified IRP Site 5 (a former shops area) and IRP Site 11 (Mugu Lagoon and associated drainage ditches) as having metals that exceeded regulatory action levels for bird species (Tetra Tech 2005). At IRP Site 5, final removal of contaminated sediments occurred in 2011. A draft final Feasibility Study for IRP Site 11 (Chadux Tt 2009) is currently awaiting regulatory agency approval before a proposed plan and Record of Decision can be developed. The other IRP sites at NBVC Point Mugu are in the final stages of the CERCLA process with Records of Decision awaiting regulatory agency approvals.

Through the Remedial Investigation/Feasibility Study process for IRP Site 11, upstream off-base source areas were identified as primary contributors of contaminants to Mugu Lagoon; contaminants include legacy pesticides, polychlorinated biphenyls, nitrogen compounds, and metals. Other stressors include sediment, trash, and bacteria. These contaminants and other stressors have been transported to Mugu Lagoon via drainage ditches that originate in irrigated agricultural lands upstream of Mugu Lagoon, and from the Calleguas Creek watershed that drains into the lagoon (Figure 3-6).

Upstream contaminant sources are currently operating under the California Regional Water Quality Control Board's TMDL Program (Section 3.2.3 Water Resources and Water Management). In 1996, Mugu Lagoon was included on the EPA's 303(d) list of impaired water bodies for a number of constituent exceedances (Los Angeles Regional Water Quality Control Board 2002; California State Water Resources Control Board 2012). In 2002, the Los Angeles Regional Water Quality Control Board (LARWQCB) TMDL Program listed the Calleguas Creek Watershed as an impacted watershed (Calleguas Creek Watershed Management Plan 2012). Under the TMDL program, NBVC has been listed as a responsible party from contaminants associated with IRP Site 5.

Stakeholders identified as contributors of contaminants have agreed to pay for and conduct monitoring and contaminant source control as the preferred method for restoring the watershed to natural conditions. This involves taking regular water and sediment samples in Mugu Lagoon. NBVC was apportioned a 1.1 percent prorated share of the annual monitoring program, which is projected to continue for 30 years (NBVC 2008).

Specific Concerns

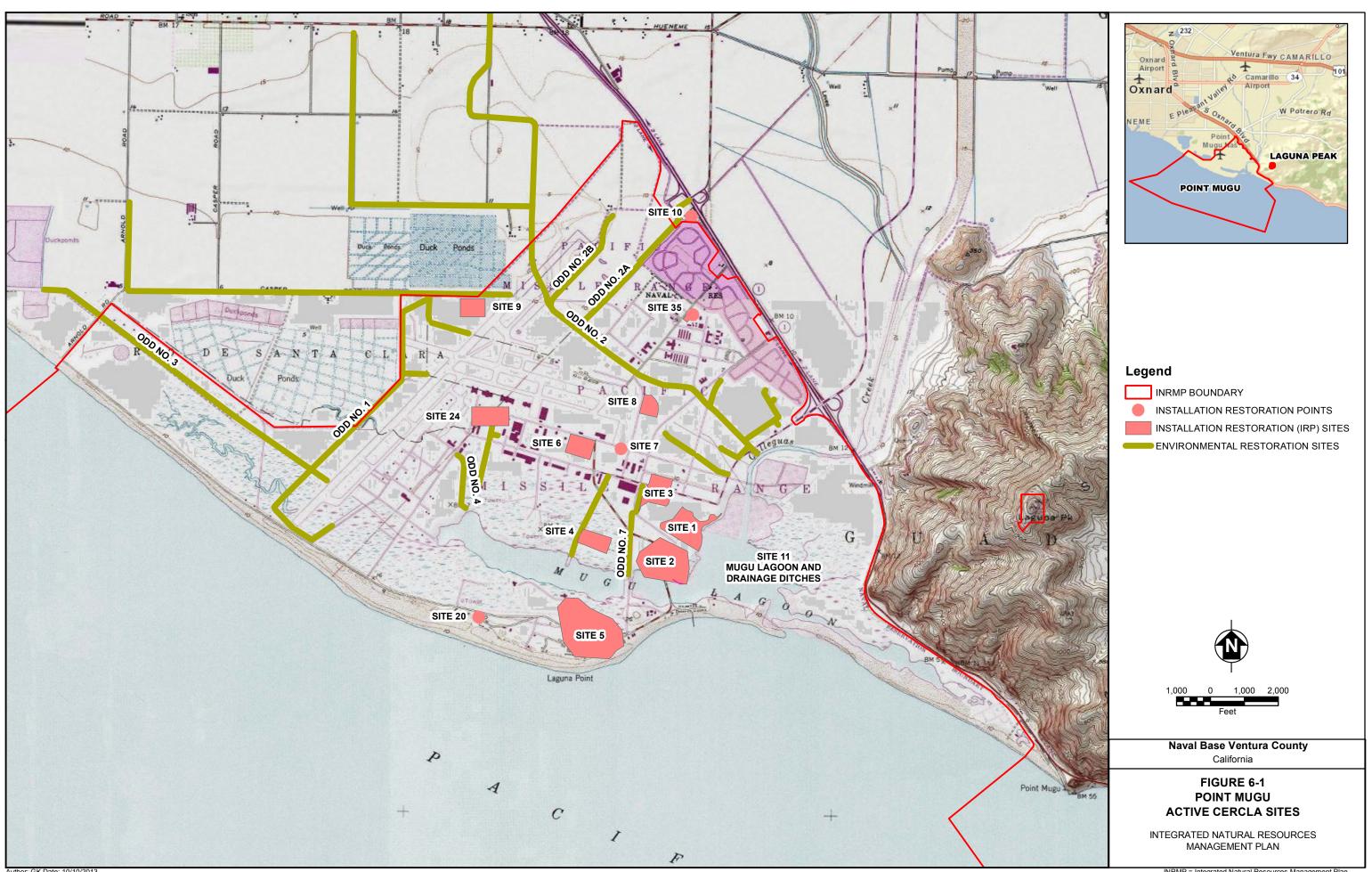
- Contaminated media such as soils, sediment, surface water, and biota can harm wildlife and human health and the environment.
- The Environmental Restoration Program site remediation process may have temporary impacts on ecological habitat and threatened and endangered species at NBVC Point Mugu.

Current Management

Cleanup or remediation of CERCLA and Resource Conservation and Recovery Act sites is regulated by several state and federal statutes. The primary laws that apply, or may apply in some instances, are listed in Appendix B. The most important of these is the Porter-Cologne Water Quality Control Act, which is the basis of the California Water Code.

Similarly, several federal, state, and local governmental or regulatory agencies have responsibility for contaminated media. The lead agencies are the RWQCB, EPA, and USACE. At NBVC Point Mugu, the Navy has a major responsibility to coordinate with other federal and state agencies to ensure contaminated media are remediated.

The Navy's policy on cleanup of identified CERCLA and Resource Conservation and Recovery Act sites is that the source must be controlled before cleanup occurs, the cleanup must be riskbased and have site specific cleanup goals; and the criteria for any monitoring plan must be established before the first sample is collected.



Author: GK Date: 10/10/2013. Data Source: TetraTech and NBVC GIS Databases.

This map is government property, not to be reproduced or distributed without concurrence from the Naval Base Ventura County Environmental Division.

NBVC Point Mugu recognizes that adverse impacts to natural resources described in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The Navy Environmental Restoration Program is responsible for identifying CERCLA releases, Resource Conservation and Recovery Act releases, and releases under related provisions; considering risks and assessing impacts to human health and the environment, including impacts to endangered species, migratory birds, and biotic communities; and developing and selecting response actions when a release may result in an unacceptable risk to human health and the environment.

NBVC Point Mugu follows management strategy pursuant to the Navy's INRMP Guidance (Navy 2006). When appropriate, the regional or installation's natural resources management staff will help the Environmental Restoration Program Remedial Project Manager identify potential impacts to natural resources caused by the release of these contaminants.

Regional or installation natural resources staff will also participate, as appropriate, in the Environmental Restoration Program decision-making process by communicating natural resource issues on the installation to the Remedial Project Manager, attending Restoration Advisory Board meetings, reviewing and commenting on Environmental Restoration Program documents (e.g., Remedial Investigation, Ecological Risk Assessment), and ensuring that response actions, to the maximum extent practical, are undertaken in a manner that minimizes impacts to natural resources on the installation.

When appropriate, the regional or installation natural resources staff will make recommendations to the Environmental Restoration Program Remedial Project Manager regarding clean up strategies and site restoration. During initial monitoring protocols, the natural resources manager may suggest sampling and testing be accomplished so as to not impact sensitive or critical areas. Also during site restoration, the natural resources manager has the opportunity to recommend site restoration practices that are outlined in the INRMP. Examples include, landfill caps restored to grasslands, excavation areas restored to wetland/pond areas, and treated water located to enhance a pond area.

Assessment of Current Management

The CERCLA and Resource Conservation and Recovery Act programs are effective at remediation of contaminated media, while minimizing any impacts to natural resources. Any remediation effects may have temporary impacts to resources, but beneficial in the long term. Environmental Restoration Program sites managers should continue to coordinate with NBVC ED natural resource managers. During planning for site restoration, coordination with NBVC ED should occur when restoration plans involve revegetation so that NBVC-approved native landscaping is used. Additionally, coordination with NBVC ED should occur to ensure that federally listed species are not adversely affected by CERCLA activities.

Management Strategy

Objective: Prevent or minimize impacts of contaminated media on ecological receptors.

- *I.* Continue to coordinate with the Environmental Restoration Program in regards to CERCLA issues, to ensure that remedial site designs do not conflict with policies stated in this INRMP.
 - *A.* NBVC ED should coordinate on-site remediation and restoration plans that include revegetation, to ensure no invasive species are used.
 - *B.* Continue to update GIS database of natural resources to support remediation planning.
 - C. Continue to integrate baseline ecological surveys into preparedness planning.

6.5.2 NBVC Channel Islands Special Areas

There are no active CERCLA sites at NBVC Channel Islands Special Areas. Historically, San Miguel Island contained seven sites, and Santa Rosa Island had two sites. All nine CERCLA sites have been closed with no further action required (Tetra Tech 2012t). As such, no management strategies are needed for this topic.

6.5.3 NBVC Fort Hunter Liggett Special Area

There are no active CERCLA sites at NBVC Fort Hunter Liggett Special Area (Tetra Tech 2012t). The Blackjack Compound has been recently reclassified as an operational range (Tetra Tech 2013a). No management strategies are needed for this topic.

6.6 OIL SPILL RESPONSE AND HAZARDOUS SUBSTANCE PREVENTION AND CLEANUP

The following sections detail oil spill response and hazardous substance prevention and cleanup at NBVC Point Mugu and Special Areas.

6.6.1 NBVC Point Mugu and Special Area Laguna Peak

Oil spill prevention and response are regulated under the federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 *et seq.*), as amended by the Clean Water Act of 1977, and the Oil Pollution Prevention Act of 1990. Under the Clean Water Act, Natural Resource Trustees are authorized to recover damages for injury to, destruction of or loss of natural resources resulting from a discharge or the substantial threat of discharge, of oil into navigable waters. Hazardous substances other than oil are addressed by CERCLA (42 U.S.C. 9601 *et seq.*), which authorizes Natural Resource Trustees to recover damages for injury to, destruction of or loss of natural resources resulting from the release of a hazardous substance. At the state level, the California Department of Fish and Game's (CDFW) Office of Spill Prevention and Response was formed in

1990 with the passage of Senate Bill 2040. Office of Spill Prevention and Response is responsible for protecting California's natural resources by preventing, preparing for, and responding to spills of oil and other deleterious materials, and through restoring and enhancing affected resources. Federal and state regulations and laws are detailed in Appendix B.

The U.S. Coast Guard is the lead agency for oil spill prevention and response, and is authorized to direct state and local agencies in controlling pollution in bays and coastal waters. The CDFW normally leads wildlife response during a spill in California.

NOAA is assigned responsibility for Natural Resource Damage Assessment from spills, and the Navy has adopted NOAA procedures for damage assessment (15 CFR 990). Similarly, the U.S. Department of Interior is in charge of damage assessment for hazardous substance spills under Executive Order (EO) 12580. The baseline condition of the natural resources and services that would have existed had the oil or hazardous substance release not occurred is estimated using historical data, reference data, control data or data on incremental changes, alone or in combination, as appropriate. Navy guidance (OPNAVINST 5090.1C CH-1) suggests that this information may be obtained from INRMPs, NEPA documents, or special studies. Naval Facilities Engineering Command (NAVFAC) Southwest has developed an "Ephemeral Data Collection Plan" in support of Natural Resource Damage Assessment (Robilliard and others 1997). Immediately during and after a spill, data will be collected to evaluate the injury. Examples include macro invertebrate surveys, water and sediment samples, and vegetation surveys. Following federal guidelines, this is often done cooperatively with the responsible party, and with fellow trustee agencies. The NAVFAC plan identifies specific locations, methodologies, and responsibilities for data collection.

The most recent and significant hazardous substance response at NBVC Point Mugu occurred early evening on 18 May 2011, when a Boeing K707 aerial refueling tanker, carrying jet fuel crashed during take-off east of the runway, into Mugu Lagoon. Up to 10,000 gallons of Jet Petroleum 8 fuel may have been lost in the crash, an unknown portion of which was released into the marsh. The crash scattered debris, scoured tracks into the marsh, and left the remaining fuselage partially buried in the mudflat. A Unified Command was instituted immediately following the incident, consisting of staff from NBVC, CDFW's Office of Spill Prevention and Response, U.S. Coast Guard, USFWS, and the aircraft owner Omega Air, Inc. The Unified Command was established to oversee the emergency response, oversee clean-up operations and mitigate potential impacts to the entire estuary. A high tide occurred overnight when darkness limited actions to control and document fuel transport. The following day, 19 May 2011, more extensive response actions included (1) installation of sandbags at the various culverts to reduce further transport of fuel through Mugu Lagoon and (2) surveys to identify presence of fuel, debris, and any impacted wildlife. Saline mud flat and tidally inundated salt marsh in the immediate vicinity of the crash were affected by the crash. Surveys of the area post-crash did not identify any impacts to listed species or migratory birds from the crash or response efforts. Impacts from the crash and response were limited to vegetation and benthic invertebrate impacts. Vegetation impacts occurred from fire, emergency and salvage operations, and sediment removal. Benthic invertebrate impacts included crab and snail mortality near the crash site, and impacts to the epibenthic and infaunal invertebrate communities in the crash site. During

removal of contaminated sediment from the crash site, additional impacts occurred to the benthic invertebrate community from excavation.

Specific Concerns

- Cumulative effects of small, medium, and large oil spills can negatively affect natural resources.
- Coordinated planning for oil spill cleanup activities should be integrated with conservation priorities of this INRMP.
- There is a need to incorporate planning for Natural Resource Damage Assessment under both federal and state oil spill prevention regulation, and to establish a quantitative baseline to support natural resources management decisions, habitat mitigation and enhancement planning, and sustainability planning.
- Oil spills most notably affects marine fauna such as birds and marine mammals, but also exerts damaging effects on plankton and other organisms either directly or indirectly through habitat damage. The size of an oil spill doesn't necessarily correlate with the amount of damage it can do. Even small spills can have big consequences for birds if the oil contaminates an area where large numbers of seabirds are rafting or foraging (Bunn and others 2007).

Current Management

The "NBVC Integrated Contingency Plan" addresses oil response, sources of potential spills, and how to contain spills to reduce impacts (SAIC 2012). NBVC Point Mugu's fuel storage and transfer operations have the greatest potential for a discharge of oil onto land or into navigable waters that could cause substantial harm to the environment, including injury to fish and wildlife and sensitive areas. Operational efficiency and safety of personnel and equipment, and Federal, State, and Navy regulations require that a plan exist to effectively respond to oil and hazardous substance spills.

Oil and hazardous substance spill prevention and response planning requirements include the *National Contingency Plan, Area Contingency Plan, Spill Prevention Control and Countermeasure Plan, Federal Facility Response Plans, State of California Oil Spill Contingency Plan, Navy Instructions, additional emergency response planning, and an Integrated Contingency Plan (SAIC 2012).* NBVC Point Mugu operates within the guidelines of the U.S. Coast Guard, EPA, and the State of California under the *Los Angeles/Long Beach Area Contingency Plan* published in January 2006. Agency notification and coordination protocols are outlined in this plan.

Facilities that handle or store hazardous substances, the release of which could endanger health and human safety and adversely impact the environment, must comply with additional federal regulations that govern emergency planning, notification, and response. These requirements are part of the Resource Conservation and Recovery Act, CERCLA, and the Emergency Planning and Community Right-to-Know Act regulations contained in 40 CFR Part 264, 40 CFR Part 302, and 40 CFR Part 355, respectively. The Occupational Safety and Health Administration has regulations governing emergency response and planning. Applicable requirements contained in 29 CFR Part 1910 are addressed in the NBVC Integrated Contingency Plan (SAIC 2012).

At NBVC Point Mugu, spill response drills are conducted annually, to ensure NBVC staff are trained and prepared in spill response and protocol.

Many birds that are oiled offshore either from natural seeps or human-related spills find refuge in Mugu Lagoon. Finding oiled loons or grebes is common, especially during the winter. During a spill event in 2005 that occurred north of NBVC, over 500 oiled western grebes were captured at Mugu Lagoon. NBVC ED biology staff regularly watches for and capture oiled birds when possible, and transfer the birds to rehabilitators.

Assessment of Current Management

Oil spill response and hazardous substance prevention and cleanup are effectively managed by the implementation of federal and state plans listed above. The collection and maintenance of ecological information required by OPNAVINST 5090.1C CH-1 (Chapter 24) are essential to pre-incident planning on behalf of the Navy's Regional Environmental Coordinator. NBVC ED should continue to support planning and response readiness by maintaining the natural resource survey and GIS databases. If there is a spill, coordination with NOAA/NMFS should occur prior to using dispersants, to determine management actions that are species and habitat-specific.

Management Strategy

Objective: Support the effectiveness of prevention and response planning and participate in wildlife rescue.

- *I.* Continue to integrate the protection priorities of this INRMP into contingency spill response and Natural Resource Damage Assessment planning.
 - A. Continue to update GIS layers of natural resources to support preparedness planning.
 - B. Continue to integrate baseline ecological surveys into preparedness planning.
 - C. Integrate invasive exotic species response planning with oil spill contingency plans.
 - D. Continue to have NBVC ED staff participate in the annual spill training exercise.
 - E. Continue to monitor for oiled birds in estuary and rescue birds when appropriate.

6.6.2 NBVC Channel Islands Special Areas

Oil spill response and hazardous substance prevention and cleanup at NBVC Channel Islands Special Areas occur under the same regulations and using the same programmatic protocols outlined above for NBVC Point Mugu. Management strategies are also the same. In the event of a spill, NBVC would coordinate containment and cleanup efforts with the National Park Service, as necessary.

6.6.3 NBVC Fort Hunter Liggett Special Area

Oil spill response and hazardous substance prevention and cleanup at NBVC Fort Hunter Liggett Special Area occur under the same regulations and using the same programmatic protocols outlined above for NBVC Point Mugu. Management strategies are also the same. In the event of a spill, NBVC would coordinate containment and cleanup efforts with the Army, as necessary.

6.7 CONSTRUCTION, FACILITY AND UTILITIES MAINTENANCE

Successful management of natural resources at NBVC Point Mugu and Special Areas depends on both direct management of species and habitats and integration and proper management of maintenance activities that indirectly affect resources. This section presents objectives for management of facilities including structures, roads, fences, utilities, and grounds maintenance activities.

6.7.1 NBVC Point Mugu and Special Area Laguna Peak

Maintenance activities discussed below include removal of structures, road maintenance, utilities maintenance, and boundary fence maintenance. These projects and information are taken from the 2002 INRMP and the Programmatic Biological Opinion. Specific concerns and management strategies are addressed at the end of this section.

6.7.1.1 Removal of Structures

The NBVC Point Mugu installation contains structures that are no longer used, such as old electrical boxes, targets, antennas, tall wooden poles, concrete pads and berms, asphalt parking areas and roads, and some buildings. Some of these structures harbor mammalian and avian predators; the elimination of tall vertical structures used by avian predators is important for management of listed bird species. The Navy's overall goal is to remove structures that are no longer used, as detailed in Section 2.1.2.1 Military Land Use and Categories of Operation. The removal of structures can present opportunities for wetland restoration and entry of restoration sites into the proposed NBVC Point Mugu Wetland Mitigation Bank (Section 3.3.1.5 Jurisdictional Waters – Wetland Management).

Since 2002, the Navy has met the objectives for removal of structures outlined in the 2002 INRMP (called "Management Guidelines"). These objectives include removal of the asphalt parking lot at Holiday Beach and restoration of the area to sandy beach habitat; and removal of the asphalt pad and earthen berms after Building 736 was demolished, followed with restoration of the area to open water tidal creek and spiny rush habitat for the light-footed clapper rail.

6.7.1.2 Road Maintenance

The Public Works Department maintains and repairs all paved and dirt roads at NBVC Point Mugu and Special Area Laguna Peak. Maintenance at NBVC Point Mugu and Special Area Laguna Peak includes regrading, resurfacing, culvert repair, and removal of vegetation along road shoulders. Maintenance may entail resurfacing or grading roads within salt marsh habitat where there are utility lines (electrical, sewer, or communication). Road maintenance also includes repair of culverts throughout Mugu Lagoon. Maintenance involves noise, loud machinery, and human activity near habitat for listed species. Any of these aspects of maintenance may disturb wildlife, including listed species, in nesting, roosting, or foraging areas. The clearance of roadside vegetation may create opportunities for invasive, non-native plants to become established, making the habitat unsuitable for listed species.

Road maintenance activities and associated compensatory measures are addressed in the *Programmatic Biological Opinion for Ongoing Activities at the Naval Base Ventura County, California (5090 Ser PW420/075) (1-8-99-F-24),* in Appendix O.

Road Kills

Although traffic at NBVC Point Mugu is relatively light overall, several roads pass through habitat that supports listed species. Listed species occasionally cross or are present on roads, putting them in danger of vehicular collision. Some roads are closed occasionally for Navy operations. The speed limit is controlled by signs in important locations.

Road kills of least terns, snowy plovers, and light-footed clapper rails have been documented at NBVC Point Mugu, which may have resulted from excessive speed, poor visibility, or nighttime driving.

In 1999, five California least terns were struck and killed on roadways at NBVC Point Mugu as terns like to congregate on roads near culverts where foraging efficiency is improved. The Navy immediately installed stop signs at the location to slow traffic, and no additional tern mortalities were reported. During post-fledging, NBVC biologists now monitor for terns congregating along roads near foraging areas, and place temporary "slow down" signs to reduce potential strikes.

In 2011, the speed limit along Beach Road was reduced from 35 to 25 miles per hour to specifically reduce chances of vehicle strikes to endangered species. The speed limit was lowered in response to an increase in western snowy plover vehicle mortalities; mortalities were likely caused when plovers began to commonly nest along the shoulders of Beach Road.

The Programmatic Biological Opinion (Appendix O) addresses mitigation measures for take attributed to road kills. Measures include enhancing existing habitats for sensitive species, as well as traffic controls. Road kill of small mammals is also a source of food for turkey vultures that scavenge carcasses. The vultures create a BASH as they circle in the airspace above the base, especially above and near the airfields. Management measures are implemented to speed removal of road-killed carcasses so that the vultures are not attracted to the area.

6.7.1.3 Utilities Maintenance

Utilities at NBVC Point Mugu require periodic maintenance. The utilities include electric and communication lines (overhead lines, underground lines, and poles), sewer lines and storm drains, and water and natural gas lines. Maintenance of utilities includes removing debris, cleaning out vaults, washing transformers, inspecting the components periodically, and repair. These activities require specialized vehicles, may result in some ground disturbance, and can produce noise.

California brown pelicans have been injured or killed when they struck utility lines that cross Mugu Lagoon. As a result, some lines were put underground and a stretch of lines near the mouth of the lagoon was outfitted with bird diverters (flappers) to increase visibility to birds and prevent collision and mortalities. The bird diverters reduced pelican strikes by at least 90 percent. The power lines that cross the marsh from Laguna Road to South J Avenue are problematic as they provide raptor hunting perches over light-footed clapper rail areas. Antiperching devices have been placed on selected pole to reduce raptor perching. However, results have been mixed; therefore, no additional exclusionary devices will be installed. NBVC ED has been and will continue to work to relocate those lines either underground or otherwise. The utility line access road will be more commonly inundated as a result of sea level rise, so it is in the utility division's best interest to modify the lines before access is lost. Most injuries and deaths have occurred at a power line that parallels the lagoon along Beach Road. Collisions with power lines would be eliminated if lines were relocated underground. Specifically, all power lines south of 13th Street and east of Las Posas Road, as well as in the central basin of Mugu Lagoon up to Laguna Peak, should be relocated underground. Relocation would reduce the number of deaths and injuries to birds caused by collisions with wires and secondarily reduce the availability of carcasses that attract vultures that pose a BASH threat to air operations.

The Programmatic Biological Opinion (Appendix O) addresses utilities maintenance protective measures to avoid impacts to sensitive species.

6.7.1.4 Boundary Fence Maintenance

Two of the boundary fences at NBVC Point Mugu are on sandy beaches. The western fence that separates NBVC Point Mugu from Ormond Beach is nesting habitat for the western snowy plover and California least tern. The eastern fence, which separates NBVC Point Mugu from Point Mugu State Park, is potential foraging habitat for the western snowy plover, but its use by plovers is likely rare.

The boundary fences undergo severe weathering and damage from wave action, salt spray, wind erosion, and vandalism. They need periodic maintenance and repairs that require crews to move heavy equipment on the beach and replace old pilings and fencing material. The fence is necessary to keep trespassers off NBVC Point Mugu property, thus protecting special status species from uncontrolled intrusion. The implementation of protective measures detailed in the Programmatic Biological Opinion, and coordination with the Natural Resource Manager to avoid work near active nests, will ensure impacts to listed species are avoided. Maintenance of the fence can occur year-round, at the discretion of NBVC ED, as long as there are no impacts to sensitive species.

6.7.1.5 Sustainability in the Built Environment

Sustainable development practices produce highly efficient and cost effective buildings that reduce the use of natural resources such as water and oil, decrease pollution, and provide a healthier indoor environment. This type of development takes into account the full life cycle cost of a project, including broader concerns such as its effect on the environment and the community, and not just the financial cost.

To evaluate objectively whether a building project meets the definition of "sustainable," in 1994 the U.S. Green Building Council developed the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The LEED program is one of several ratings systems for energy performance. It includes a checklist of various "green" options for building design and construction, developed through a consensus by a consortium of industry groups. It evaluates environmental performance from a "whole building" perspective over a building's life-cycle, providing a definitive standard for what constitutes a "green building." The LEED rating system's six credit areas for new construction are: Sustainable Sites (includes site selection, site resource protection, landscaping, and stormwater management); Water Efficiency (water efficient landscaping, water conservation, and innovative technologies); Energy and Atmosphere; Materials and Resources; Indoor Environmental Quality; and Innovation and Design Process (includes exceptional performance beyond the LEED requirements).

The EPA developed several documents for sustainable water management that include a literature review, concepts, case studies, and guidance in LID, that are becoming requirements in some stormwater permits. On 20 January 2005, the State Water Resources Control Board adopted sustainability as a core value for all California Water Boards' activities and programs, and directed California Water Boards' staff to consider sustainability in all future policies, guidelines, and regulatory actions. Additional information on EPA guidance for LID can be found at www.epa.gov/owow/nps/lid/.

While standards exist for sustainable structures—"green buildings" and "water management" there are no comprehensive guidelines and performance benchmarks for those who want to create and measure sustainable landscapes in the built environment. The Sustainable Sites Initiative is an interdisciplinary effort by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center at the University of Texas at Austin, and the U.S. Botanic Garden to create voluntary national guidelines and performance benchmarks for sustainable land design, construction, and maintenance practices (Sustainable Sites Initiative 2010). For more information, refer to www.sustainablesites.org

EO 13123 "Greening the Government through Efficient Energy Management" (superseding EO 12902) directs that the federal government significantly improve its energy management. It promotes energy efficiency through building design, construction, and operation; water conservation; use of renewable technologies; and fostering markets for emerging technologies.

In the Navy, the first requirement of facilities is mission support; however, as stated in Naval Facilities Engineering Command Instruction (NAVFACINST) 11010.45, "Sustainable development is required by law and policy, and is a requirement for the Navy" up to and including completion of project documentation (DD Form 1391). The Navy's goal is to exceed the LEED "certified" level where justified by life cycle costs (NAVFACINST 11010.45). The Navy uses LEED as a tool in applying sustainable development principles and as a metric to measure the sustainability achieved. The Navy was the first federal agency to participate in the LEED program.

Much sustainability planning in the Navy occurs in the Regional Shore Infrastructure Plan process, because this process is the tool where facility needs are evaluated and siting options are examined. One of the stated Navy goals of the Regional Shore Infrastructure Plan process is (as set forth in NAVFACINST 11010.45): "Recognizing the environmental association of all planning recommendations and providing ecologically sustainable solutions that support and enhance the regional shore establishment." Properly following the Regional Shore Infrastructure Plan process means that a planner is already taking a longer-term approach (NAVFACINST 11010.45).

Across nearly all sectors of environmental concern, there is unfulfilled potential to conduct operations in a more sustainable manner. In addition, there are few projects that meet criteria as sustainable. Information sharing among agency practitioners with the work of professional societies in a range of resource areas is only beginning. LEED is well integrated into agency work through application of EO 13423—Strengthening Federal Environmental, Energy, and Transportation Management (January 2007).

Many opportunities exist for the construction of infrastructure in a way that promotes the achievement of the Navy's mission in an environmentally integrated way. For example, the use of LID-approved permeable surfaces and bioswales reduces storm-water runoff and reduces contaminants of concern in stormwater runoff. Bioengineering techniques can promote favored wildlife while excluding undesirable species, such as rats. It is less expensive to design to prevent these impacts rather than to fix them after the fact.

TABLE 6-2: PARTIAL CHECKLIST (PORTION RELATING TO NATURAL RESOURCES) AND SCORING SYSTEM FOR NAVY LEED PROJECTS

Erosion and Stormwater Control
Construction site sediment and erosion control plan that conforms to best management practices.
No net increase in the rate or quantity of stormwater runoff from existing to developed conditions, OR, if existing imperviousness is greater than 50 percent, new development will result in a 25 percent decrease in the rate and quantity of stormwater runoff.
Stormwater treatment systems designed to remove 80 percent of the average annual post development total suspended solids, and 40 percent total phosphorous.
Site Selection
If the site is FREE from the following unfavorable conditions.
Land elevation is lower than 5 feet (1.5 meters) above the elevation of the 100-year flood as defined by Federal Emergency Management Agency. Within 100 feet (30.5 meters) of any federal, state, or local wetland.
Land that provides habitat for any species on the federal or state threatened or endangered list.
If the site has any of these problems, strongly consider using another area.
Urban Redevelopment
Develop on a site classified as a brown field and provide remediation.
Conserve water use through xeriscaping with native plants.
Reduced Site Disturbance/Reduced Heat Islands
Post development landscaping uses native plants that improve habitat for native species.
Light Pollution Reduction
Do not exceed Illuminating Engineering Society of North America foot candle level requirements, and design interior and exterior lighting such that zero direct-beam illumination leaves the building site.
Water Use Reduction
Use only captured rain, graywater, or trenched wastewater to water landscape.
Install non-potable water system for toilets, cooling towers, boilers, landscaping, vehicle washing, and other non- potable water needs.
Employ strategies that in aggregate use 20 percent less water than the water use baseline after meeting Energy Policy Act of 1992 fixture performance requirements.
Exceed the potable water use reduction by an additional 10 percent.
Comply with the Department of Energy Performance Measured Protocol.

Sustainability indicators for specific resources, such as water, energy, and wildlife, are undergoing research and scrutiny for criteria and selection of the best indicators of sustainability. Resource indicators are developed through the expert opinions of scientists, management agency personnel, non-governmental organization representatives, practitioners, and other stakeholders. A suite of variables, when complemented with other sustainability indicators, produces a viable system to monitor at the national level the biophysical, social, and economic characteristics indicating trends of sustainability. There is a need to develop local indicators that tier off these.

The following discussion addresses management, objectives, and strategies for all activities addressed under Section 6.7.1 above. Concerns, objectives, and management strategies for construction, facilities, and utilities maintenance are summarized below.

Specific Concerns

- Construction and facility maintenance projects may result in the incidental take of avifauna, such as bird nests, and direct mortality of less mobile species such as small mammals, reptiles, and amphibians.
- Construction and facility maintenance projects may result in the introduction or spread of invasive plant species transported in materials or on equipment.
- Erosion control measures may be eliminated from a project as a cost-cutting measure.

Current Management

All infrastructure support projects are reviewed by the SA/PRB to minimize any potential impacts to natural resources. NBVC ED is consulted from project inception, through the SA/PRB, to avoid delays in project schedule and minimize adverse environmental effects.

By EO, the President has directed that federal agencies shall design, use, or promote construction practices that minimize adverse effects on the natural habitat where cost-effective and to the extent practicable (EO 13112). Several other laws are pertinent: Clean Water Act, Clean Air Act, ESA, NEPA, Magnuson-Stevens Fishery Conservation and Management Act, MBTA, Porter-Cologne Water Quality Control Act, and Soil Conservation Act. Routine maintenance activities that may affect drainages fall under the USACE authority from Section 404 of the Clean Water Act. The Programmatic Biological Opinion addresses mitigation and compensatory measures for construction and maintenance at the base (Appendix O).

Future use patterns focus on maximizing efficiency of existing spaces by upgrading current facilities and infrastructure. The NBVC Proposed Land Use Plan depicts a long-range framework for development, renovation, and consolidation within the existing land use pattern, rebuilding in existing developed footprints and thus reducing the need to break new ground (Onyx Group 2006).

Assessment of Current Management

Facilities maintenance projects are well coordinated with the natural resource program to minimize impacts with natural resources. The goals of renovation and consolidation stated in the NBVC Proposed Land Use Plan (KTU+A 2010), and the land use planning process of the SA/PRB, are adequate to avoid and minimize potential impacts to natural resources from construction and facility maintenance and upgrades. The potential exists, however, for activities to disrupt nesting birds or contribute to soil erosion. BMPs and processes by which to avoid bird disturbance and soil erosion are further addressed in Section 3.4.4, Birds; Section 3.2.3.2, Surface Water Hydrology and Stormwater Management; and Section 3.2.2, Soils and Soil Conservation.

Objective: Conduct construction and facility maintenance in a way that allows for protection of sensitive environmental resources while ensuring accomplishment of the military mission.

- *I*. Ensure continued use of the SA/PRB to avoid or minimize potential impacts to native habitats and species.
 - a. Ensure that new construction or reconstruction of facilities on or near coastal areas meet the requirements detailed in the federal Coastal Zone Management Act and California Coastal Act for construction in the coastal zone (Figure 2-3).
- *II.* Ensure the continued implementation of protective measures outlined in the Programmatic Biological Opinion (Appendix O).
 - a. Continue to coordinate with NBVC Public Works for scheduling and monitoring utilities maintenance.
- *III.* Ensure impacts to bats and migratory birds are avoided during project implementation.
 - a. The MBTA requires that federal agencies coordinate with USFWS if a construction or site activity would result in the take of a migratory bird. If construction or clearing activities are scheduled during nesting season (March 15 through September 15), NBVC ED should be consulted to conduct surveys to identify potential active nests. If construction activities would result in the take of a migratory bird, and it is not possible to delay projects, then coordination with USFWS and the NBVC ED should occur, and applicable permits obtained prior to construction or clearing activities.
 - b. If possible, schedule all building demolition to occur during the non-nesting season to avoid possible delays or accidental take of migratory birds.
 - c. Prior to building demolition, bat surveys should occur if buildings are known or have potential to house bats. In the event active bat roosts are discovered, bat exclusion activities are required to occur to avoid impacts to bats before any disturbance occurs.
- *IV.* Ensure water resources are protected.
 - a. Ensure projects include BMPs at construction sites for controlling soil erosion from wind and water transport, as outlined in the *California Stormwater Best Management Practices Handbook* (Caltrans 2000) and the Stormwater Pollution Prevention Plan for NBVC Point Mugu.
 - b. Monitor and enforce compliance with stated BMPs.
 - c. Obtain necessary regulatory permits under Clean Water Act regulations.

- V. Ensure Navy leadership has visibility with respect to the total cost of mission sustainment, day-to-day operations, infrastructure and building development, and redevelopment. This objective should incorporate climate change scenarios and the projected value of the loss of habitat associated with action decisions.
- VI. Apply sustainability principles to the management of habitats, species, and ecological functions on NBVC Point Mugu and Special Areas by identifying resource-specific BMPs similar to what has been done for energy and water in the built environment using Leadership in Energy and Environmental Design (LEED), LID, and Sustainable Sites Initiative approaches.
 - a. Continue to comply with EO 13123 that tasks federal agencies with defining principles for implementing sustainable development in construction.
 - b. Use construction siting, materials, and methods that promote biotic communities to the fullest extent possible.

6.7.2 NBVC Channel Islands Special Areas

The Memorandum of Agreement between the NPS and Navy for the Channel Islands (Appendix P), states "that no permanent facility or utility construction by the Department of the Interior shall be installed unless specifically permitted by separate use agreement, and that the Navy will not be required to protect or repair any facility or utility against damage which might result from the use of the islands in connection with missile test range or other military uses."

The Navy (Naval Air Warfare Center Weapons Division) is responsible for construction and all facilities and utilities maintenance on Santa Cruz Island. TNC (lessor) does not conduct maintenance or construction. Navy staff includes one maintenance worker on Santa Cruz Island, who ensures all equipment is operating correctly. Construction projects are implemented by contractors sent to the island for specific jobs (Tetra Tech 2013f). Contracts and projects are reviewed through the Navy's SA/PRB process.

The Navy maintains a remote, solar-powered weather station on San Miguel Island. No routine maintenance is usually necessary, but if a problem arises, Navy personnel are sent to the island to make repairs.

NBVC ED has no specific concerns or management strategies at this time.

6.7.3 NBVC Fort Hunter Liggett Special Area

Because of the developed nature of the land at NBVC Fort Hunter Liggett Special Area, there would likely be few to no conflicts with natural resources management and the maintenance and construction of utilities and facilities.

6.8 LANDSCAPING AND GROUNDS MAINTENANCE

The following sections detail landscaping and grounds maintenance as it relates to natural resource management at NBVC Point Mugu and Special Areas.

6.8.1 NBVC Point Mugu and Special Area Laguna Peak

The main urbanized area of NBVC Point Mugu consists of residential, industrial, community service, administrative, and recreation uses. This area contains various turf and landscaping improvements. Other landscaped areas on base are "improved" areas that include family housing lawns, the old golf course, and other small areas. Many introduced and native species have been used for landscaping in the improved areas and include varieties of coniferous and broadleaf trees, lawn grasses, shrubs, vines, and colorful flowers used to decorate building surroundings. Landscaped areas, shelterbelts, and windrows at NBVC Point Mugu and Special Area Laguna Peak can provide habitat for native bird species and other wildlife species because these areas serve as ecological islands in an urban environment (Siena College–Audubon International Institute 1997).

Grounds maintenance at NBVC Point Mugu involves activities related to the care of landscapes, clearance of airfield approach zones, and maintenance of roads and paved areas. The following sections present management guidelines for these activities, including pest management, invasive species and noxious weeds control, environmentally and economically beneficial landscaping, fertilizer application, and green waste management.

Landscape management can create non-point source pollution associated with runoff of excess fertilizer. As this fertilizer make its way into aquatic ecosystems, it often results in high levels of primary production, leading to the rapid buildup of organic matter and eventual eutrophication of the water body (Miller 1994). This excessive primary production can dramatically alter the ecosystem and crowd fish, birds, amphibians, and other creatures out of their traditional habitats. The resulting reduction of photosynthesis in marine environments affects the food supply and thus limits growth of the marine population. These long-term shifts in the function of the ecosystem are significant and often difficult to reverse.

Specific Concerns

- The Grounds Maintenance Contract needs to be evaluated for consistency with recent EOs or Navy policy.
- The Base Exterior Architecture Plan should be evaluated for consistency with respect to landscaping recommendations herein.
- Landscaping practices have the potential to disrupt nesting birds and other pollinators.
- Opportunities exist at the urban-natural area interface to create or enhance buffers with native plant species.

- Grounds maintenance activities have the potential to impair natural resources on base through the use of fertilizers and pesticides.
- Roadside spraying can create erosion problems and removes native species.

Current Management

Maintenance of semi-developed and developed grounds is accomplished at NBVC Point Mugu with technical assistance from staff in NBVC ED. Landscaping and grounds keeping work occurs primarily in the Community Support, Housing, and Administrative land use areas at NBVC Point Mugu (Map 1-2). However, roadside maintenance occurs throughout the base. Landscaping at NBVC Point Mugu follows the guidance set forth in the NBVC Smart Landscape Master Plan and Approved Plant List (Navy 2008). The purpose of the list is to provide a clear set of approved landscaping plants that are known to not be invasive in the NBVC Point Mugu region. The NBVC Approved Landscaping Plant List is in Appendix G and also includes plants that are prohibited from use under any circumstances. This plan requires that a minimum of 80 percent native plants are used for landscaping projects. All landscape designs and plant lists shall be reviewed and approved by NBVC ED and the NAVFAC Landscape Architect in the planning stages of project design. In some instances, however, smaller landscaping projects have occurred without notification to NBVC ED and assurance that appropriate plants are used.

NBVC supports the goals of EO 13148 (21 April 2000) *Greening the Government through Leadership in Environmental Management* and promotes the President's 26 April 1994 *Memorandum on Environmentally Beneficial Landscaping*. It is Navy policy to:

- 1. Use regionally native plants for landscaping.
- 2. Design, use and promote construction practices that minimize adverse effects on natural habitat.
- 3. Prevent pollution by reducing fertilizer and pesticide use, integrated pest management practices, recycling green waste (composting) and minimizing runoff.
- 4. Implement water-efficient practices, use efficient irrigation systems and recycled water, and use landscaping to conserve energy.
- 5. Create additional demonstration projects to promote awareness of environmental and economic benefits of these practices.

The NBVC Smart Landscape Master Plan focuses on resource conservation through creative and appropriate landscape design and management. The plan is designed to reduce the consumption of all resources including irrigation water, labor, materials (fuel, pesticides and fertilizers) and the transportation and disposal of green waste (clippings and prunings). The fundamentals of smart landscaping can be summarized in seven steps: planning and design, low water use plants, limited turf areas, efficient irrigation, soil improvement, mulches, and sound maintenance (Navy 2008). If feasible for specific projects, the use of bioswales is required in project designs to capture run-off from impermeable surfaces.

Assessment of Current Management

Grounds maintenance staff work well with NBVC ED to ensure their activities do not affect natural resources. Any landscaping projects that go through the SA/PRB are coordinated to ensure appropriate plants are used. However, some projects that do not go through the SA/PRB are missed, with the result that planting designs do not follow the Smart Landscape guidelines. Use of the NBVC Smart Landscape Master Plan and its Approved Plant List satisfies compliance with EOs and Navy policy. The guidelines provided in the NBVC Smart Landscape Master Plan should be updated as needed when changes occur to the goals and strategies of the water conservation efforts under the Energy Showcase Program, the Stormwater Pollution Prevention Plan, or the Integrated Pest Management Plan.

The vegetative structure of landscaped areas is particularly important to wildlife and must be considered when maintaining these landscaped areas or when developing new landscaping for the base. Native plants require less irrigation and maintenance than ornamental species and are the preferred food resource for native pollinators and birds. Exotic ornamentals have the potential to escape and spread into natural areas, which then require costs for removal.

Coordination must occur with NBVC ED and the NAVFAC Landscape Architect in the early phases of planning to identify site-specific needs and constraints. Other species may be used for landscaping but must be approved by NBVC ED and the NAVFAC Landscape Architect before site plans or scopes of work can be produced. These species must be screened through regional invasive plant lists. The plant list may be updated periodically as a result of additions or changes to regional invasive species lists. Prior to initiating a project, the most recent list should be obtained from NBVC ED.

Management Strategy

Objective: Sustainably improve the visual and aesthetic environment of NBVC Point Mugu and Special Area Laguna Peak, while maintaining the integrity and character of natural resources.

- *I.* Comply with environmental laws, EOs, Biological Opinions, and Navy policies.
 - a. Ensure mowing, use of rodenticides, and other groundskeeping practices are consistent with the IPMP, the Stormwater Pollution Prevention Plan, EPA regulations on herbicides near wetlands, terms of USACE permits, mitigation obligations, the Programmatic Biological Opinion (Appendix O), EISs, and any other legal agreements or natural resource management plans.
 - i. Ensure that these requirements are communicated to groundskeeping staff.
 - ii. All NBVC Point Mugu contracts related to grounds maintenance should include language that promotes implementation of the INRMP.

- b. Continue to update the NBVC Point Mugu Approved Plant List to reflect changes in regional invasive species lists.
- c. Coordinate with NBVC ED for questions, comments, or concerns regarding landscaping before a project is submitted.
- *II.* Implement sustainable landscape guidelines set forth in the NBVC Smart Landscape Master Plan.
 - a. Use urban planning designs such as LID landscape design concepts to benefit the human working environment by moderating environmental influences (such as solar heat gain, glare, dust, and wind), conserving energy, protecting water quality, preventing soil erosion, reducing glare, buffering noise, improving visual aesthetics, providing wildlife habitat, and unifying exterior spaces.
 - b. New lawns are discouraged except where functionally essential such as formal areas used for ceremonies, family housing, recreation fields, and children's playgrounds. Replacing turf with native and drought-tolerant plants in combination with rocks or gravel over bare areas will promote the goals of the water conservation program and meet the needs of dust control.
 - c. Contribute to NBVC water conservation efforts.
 - i. Reduce water usage by implementing xeriscaping concepts, using mulch, and performing regular maintenance and upgrades to irrigation systems.
 - ii. Give priority to landscape improvement projects that will reduce water usage and help meet water conservation goals.
 - d. Minimize the use of pesticides and herbicides in landscape management.
 - i. Be consistent with existing NAVFACINSTs on Integrated Pest Management guidance (OPNAVINST 6250.4B 1998) and continue to follow the Integrated Pest Management Plan to effectively deal with pest problems at NBVC Point Mugu.
- *III.* Consider the connectivity of landscaped areas to stormwater runoff conveyances and wetlands when planning for new or replacement plantings to ensure compatibility with natural resource objectives.
- *IV.* Avoid groundskeeping practices that may negatively affect migratory and resident birds or sensitive invertebrate species.
 - a. Conduct tree trimming outside nesting season whenever possible, between 15 September and 15 March, to comply with the MBTA.

- i. Trimming or removal that must occur during the nesting season, based on a safety hazard or mission critical needs, will require a pre-activity survey by NBVC ED to determine that active nests will not be affected.
- *V.* Use native trees and shrubs to block all undesirable views, noise, and lights, and provide privacy.

6.8.2 NBVC Channel Islands Special Areas

The Navy does not conduct landscaping or grounds maintenance at Santa Rosa, San Miguel and Prince Islands. At Santa Cruz Island, within the Navy's fenceline, Navy grounds maintenance staff mow grasses and non-native fennel. The property is largely disturbed, developed land. Any grounds maintenance that occurs will be coordinated with NPS to ensure the Navy is following their resource guidelines for vegetation management. There are no concerns about landscaping and grounds maintenance related to natural resources management at NBVC Channel Islands Special Areas.

The NPS manages landscaping and grounds maintenance at leased facilities on Santa Rosa and Santa Cruz islands. No landscaping occurs at Prince Island. No landscaping occurs on San Miguel, other than small native plant restoration projects that have involved growing cuttings of island tree mallow and outplanting on the island. No native planting template is currently in place; native revegetation projects that may occur would be designed to reflect the mosaic of native vegetation communities on site (Tetra Tech 2013e).

The NPS adequately manages landscaping and grounds maintenance at San Miguel and Prince Island and on lands surrounding leased properties on Santa Cruz and Santa Rosa islands. No management strategies are needed at this time.

6.8.3 NBVC Fort Hunter Liggett Special Area

NBVC Fort Hunter Liggett presently has no landscaped areas. The AOP describes the landscape of the facilities as expeditionary compounds. At this time, there are no concerns or management strategies for this resource area. However, the AOP calls for consolidation and development of new facilities (KTU+A 2010). If landscaping is incorporated into the redesign of the facilities, then the general LID management strategies and natural resource protective measures (MBTA and use of appropriate native landscaping) identified in Section 6.8.1 would apply to NBVC Fort Hunter Liggett Special Area.

Any landscape plan that may be developed for NBVC Fort Hunter Liggett Special Area should focus on resource conservation through creative and appropriate landscape design and management. The plan should be designed to reduce the consumption of all resources, including irrigation water, labor, materials (fuel, pesticides, and fertilizers) and the transportation and disposal of green waste (clippings and prunings). The fundamentals of smart landscaping can be summarized in seven steps: planning and design, low water use plants, limited turf areas, efficient irrigation, soil improvement, mulches, and sound maintenance (Navy 2008).

6.9 RECREATION AND PUBLIC ACCESS

The following sections discuss recreation and public access at NBVC Point Mugu and Special Areas.

6.9.1 NBVC Point Mugu and Special Area Laguna Peak

The MWR Department manages recreational use at Point Mugu for NBVC personnel. The MWR program provides a varied program of wholesome, constructive, leisure activities that contribute to the mental and physical well-being of naval personnel and their dependents. NBVC provides several recreational activities for the benefit of station personnel, retired Navy officers, and to a lesser extent, the public. NBVC ED and the MWR Department coordinate for planning, management, and implementation of outdoor recreation at NBVC Point Mugu.

Access is restricted to most of the base, even for installation personnel, because of mission activities and sensitive natural resources. Areas open to base personnel for recreation include Family Beach, the picnic and campground areas, and hunting blinds during the waterfowl hunting season (Figure 6-2). MWR does not manage the waterfowl hunting program. NBVC ED manages the waterfowl hunting program, with the support of the Waterfowl Committee to conduct the day to day program requirements. Beach closures are posted for safety and mission requirements and to conserve sensitive habitat areas. The majority of the western arm of the base is enclosed within a Weapons Safety Arc for missile and operational activities. Only personnel with proper authorization or who obtain authorization from the Weapons Safety Officer can drive roads and work at facilities in the closed areas. No operational staff is allowed on the beach and marsh, unless authorized by NBVC ED, with the exception of NBVC Force Protection.

Outdoor recreational activities are scattered throughout the base, and some are concentrated in areas used by listed species. Outdoor recreation activities include hunting, fishing, wildlife viewing, camping, picnicking, and limited recreational use of beaches. The most heavily used recreation area at NBVC Point Mugu is Family Beach, adjacent to the mouth of Mugu Lagoon (Figure 6-2). It is popular for picnics, jogging, and wildlife observation. Activities are prohibited on the lagoon side. A group campground is located on the lagoon side of the barrier beach.

Fishing is a popular activity at NBVC Point Mugu. The fishing pier no longer exists; however, shore fishing at Family Beach and along the existing rock seawall is still permitted (Figure 6-2). This area receives a high level of use. An NBVC recreational instruction is in place (NBVC Instruction 1710.4) that lists fishing regulations. Fish licensing requirements are posted oceanside of the estuary mouth, where the majority of people fish. Fishermen must follow all state and federal fishing regulations. On occasion, CDFW visit the sites and check for licenses and catch. Another popular outdoor recreation activity at NBVC Point Mugu is waterfowl hunting. This activity takes place west of the runway (Figure 6-2), with a few blinds on the northern edge of Calleguas Creek that are open less regularly during the hunting season.

NBVC Point Mugu harbors a large number of overwintering waterfowl. Hunting season usually begins from the third week of October through the third week of January.

Waterfowl hunting is managed by the NBVC Point Mugu Waterfowl Committee under the responsibility of NBVC ED. Hunting is open to active military, installation civilian employees, retired military, retired installation civilian employees, and contractors, in that order, with priority given to active duty personnel. The number of hunters allowed on any day is limited by the number of blinds available during a hunting season, which is established by the Waterfowl Committee and NBVC ED. Hunting blinds are assigned by status (see above) followed by a first-come, first-served basis. Anyone who helps build and repair blinds may also attain priority credits toward placement in preferred blinds.

The location of the blinds near the runway likely benefits the BASH program by moving waterfowl from hazardous areas adjacent to the airfield (Section 3.4.4.1). Some blinds are also near habitat for salt marsh bird's-beak. Waterfowl hunting causes the greatest amount of disturbance (to waterbirds) of all outdoor recreational activities that take place at the lagoon (Tetra Tech 2002). Several of the blinds have been closed to protect populations of salt marsh bird's-beak and light-footed clapper rail.



INRMP = Integrated Natural Resources Management Plan NBVC = Naval Base Ventura County Mugu Lagoon is also a popular destination for bird-watching groups, with various Audubon chapters from southern California making regular trips through the fall and winter. Growth of residential developments in the immediate vicinity of NBVC Point Mugu has been accompanied by steady demand for expansion of the ecological tour program at Point Mugu. NBVC ED escorts and provides tours to various public groups. The most popular aspects of the ecological tour program have been a series of bird field classes, other ecological field classes, and lectures for groups such as the Audubon Society, universities and colleges, and other schools. The introduction and growth of the environmental program at California State University of Channel Islands has led to an increase in classes requesting tours and student projects on base.

Major recreational areas surrounding NBVC Point Mugu and Special Area Laguna Peak include city, county, and state beaches; McGrath and Mugu State Parks; and bicycle/hiking trails.

Specific Concerns

- Activities associated with waterfowl hunting disturb wildlife populations and could result in accidental take of protected migratory birds.
- Requests for establishing new hunting blinds are in conflict with protection of listed species and sensitive habitats.
- The protection of sensitive natural resources conflicts with public desire to access closed beaches or sensitive areas.
- Demand for public tours and coordinating researchers can exceed available staff time and budget.
- Research can result in disturbance to wildlife and damage to habitat from foot access.

Current Management

DoD installations are to provide for sustained public access and use of natural resources for educational or recreational purposes when such access is compatible with mission activities, and with other considerations such as security, safety, or resources sensitivity. Recreational access at NBVC Point Mugu complies with the requirements associated with the provisions of the Americans with Disabilities Act of 1990, as amended, and the Disabled Sportsman Access Act of 1998, as amended. Recreation-related projects that result in ground disturbance are managed through the SA/PRB (NBVC Instruction 11010.0) to avoid and minimize potential impacts.

Implementation of the outdoor recreation management program is the responsibility of the Commanding Officer of NBVC Point Mugu. The Natural Resources Manager oversees the outdoor (natural resource) recreation program and ensures that, where applicable, programs are developed in coordination with appropriate state and federal agencies. The Natural Resources Manager also coordinates with and informs MWR of projects and operations related to outdoor

recreation. Additional expertise and technical assistance for implementation and coordination of outdoor recreation is available from a number of sources identified in this plan.

The Commanding Officer, NBVC Point Mugu, supports and participates in management of the outdoor recreation program; however, the Natural Resources Manager has been delegated the responsibility of developing, implementing, and maintaining the natural resource outdoor recreation plan.

The Commanding Officer, Southwestern Division, Naval Facilities Engineering Command, San Diego, California, through the Natural Resource Office, provides technical assistance for management of natural resource outdoor recreation resources. The Commanding Officer, Command Navy Region Southwest, San Diego, California, through the Natural Resource Office, provides policy direction for management of outdoor recreation resources.

NBVC ED oversees the duck hunting program at Point Mugu, in coordination with a Waterfowl Committee consisting of active duty members, civil service, and contractors. CDFW is responsible for enforcement of rules such as fishing regulations and other outdoor recreation activities that affect natural resources. NBVC Force Protection is responsible for the following: ensuring recreators follow base-specific regulations; ensuring recreators remain in approved locations to hunt or fish; and checking that hunters have appropriate paperwork and approvals. CDFW inspects for valid state licenses and legal limits for fishing and hunting. All waterfowl hunters must hold a valid CDFW hunting license along with a federal duck stamp.

The NBVC ED Natural Resource Manager, in coordination with the Waterfowl Committee, facilitates access to hunting blinds and coordinates hunter education on natural resources regulations, closure areas, and identification of waterfowl and protected migratory birds. NBVC ED provides hunters with educational materials to review, which are updated annually to reflect changes in species listings and any changes in regulations. NBVC requires hunters to pass a written exam that discusses sensitive resources, administered by the Waterfowl Committee, before they are eligible to hunt on the base and added to the list of eligible hunters. NBVC ED flags populations of salt marsh bird's-beak during annual surveys; hunters are instructed to avoid flagged areas. Despite hunter education, two accidental migratory bird takes have been documented in the recent past.

Bag limits are established by USFWS and enforced by USFWS Special Agents and CDFW. Lead shot is banned at NBVC Point Mugu (and nationwide). Hunters at NBVC Point Mugu must use steel or bismuth shots and must clean up remnant shells from around the hunting blinds.

Natural resource tours are given to outside groups and include birding tours, wetland tours, and field classes for universities. An interpretive trail is on base that focuses on wetlands, watershed, migratory birds, marine mammals, and sensitive species.

Assessment of Current Management

NBVC adequately provides natural resource outdoor activities while minimizing impacts to natural resources. Outside groups and universities can enjoy and take part in studying Point Mugu's resources and are aware of the Navy's efforts to manage Point Mugu. Duck hunting provides a great "quality of life" opportunity for active duty personnel. Planning for all activities at NBVC Point Mugu should consider safety, public access, security, protection for all types of resources, and potential conflicts between users. NBVC should continue to ensure that public access is allowed only for temporary uses that are compatible with the Point Mugu mission, natural resources responsibility, safety, and security. Recreation is addressed in the Programmatic Biological Opinion for Point Mugu (USFWS 2001b). The Biological Opinion details protective measures to ensure sensitive species are unaffected by recreation. These measures should continue to be implemented and enforced. Protective measures include annual evaluations of blinds by the Natural Resource Manager to determine closures needed because of the presence Monitoring of hunters by Natural Resource Management, in of salt marsh bird's-beak. coordination with NBVC Force Protection and CDFW, should be performed to ensure compliance with hunting rules.

At the barrier beach is a tent and recreational vehicle camping area. The 2002 INRMP identified relocation of the tent campground as a high-priority issue, as the site was never approved through the appropriate project review process, and its current location creates liability for violations of the MMPA. The campground is on a small area adjacent to harbor seal haulout locations. Any disturbance to harbor seals from camping may be considered a violation under the MMPA. Therefore, the activities of people and their proximity to harbor seals, and to a lesser extent waterbirds, pose a regulatory threat and potential impact to the natural resources that surround the site. The 2002 INRMP recommended that the campground be moved farther west, away from the harbor seals (Tetra Tech 2002). Relocation has been discussed with MWR during recreational planning meetings for re-designing that area; however, relocation plans have not been finalized.

The current seasonal closures help reduce disturbance during the sensitive pupping period; however, as sea level rises, seals may move closer to the campground, resulting in more disturbance to seals from campground activity. The western side of the mouth of Mugu Lagoon (referred to as "the Point") accommodates a high level of use by NBVC Point Mugu personnel, especially at lunch breaks. This site is popular with employees because of the variety of birds and harbor seals that can be easily and frequently observed. The bird field trips and classes conducted by the Natural Resources Management Office usually begin or end at this location. As a result of the movement of the Mugu submarine canyon headwall, and once the canyon breaches the lagoon, the Point will likely turn into an island in the future. In anticipation of the breach, NBVC has slowly removed and reduced infrastructure off the Point and invests little to no money in the maintenance of remaining infrastructure.

A new picnic area was constructed at Family Beach to encourage base personnel to leave their cars and enjoy a picnic outside. A self-guided natural resource nature walk begins at that location and contains interpretive signs that discuss topics such as wetland restoration, the

State fishing regulations should continue to be enforced by CDFW. Additional signs should be provided at Family Beach and the Point to display fishing regulations (including the need for a valid state fishing license).

NBVC ED should meet with MWR to discuss a potential fish cleaning area to eliminate potential discharge of wastes directly into the ocean and to warn users about potential safety hazards. Signs should be clearly marked to confine this activity to a single designated area and disposal containers with lids installed to prevent wildlife scavenging.

Management Strategy

Objective: Maintain the integrity of sensitive habitats and species while providing access to the natural resources of NBVC Point Mugu.

- *I*. Continue to use the SA/PRB process to ensure that recreation project activities avoid or minimize impacts to species and habitats.
- *II.* Continue to coordinate with MWR and the Waterfowl Committee to ensure recreation is compatible with the goals of resource management, as outlined in this INRMP.
 - a. Continue to oversee the duck hunting program.
 - b. Ensure sensitive areas are off-limits, and closures are enforced.
 - c. Allow access for recreation to areas where no adverse impacts on resources would occur.
- *III.* Continue to provide tours to groups interested in Mugu Lagoon's natural resources.
- *IV.* Continue to support passive recreation opportunities by installing interpretive signs where appropriate.

6.9.2 NBVC Channel Islands Special Areas

No recreation occurs on the Navy leased properties on Santa Cruz and Santa Rosa.

Specific Concerns

There are no concerns about recreation related to natural resources management at NBVC Channel Islands Special Areas.

Current Management

The NPS manages recreation at Santa Cruz, Santa Rosa, San Miguel, and in the offshore waters of San Miguel and Prince Island. No recreation occurs at Prince Island. Researchers who visit the islands must coordinate with the NPS to gain permission for access and are subject to NPS rules for natural resource protection.

Assessment of Current Management

The NPS adequately manages recreation at San Miguel and Prince Island and on the lands surrounding leased properties on Santa Cruz and Santa Rosa islands. No management strategies are needed at this time.

6.9.3 NBVC Fort Hunter Liggett Special Area

No recreation occurs on the Navy owned properties Fort Hunter Liggett.

Specific Concerns

There are no concerns regarding recreation related to natural resources management at NBVC Fort Hunter Liggett Special Area.

Current Management

Hunting licenses are distributed by the Army from the Hunting Lodge for big-game hunting on the grounds owned and managed by the Army. The Army manages funds generated from the sale of hunting licenses.

Assessment of Current Management

The Army adequately manages recreation on the lands surrounding Navy properties at Fort Hunter Liggett. No management strategies are needed at this time.

6.10 PUBLIC OUTREACH

The following sections detail public outreach conducted at NBVC Point Mugu and Special Areas.

6.10.1 NBVC Point Mugu and Special Area Laguna Peak

Specific Concerns

• The community may not be aware of the intensive management efforts undertaken by the Navy to ensure compatibility of mission activities with natural resource protection.

Current Management

Public outreach occurs during special events hosted at NBVC Point Mugu, such as Earth Day, where the natural resources of Point Mugu are discussed. When the opportunity arises, the NBVC Natural Resources Manager and other ED staff attend community meetings related to natural resources. NBVC ED also conducts public outreach during ecological tours. On occasion, presentations about the Navy's natural resource program are given to community groups. Currently, the Commanding Officer has requested NBVC ED to conduct outreach to a wider community audience to inform on NBVC's stewardship of Point Mugu's natural resources.

Assessment of Current Management

The public outreach efforts that occur at special events and selected presentation requests are adequate for informing the public of the kinds of natural resources present at Point Mugu and how they are managed. However, more outreach can only help support the installation.

Management Strategy

Objective: Increase public outreach efforts as they relate to natural resources at Point Mugu.

- *I.* Continue to incorporate discussion of the management of natural resources at Point Mugu into the topics addressed at the various special events held at NBVC Point Mugu.
- *II.* Continue to provide presentations to groups interested in learning about the natural resources of Point Mugu and how the Navy manages those resources.
- *III.* Where appropriate, develop interpretive signs at natural resource areas.

6.10.2 NBVC Channel Islands Special Areas

The Navy does not manage public outreach for the NBVC Channel Islands Special Areas and, thus, has no specific concerns or management strategies. Public outreach for the Channel Islands is adequately provided by the National Park Service and TNC.

6.10.3 NBVC Fort Hunter Liggett Special Area

The Navy does not manage public outreach for the NBVC Fort Hunter Liggett Special Area and so has no specific concerns. The Army conducts some public outreach on Navy property by posting natural resource informational fliers in the Hunting Lodge. Public outreach is adequately addressed by the Army at NBVC Fort Hunter Liggett Special Area. No management strategies are needed at this time.

7.1 GENERAL CONSIDERATIONS

A successfully implemented INRMP will:

- Ensure the sustainability of all habitats in NBVC Point Mugu and Special Areas.
- Ensure no net loss of the capability of NBVC Point Mugu and Special Areas lands to support the DoD mission.

The INRMP is considered implemented if the installation:

- 1. Actively requests, receives, and uses funds for all Level 4 projects and activities;
- 2. Ensures that sufficient numbers of professionally trained natural resources management staff are available to perform the tasks required by the INRMP.
- 3. Coordinates annually with all cooperating offices; and,
- 4. Documents specific INRMP action accomplishments undertaken each year.

Formal adoption of an INRMP by a Commanding Officer or Officer-In-Charge constitutes a commitment to seek funding and execute, subject to the availability of funding, all Environmental Readiness Level (ERL) 4 projects and activities in accordance with specific timeframes identified in the INRMP. For a description of "Level 4" projects and activities and budget programming hierarchy for this INRMP (both DoD and Navy), see Section 7.3, Budget Considerations.

Successful implementation of this INRMP will depend upon not only the guidelines set up and projects described, but how well these are translated into performance work statements (who will do what and with what money), project lists and scopes of work, and a workload plan. It must fit into the formal EMS established at NBVC for integrating environmental considerations into day-to-day activities across all levels and functions of Navy enterprise (see Section 1.6, Ecosystem Approach and Adaptive Management). To accomplish this, NBVC Point Mugu and Special Areas will need to take advantage of funding opportunities outside normal program boundaries, consistent with authority to receive and use any such funds.

7.1.1 INRMP Implementation and Responsibilities

Successfully implementing an INRMP and associated DoD guidelines requires the support of natural resources personnel, other installation staff, command personnel, and installation tenants. The following section discusses the responsibilities for INRMP implementation within the Navy. See Appendix M for a list of stakeholders who participated in the development of the 2013

INRMP. The following sections address roles and responsibilities of the INRMP Working Group and details internal and external stakeholders.

7.1.1.1 Navy Responsibilities

The following is a list of internal stakeholders and their role in supporting the installation and the development, revision, and implementation of this INRMP. Policy leadership and liaison with non-Navy partners is provided by the Commander, Navy Region Southwest N40, NAVFAC SW, and NBVC.

Chief of Naval Operations—The Chief of Naval Operations provides policy, guidance and resources for the development, revision, and implementation of the INRMP and associated NEPA documentation. The Chief of Naval Operations evaluates and validates Navy Environmental Program Requirements Web (EPR-Web) project proposals (Navy 2006).

Commander of Navy Installations Command—The Commander Navy Installations Command reviews the INRMP. Their role is to ensure installations comply with DoD, Navy, and Chief of Naval Operations policy on INRMPs and their associated NEPA documentation. They also ensure the programming of resources necessary to maintain and implement INRMPs, participate in the development and revision of INRMPs, and provide overall program management oversight for all natural resources program elements. The Commander Navy Installations Command reviews and endorses projects recommended for INRMP implementation prior to submittal for signature, and evaluates and validates Navy EPR-Web project proposals (Navy 2006).

Commander Navy Region Southwest— Regional Commanders ensure that installations comply with DoD, Navy, and Chief of Naval Operations policy on INRMPs and their associated NEPA documentation. They ensure that installations under their control undergo annual reviews and formal 5-year evaluations. They ensure the programming of resources necessary to maintain and implement INRMPs, which involves the evaluation and validation of EPR-Web based project proposals and the funding of installation natural resources management staff. The Commander Navy Region Southwest maintains close liaison with the INRMP signatory partners (USFWS, NMFS and CDFW) and other INRMP stakeholders EPR-Web (Navy 2006).

Installation Commanding Officers— Installation Commanding Officers ensure the preparation, completion, and implementation of INRMPs and associated NEPA documentation. Their role is to: act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process; ensure natural resources management and INRMPs comply with all natural resources related federal regulations, directives, instructions, and policies; involve appropriate tenant, operational, training, or testing commands in the INRMP review process to ensure no net loss of military mission; designate a Natural Resources Manager/Coordinator responsible for the management efforts related to the preparation, revision, implementation, and funding for INRMPs, as well as coordination with subordinate commands and installations; involve appropriate Navy Judge Advocate General or Office of the General Counsel legal counsel to provide advice and counsel

with respect to legal matters related to natural resources management and INRMPs; and approve INRMPs via Commanding Officer signature.

Public Affairs Office—The Public Affairs Office is involved in aspects of the environmental program at NBVC. This includes being informed of, and when applicable, implementing the public notice process required in various NEPA analysis processes.

Office of Counsel—The Office of the General Counsel, Commander Navy Region Southwest, and Judge Advocate General' Region Environmental Counsel provide legal services to NBVC on a variety of environmental matters. Particularly pertinent to natural resources management, is their review of NEPA documentation and legal interpretations involving compliance with natural resources laws as they pertain to base operations.

Naval Facilities Engineering Command Southwest (NAVFAC SW)

Public Works Department—The NBVC Facilities Planning Office, Public Works Department, is responsible for the comprehensive oversight and planning of all land use issues relating to NBVC. Public Works Department personnel provide document review to confirm that this INRMP describes compatible land uses.

Environmental Division—The NBVC ED, as delegated by command directive, is responsible for the preparation and implementation of this INRMP. Acting through the Natural Resources Manager, NBVC ED is responsible for the management of natural resources as part of the overall NBVC environmental program (Appendix K). NBVC natural resources staff provides technical support. This INRMP is the direct "vehicle" for accomplishment of many of the responsibilities of the Commanding Officer and Natural Resource Manager. The Installation Environmental Program Director communicates directly with the NBVC Commanding Officer.

Business Line Team Leader (N45 NAVFAC SW) — Natural resources business line team specialists (N45) provide technical support and contractual oversight in the development, revision and implementation of this INRMP. In addition, NAVFAC SW is responsible for providing support for natural resources management at NBVC when requested. NAVFAC SW personnel such as the NEPA and INRMP coordinators, have natural resources programming and/or technical support roles in developing this INRMP.

Morale, Welfare & Recreation (MWR) —The mission of MWR is to support a variety of recreation, social, and community support activities on Navy facilities. MWR manages installation morale, welfare, and recreation activities for the NBVC community. The MWR has a primary role in managing the installation's recreational resources at NBVC. MWR works with Environmental Division to ensure compliance with environmental laws.

Other Installation and Tenant Organizations, and Partners — In addition to the directorates and offices mentioned above, INRMP implementation requires assistance from, or in coordination with, a variety of other installation organizations, tenants, partners, and contract personnel. Other installation partners consulted for natural resources activities on NBVC include Lincoln Family Housing LLC, responsible for developing and managing family housing under the Public-Private Venture. Tenants are discussed in Section 2.0 Military Mission and Operations, and detailed in Table 2-1.

7.1.1.2 External Partner Responsibilities

The following details external stakeholders and their role in supporting the installation and the development, revision, and implementation of this INRMP.

INRMP Signatories — As required in the Sikes Act, as amended (Section 2904[a][2]), INRMPs are to be developed in cooperation with the USFWS, state wildlife agency, and other appropriate federal agencies. Through a Tripartite Agreement (herein referred to as an MOU) signed January 2006, the DoD, U.S. Department of Interior, USFWS, and CDFW have a statutory obligation to coordinate preparing, reviewing and implementing INRMPs. The desire is for "synchronization of INRMPs with existing USFWS and state natural resource management plans" and "mutually agreed-upon fish and wildlife service conservation objectives to satisfy the goals of the Sikes Act." The MOU is in Appendix P.

The external stakeholders participating in this INRMP are:

- USFWS—Ecological Services: The primary mission of the USFWS (2006 MOU signatory [Appendix P]) is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The USFWS provides the Navy technical assistance with botanical and wildlife issues. In addition, the DoD and Navy consult formally and informally with the USFWS on the impacts of Navy activities on federally listed species and designated critical habitat.
- NOAA/NMFS Habitat Conservation: NOAA/NMFS is responsible for protecting habitat for fish, marine mammals, and federally listed species and other natural resources within the coastal zone. Though they are not a part of the MOU (Appendix P), NOAA/NMFS is a signatory partner for the INRMP. The DoD and Navy consult formally and informally with the NOAA/NMFS on the impacts of Navy activities on federally listed species, marine mammals, and essential fish habitat.
- CDFW—Habitat Conservation, Marine and Terrestrial: The CDFW (2006 MOU signatory [Appendix P]) is responsible for management of most fish and wildlife in the state. Nothing in this INRMP affects any provision of a federal law governing the conservation or protection of fish and wildlife species, or enlarges or diminishes California's responsibility and authority for the protection and management of fish

and resident wildlife. The CDFW and other state fish and wildlife agencies were represented by the International Association of Fish and Wildlife Agencies.

Mutual agreement among the agencies is formalized on the signatory pages at the front of this INRMP.

7.1.1.3 Other External Organizations and Partners

In addition to the external organizations mentioned above, INRMP implementation requires assistance from, or coordination with, the following entities:

- U.S. Department of the Interior National Park Service—Channel Islands, and Santa Monica Mountains National Recreation Area
- U.S. Army at Fort Hunter Liggett
- U.S. Army Corps of Engineers, Los Angeles District
- State of California Department of Parks and Recreation, Point Mugu State Park
- TNC

7.1.2 Federal Anti-Deficiency Act

NBVC intends to implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be nor must be construed to be a violation of the Anti-Deficiency Act (31 U.S.C. 1341 *et seq.*).

7.1.3 Staffing

The Sikes Act specifically requires that there be "sufficient numbers of professionally trained natural resources management and natural resources enforcement personnel to be available and assigned responsibility" to implement an INRMP. The NBVC ED is responsible for identifying personnel requirements to accomplish INRMP goals and objectives. The NBVC ED is also responsible for providing input into this process by allocating existing budgetary and personnel resources and then identifying staffing needs based on any additional current and future projects. Personnel assigned to natural resources management are the core staff responsible for implementing the INRMP. These personnel ensure that a consistent conservation program is carried out by using strategies outlined in this plan to support the Navy mission and achieve INRMP goals and objectives. Staff coordination includes both planning teams for initiating projects and staffing teams to manage and run projects. Some of the projects described in this plan will depend on coordination with the Public Works Department and other installation personnel.

- Ecologist
- Wildlife biologist
- Environmental protection specialist (NEPA)
- Two natural resources specialists

7.1.3.1 Professional Development and Natural Resources Training

Adequate training of natural resource personnel is important to the success of military sustainability and land management. Chief of Naval Operations Instruction 5090.1C CH-1 requires that Navy commands develop, implement and enforce the management plan through personnel with professional training in natural resources. "Natural resources programs shall support military readiness and sustainability and commands shall assign specific responsibility, provide centralized supervision and assign professionally trained personnel to the program. Natural resources personnel shall be provided an opportunity to participate in natural resource management job-training activities and professional meetings." The Sikes Act (Section 670g) and DoDINST 4715.03 (18 March 2011) also addresses this need.

Properly trained personnel are required to achieve objectives and guidelines of this INRMP. Environmental staff members entrusted with this work must have a thorough knowledge and understanding of biology and natural resources, and administrative duties such as project management, reporting, and contracting. Periodically, additional training is needed to keep personnel updated on the current practices and advances in knowledge of these topics. This training may be obtained from a variety of sources, including universities, regulatory agencies, professional societies, and other Navy or military organizations. These training opportunities may be offered in the forms of structured courses or conferences, workshops, and symposia. Professional development and the sharing of information with natural resource experts ensure the maximum benefits of adaptive management and research efforts is derived. NBVC ED will evaluate the following annual workshops or professional conferences for attendance depending on funding available for travel and training:

- National Military Fish and Wildlife Association annual workshop;
- North American Natural Resources Conference;
- Wildlife Society Western Section; Partners-In-Flight national, regional, and state meetings (generally in conjunction with other listed meetings); and
- Working groups for species of concern on the installation.

Other conferences and workshops will be evaluated for their usefulness, and decisions will be made based on appropriateness to ongoing projects and funding availability. Conferences, which are especially useful, include those that address invasive species biology and control, wetland restoration and management, shorebird management, and endangered species management. The Wildlife Society, Society for Ecological Restoration, and National Military Fish and Wildlife Association are among the professional societies applicable to meeting the needs of NBVC's natural resources managers. Membership in these societies is encouraged. The Wildlife Society has some of the best scientific publications in the profession, and literature review is a necessary commitment to maintain standards. Attending meetings of these societies provides excellent opportunities to communicate with fellow professionals and maintain professional standards.

7.2 ADAPTIVE MANAGEMENT: ANNUAL UPDATE, REVIEW AND METRICS

DoD policy requires installations to review INRMPs annually in cooperation with the two primary partnering parties to the INRMP: USFWS and the state fish and wildlife agency. Annual reviews facilitate "adaptive management" by providing an opportunity to review the goals and objectives of the plan, and establish a realistic schedule for undertaking proposed actions. Section 101(b)(2) of the Sikes Act (16 U.S. Code [U.S.C.] 670a[b][2]) requires that INRMPs be reviewed for operation and effect regularly (no less than every five years) by the installation, the USFWS, the state fish and wildlife agency (CDFW), and the National Marine Fisheries Service (NMFS). The DoD and Navy have provided specific guidance on the joint review and coordination process and timeframe (Deputy Under Secretary of Defense for Installations and Environment 2002; Chief of Naval Operations Instruction 5090.1C CH-1). As part of the review, NBVC should invite annual feedback from the USFWS, NMFS, and the CDFW on the effectiveness of the INRMP, and inform the agencies about those INRMP projects and activities that are required to meet current natural resources compliance needs (Navy 2013a). INRMP updates are in Appendix N.

According to Chief of Naval Operations guidance, (Navy 2006), INRMPs must also be reviewed by installations at least once per year to verify the following:

- Current information on INRMP conservation metrics, as described in the Navy Conservation Website;
- All "must fund" projects and activities have been budgeted for and implementation is on schedule;
- All required trained natural resources positions are filled or are in the process of being filled and the number of positions is based on natural resource recommendations;
- Projects and activities for the upcoming year have been identified and included in the INRMP -an updated project list does not necessitate INRMP revision;
- All required coordination has occurred and all significant changes to the installation's mission requirements or its natural resources have been identified.

Chief of Naval Operations guidance requires installations use the Navy Conservation Website to facilitate annual review of the INRMP by the Navy, the USFWS, NMFS, and the CDFW (Navy 2006). The web-based program is used to evaluate the effectiveness of the INRMP and installation natural resources management as a whole through the following seven performance areas (Navy 2006): (1) INRMP Implementation; (2) Partnerships/Cooperation and Effectiveness; (3) Team Adequacy; (4) Status of Federal Listed Species and Critical Habitat; (5) Ecosystem Integrity; (6) Fish and Wildlife Management and Public Use; and (7) INRMP Impact on the Installation Mission. Each focus area has three to seven criteria that are used to determine the status of a given functional area within Natural Resources. An annual report is prepared during the annual review and is provided to the regulatory agencies upon completion (Appendix J, Annual Metrics Reports).

Neither NEPA analysis or public review are necessary if an existing INRMP requires only limited revisions that are not expected to result in significant environmental effects other than those anticipated for the existing INRMP (Navy 2006). If the parties determine that substantial revisions to an INRMP are necessary, public comment shall be invited in conjunction with any required NEPA analysis. Public review requirements may be met by providing the public a meaningful opportunity to comment on the Draft Revised INRMP. After soliciting public comments, NBVC must afford the USFWS, NMFS, and the CDFW the opportunity to review all public comments (Navy 2006).

7.3 BUDGET CONSIDERATIONS

Formal adoption of an INRMP by a Commanding Officer or Officer-in-Charge constitutes a commitment to seek funding and execute, subject to the availability of funding, all "must fund" projects and activities in accordance with specific time frames identified in the INRMP. Under the Sikes Act, as amended, and Secretary of the Navy memorandum (12 August 1998), any natural resources management activity that is specifically addressed in the INRMP must be implemented (subject to availability of funds). Failure to implement the INRMP is a violation of the Sikes Act and may be a source of litigation. Since the Sikes Act requires implementation of the INRMP, there is a clear fiscal connection between INRMP preparation, revision, implementation, and funding. Funding to implement natural resources management will largely come from program sources (through Navy Region Southwest). Accordingly, it is vital that budget personnel understand and participate in the INRMP process.

The following sections address budget considerations for funding INRMP implementation.

7.3.1 Natural Resources Management Priorities and Funding Classifications

The DoD programming and budgeting priorities for conservation programs are detailed in DoD Instruction 4715.03 (*Natural Resources Conservation Program*, 2011). The Instruction divides programming and budget requirements into two categories: Recurring and Non-recurring. Compliance activities are in the Recurring category and the Non-recurring Current and

Maintenance Compliance categories. Stewardship activities are in the Enhancement Actions Beyond Compliance category.

The following is the description of funding designations from the DoDINST 4715.03:

"1. <u>RECURRING NATURAL RESOURCES CONSERVATION</u> <u>MANAGEMENT REQUIREMENTS</u>

A. Administrative, personnel, and other costs associated with managing the DoD Natural Resources Conservation Program that are necessary to meet applicable compliance requirements in Federal and State laws, regulations, E.O.s, and DoD policies, or in direct support of the military mission.

B. DoD Components shall give priority to recurring natural resources conservation management requirements associated with the operation of facilities, installations, and deployed weapons systems. These activities include day-to-day costs of sustaining an effective natural resources management program, as well as annual requirements, including manpower, training, supplies, permits, fees, testing and monitoring, sampling and analysis, reporting and recordkeeping, maintenance of natural resources conservation equipment, and compliance self- assessments.

2. <u>NON-RECURRING NATURAL RESOURCES MANAGEMENT REQUIREMENTS</u>. DoD Components shall prioritize non-recurring requirements using these classifications:

A. <u>Current Compliance</u>. Includes installation projects and activities to support:

(1) Installations currently out of compliance (e.g., received an enforcement action from an authorized Federal or State agency or local authority).

(2) Signed compliance agreement or consent order.

(3) Meeting requirements with applicable Federal or State laws, regulations, standards, E.O.s, or DoD policies, including those listed in Enclosure 1.

(4) Immediate and essential maintenance of operational integrity or military mission sustainment.

(5) Projects or activities that will be out of compliance if not implemented in the current program year. Those activities include:

(a) Environmental analyses for natural resources conservation projects, and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources.

(c) Natural resources planning-level surveys.

(d) Reasonable and prudent measures included in incidental take statements of biological opinions, biological assessments, surveys, monitoring, reporting of assessment results, or habitat protection for listed, at-risk, and candidate species so that proposed or continuing actions can be modified in consultation with the USFWS or NOAA Fisheries Service.

(e) Mitigation to meet existing regulatory permit conditions or written agreements, such as those required in chapter 26 of Reference (ai), and included in documents required by the DoD Chesapeake Bay Strategic Action Plan (Reference (ap)).

(f) Nonpoint source pollution or watershed management studies or actions needed to meet compliance dates cited in approved State coastal nonpoint source pollution control plans, as required to meet consistency determinations consistent with Coastal Zone Management.

(g) Wetlands delineation critical for the prevention of adverse impacts to wetlands, so that continuing actions can be modified to ensure mission continuity, as required by chapter 26 of Reference (ai).

(h) Compliance with missed deadlines established in DoD executed agreements (e.g., Reference (ap)).

B. <u>Maintenance Requirements</u>. Includes those projects and activities needed to meet an established deadline beyond the current program year and maintain compliance. Examples include:

(1) Compliance with future deadlines.

(2) Conservation, GIS mapping, and data management to comply with Federal, State, and local regulations, E.O.s, and DoD policy.

(3) Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives.

(4) Wetlands enhancement to minimize wetlands loss and enhance existing degraded wetlands as required in chapter 26 of Reference (ai).

(5) Conservation recommendations in biological opinions issued pursuant to the ESA.

C. <u>Enhancement Actions Beyond Compliance</u>. Includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required by law, regulation, or E.O., and are not of an immediate nature. Examples include:

(1) Community outreach activities, such as International Migratory Bird Day, Earth Day, National Public Lands Day, Pollinator Week, and Arbor Day activities.

(2) Educational and public awareness projects, such as interpretive displays, oral histories, Watchable Wildlife areas, nature trails, wildlife checklists, and conservation teaching materials.

(3) Restoration or enhancement of natural resources when no specific compliance requirement dictates a course or timing of action.

(4) Management and execution of volunteer and partnership programs. (DoD 2011)"

The Navy funding programming hierarchy of recurring and non-recurring projects consists of four ERLs. Navy policy requires funding of all compliance driven (ERL 3 or 4) projects. ERLs enable capability-based programming and budgeting of environmental funding, and facilitate capability versus cost trade-off decisions. Projects recommended in this INRMP have been prioritized based on ERLs (Navy 2006, 2011a). ERL 3 & 4 projects are compliance driven. ERL 4 is considered the absolute minimum level of environmental readiness capability required to maintain compliance with applicable legal requirements. ERL 1 & 2 projects are under the stewardship category. Funding is routinely programmed three years in advance of project implementation. All projects and activities in the Implementation Table in Appendix C, NBVC Point Mugu Project List, are assigned an ERL or entered into EPR-Web, but many actions are completed using on-site personnel (listed in Appendix C as "NBVC In-House") and are not part of the program budget. For example, natural resources personnel lead bird walks for the public or staff informational booths at public events.

ERL levels, as defined in the 2006 INRMP Guidance (Navy 2006, 2011a) are:

Environmental Readiness Level 4:

- Supports all actions specifically required by law, regulation or EO.
- Supports all DoD Recurring Natural Resources Management requirements as they relate to a specific statute such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, reporting and record keeping.
- Supports recurring administrative, personnel and other costs associated with managing environmental programs that are necessary to meet applicable compliance requirements.

- Supports DoD policy requirement to comply with overseas Final Governing Standards and Overseas Environmental Baseline Guidance Document.
- Supports minimum feasible Navy executive agent responsibilities, participation in Office of Secretary of Defense sponsored inter-department and inter-agency efforts, and Office of Secretary of Defense mandated regional coordination efforts.

Environmental Readiness Level 3:

- Supports all capabilities provided by ERL 4.
- Supports existing level of Navy executive agent responsibilities, participation in Office of Secretary of Defense sponsored inter-department and inter-agency efforts, and Office of Secretary of Defense mandated regional coordination efforts.
- Supports proactive involvement in the legislative and regulatory process to identity and mitigate requirements that will impose excessive costs or restrictions on operations and training.
- Supports proactive initiatives critical to the protection of Navy operational readiness.

Environmental Readiness Level 2:

- Supports all capabilities provided under ERL 3.
- Supports enhanced proactive initiatives critical to the protection of Navy operational readiness.
- Supports all Navy and DoD policy requirements.
- Supports investments in pollution reduction, compliance enhancement, energy conservation and cost reduction.

Environmental Readiness Level 1:

- Supports all capabilities provided under ERL 2.
- Supports proactive actions required to ensure compliance with pending or strong anticipated laws and regulations in a timely manner or to prevent adverse impact to Navy mission.
- Supports investments that demonstrate Navy environmental leadership and pro-active environmental stewardship.

It is the Navy's policy to fully fund compliance with all applicable federal, state and local laws; EOs; and associated implementing rules, regulations, DoDINSTs and DoDDIRs, and applicable international and overseas requirements (Chief of Naval Operations Instruction 5090.1C CH-1). Budget priorities for threatened and endangered species management, especially compliance with BOs, receive the *highest possible* budgeting priority, and support NBVC Point Mugu's need to avoid critical habitat designations under Section 4(b)(2) of the ESA (ERL compliance levels 1 and 2), or Section 4(a)(3)(B)(i) of the ESA (exclusion from critical habitat designations for national security reasons).

Environmental Readiness Program Assessment Database

Environmental Program Requirements (EPR) covers multiple subject matter or "business lines" aside from natural and cultural resources. EPR-Web is an optimized online database used to define all programming for the Navy's environmental requirements, and is the tool for providing the four ERL capabilities used in fiscal planning. All natural resources requirements are entered into EPR-Web and are available for review/approval by the chain of command by the dates specified in the Guidance letter provided annually by Chief of Naval Operations (N45). EPR-Web records data on project expenditures, and provides immediate, web-based access to requirements entered by the multiple Navy environmental programs, including Environmental Compliance, Pollution Prevention, Conservation, Radiological Controls, and Range Sustainment as related to environmental costs on military ranges.

Implementation Schedule

This INRMP will become effective upon the acceptance and signatory release described in Section 7.1.1 INRMP Implementation and Responsibilities. Current projects, activities, and plans have been incorporated into the INRMP, as the plan serves as a formal structuring and integration of the existing natural resources management program.

Future work identified herein will be implemented as funding becomes available. Priorities identified in this INRMP will generally determine the order of implementation. The NBVC ED will determine what projects and activities are appropriate to initiate, given funding, at any particular time. The INRMP is meant to be flexible, dynamic, and adaptable to the immediate concerns and needs of natural resources management and the Navy mission.

Program Monitoring

The NBVC ED will be responsible for oversight and monitoring of the overall program identified in this INRMP. Cooperative projects among different Navy organizations will be monitored by the originating or controlling office as specified prior to project implementation.

7.3.2 External Assistance

Opportunities for external assistance with natural resource programs at NBVC Point Mugu and Special Areas are identified below.

Other Agencies

NBVC recognizes the importance of cooperating with federal and state agencies in addition to private organizations. Section 1.0, Introduction and Section 6.3, Beneficial Partnerships and Collaborative Resources Planning, identify other agencies and organizations with which NBVC has cooperatively worked in recent years. These organizations, particularly INRMP signatory partners (USFWS, NOAA and CDFW) will continue to assist with implementation of various aspects of this INRMP.

Volunteers

Volunteers are a potential valuable source of personnel assistance at NBVC Point Mugu and Special Areas. NBVC ED uses volunteers for marsh clean-up events, beach clean-up events, California least tern colony monitoring, and invasive species control. NBVC ED will continue to pursue the use of volunteers.

University Assistance

Universities are an excellent source of assistance for research and provide resource specific expertise, as well as assistance with implementation of restoration activities. Collaborative investigations performed in conjunction with installation biologist provide the most likely and cost effective sources of assistance with implementation of this INRMP. Local and regional universities, such as UC Los Angeles, UC Santa Barbara and California State University Channel Islands should continue to be coordinated with for potential sources of graduate and undergraduate assistance with implementation of projects discussed in this INRMP.

Contractors

Selected projects can be carried out with Navy biology staff. Many projects, such as invasive species control, wetland restoration, targeted surveys or time-sensitive surveys and monitoring requires contractor services or other federal agency services, because of a need for expertise or for necessary personnel. Therefore, funding is required to perform these actions, as installation biologists cannot accomplish all of the INRMP management goals without external assistance. In accordance with Circular Number A-76, the federal government is mandated to use commercial sources to supply the products and services the Government needs. Contractors are able to provide a wide variety of specialties to aid NBVC ED with implementation of this INRMP. Specialties range from NEPA documentation, vegetation surveys, vertebrate and invertebrate surveys, vegetation surveys, water quality surveys, production of management plans, and similar activities. Contractor supported projects require preparation of a request for proposal

to acquire services, which should be considered during project planning, to ensure appropriate funding can be obtained.

7.4 FUNDING SOURCES

To implement the various research, surveys, and programs necessary to fulfill the mission of the NBVC ED, funding must be identified and acquired. The NBVC ED, under the direction of the Commanding Officer, NBVC, is responsible for coordinating efforts and funding for natural resource and environmental programs. NBVC ED receives funding, program, and policy support and guidance from the Navy Region Southwest, San Diego. The Region is the Commander Navy Installations Command local agent for ensuring that environmental programs are effectively managed. The Region is supported by NAVFAC SW who provides assistance to many local installations.

There are several avenues of funding available to the NBVC ED, beyond the typical Naval operational budget, that allow the inclusion of additional projects to assist the NBVC ED in their mission-related and stewardship endeavors. The NBVC ED must continually assess the priority and level of budgetary needs to fulfill Navy and regulatory requirements and to sustain overall program goals. These funding sources are discussed below in general terms, as this process is dynamic and is dependent on the INRMPs continuously developing program.

These programs will be implemented using Navy personnel and program resources as much as possible; however, it is likely that contractors will accomplish many projects. NBVC ED will identify projects that would be accomplished using contract vehicles, with existing contracts being used where possible and appropriate.

For large projects that involve different Navy organizations, representatives of these organizations would coordinate budgeting and scheduling to ensure that the project can be accomplished in the planned timeframe. Large-budget projects may not be completely funded in a fiscal year, requiring incremental funding over the term of the project.

In some cases, smaller, lower-priority projects may be conducted using unspent funds from other tasks or year-end fallout funding. Some projects may be accomplished with little or no funding required, such as those requiring only a change of policy or coordination and effort from volunteer labor. These tasks can be implemented virtually as soon as planning is performed.

7.4.1 Department of Defense Funding Sources

The costs of executing INRMP actions may be funded from a variety of DoD sources. Funding sources should be reviewed carefully to identify qualifying projects. Execution of this plan by the federal government is contingent on the availability of funds properly allocated to the plan in accordance with applicable law. The primary funding sources to Navy natural resources programs include:

- 1. **Operations and Maintenance Funds**. Funding sources for the natural resources program are derived from General and Administrative, Operations and Maintenance Navy, Major Range Test Facility Base, and input into the Navy EPR system for funding. This primary budgetary source is the basis for maintaining the personnel and core programs inherent to the natural resources program. It is the responsibility of ED to manage the natural resources program budget and funding. Once Operations and Maintenance Navy funds are appropriated for core personnel and the program, funding can be justified for other project requirements.
- 2. Agricultural Outlease Funds. Funds accumulated through the outleasing of agricultural lands on many installations are directed back into the natural resource program and reallocated throughout the Navy by NAVFAC Headquarters. These are the broadest use funds available exclusively to natural resource managers. These funds are available to all installations to offset the costs of preparing and implementing INRMPs.
- *3.* **Recycling Funds**. Installations with a Qualified Recycling Program may use proceeds for some types of natural resource projects.
- 4. Navy Working Capital Fund. Many natural resource projects may be funded with the Navy Working Capital Fund. All projects submitted for funding through the Navy Working Capital Fund must be included in the INRMP, or a clear justification for their omission must be provided. Navy Working Capital Fund funds are generally not available for Navy Level 2-5 projects. The Navy Working Capital Fund is a revolving fund that is generated by fees for services and used to pay expenses.

Other DoD funding sources are described below:

Sikes Act Funds

Sikes Act funds are collected via sales of licenses to hunt or fish (Navy 2005a). They are authorized by the Sikes Act and may be used only for fish and wildlife management on the installation where they are collected. No generates Sikes Act funds are collected at NBVC Point Mugu.

Legacy Funds

The Legacy Resource Management Program was enacted in 1990 to provide financial assistance to military natural and cultural resources management. The program assists with protection and enhancement of natural resources while supporting military readiness. Legacy projects may involve regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, and/or monitoring, and predicting migratory patterns of birds and other animals.

7.4.2 Use of Cooperative Agreements and Partnerships

Cooperative agreements are legal relationships between the Navy and states, local governments, institutions of higher education, hospitals, non-profit organizations or individuals. The principal purpose of the relationship is to transfer a thing of value to the state, local government, or other recipient to carry out a public purpose of support or stimulation authorized by a law of the U.S. instead of acquiring (by purchase, lease, or barter) property or services for the direct benefit or use of the U.S. Government. Cooperative agreements may be entered into for inventories, monitoring, research, minor construction and maintenance, and public awareness, to provide for the maintenance and improvement of natural resources or conservation research on DoD installations (DoDINST 4715.03). To use a cooperative agreement, substantial involvement is expected between the Navy and the state, local government, or other recipient when carrying out the activity contemplated in the agreement. Cooperative agreements provide a mutually beneficial means of acquiring, analyzing, and interpreting natural resources data, which can then be used to inform natural resources management decisions. Cooperative agreements are funded by the Navy and produce information that can be used to help resource managers achieve project-specific compliance with environmental laws. Authorization for cooperative agreements is arranged through NAVFAC.

NBVC recognizes the importance of cooperating with federal and state agencies, in addition to private organizations. No cooperative agreements are in place other than this INRMP's signatory partners (USFWS, NOAA and CDFW) and NAVFAC SW, who will continue to assist with implementation of various aspects of this INRMP. Cooperative agreements may provide future funding opportunities for the Resources Management Program at NBVC Point Mugu and Special Areas, and should be pursued.

Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Units program is a working collaboration among federal agencies, universities, state agencies, non-governmental organizations, and other nonfederal institutional partners. The Cooperative Ecosystem Studies Units National Network provides multidisciplinary research, technical assistance, and education to resource and environmental managers. Although the overall program is overseen by USDI, one of the participating agencies is DoD. For more information regarding the Cooperative Ecosystem Studies Units program, refer to the following website: http://www.cesu.psu.edu.

7.4.3 Research Funding Requirements

Environmental program funding in the Navy is primarily based upon federally mandated requirements. Program managers are encouraged to seek outside funding for projects consistent with the INRMP, such as research, that will benefit natural resources on installations, but that are not directly related to federal mandates.

New funding sources should be sought from federal, state, local, and nonprofit organizations with an interest in achieving the goals and objectives of this INRMP in partnership with NBVC. Any such funding would need to be consistent with authorization to receive and use such funds. These will often require cost-sharing. This funding opportunity should be sought for projects that are not ERL 3 or 4 "must fund" items, tied directly to immediate regulatory compliance. Examples are watershed management, habitat enhancement, or wetland restoration.

7.4.4 Non-DOD Funding Sources

There are a number of grant programs available for natural resource management projects such as watershed management and restoration, habitat restoration, and wetland and riparian area restoration. When federally funded, these programs typically require non-federal matching funds. However, installations may be able to partner with other groups to propose eligible projects. One example grant program is listed below, but many more are available.

The National Association of Counties, National Association of Service and Conservation Corps, National Fish and Wildlife Foundation, and Wildlife Habitat Council sponsor the Five Star Restoration Challenge Grants program, in cooperation with EPA, NMFS and other sponsors. This program provides modest financial assistance (\$5,000 to \$20,000) on a competitive basis to support community-based wetland and riparian restoration projects that build diverse partnerships and foster local natural resource stewardship. Installations would need to partner with other groups to be eligible for this type of program. Applications are due in March. Information is available on the web at http://www.epa.gov/owow/wetlands/restore/5star/.

7.5 INRMP IMPLEMENTATION SUMMARY AND SCHEDULE

The objectives and strategies that support INRMP implementation are identified in this section. Detailed natural resource management prescriptions and a list of projects are in Appendix C. The Sikes Act requires implementation of this INRMP; however, INRMP implementation is also subject to the provisions of the Federal Anti-Deficiency Act. Some INRMP projects are accomplished with installation staff; others involve contracting work to specialists. The implementation schedule identified in Appendix C, Table C-4 is suggested for long-term planning purposes; however, the schedule may be modified based on need, resources, and seasonal requirements.

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