FINAL

U. S. AIR FORCE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

TRAVIS AIR FORCE BASE

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the United States Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources are managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs), USAF Playbooks; federal, state, local requirements, Biological Opinions and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language addressing USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are updated by Travis AFB.

NOTE: The terms 'Natural Resources Manager' (NRM) and 'NRM/Point of Contact' (POC) are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DODI 4715.03, Natural Resources Conservation Program

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DOCUMENT CONTROL

Standardized INRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate Business Rule 08, *EMP Review, Update, and Maintenance*, the standard content in this INRMP template is reviewed periodically, updated as appropriate, and approved by the Natural Resources Subject Matter Expert.

This version of the template is supersedes the 2019 version.

Installation INRMP

Record of Review—The INRMP is reviewed no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. IAW the Sikes Act and Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*, the INRMP is required to be reviewed for operation and effect no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented by signature on a signature page signed by the Installation Commander (or designee), and a designated representative of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) when applicable (AFMAN 32-7003).

Annual reviews and updates are accomplished by the base NRM, and/or an Section Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the USFWS, state fish and wildlife agency, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

The Integrated Natural Resources Management Plan for the Travis Air Force Base is hereby approved by the undersigned.

Digitally signed by SALMI.DEREK.M.1133963274
Date: 2022.09.12 12:55:35 -07'00'

Derek M. Salmi, Colonel
United States Air Force
Commander, 60th Air Mobility Wing

12 Sep 2022
Date

INRMP APPROVAL/SIGNATURE PAGES

The Integrated Natural Resources Management Plan for the Travis Air Force Base is hereby approved by the undersigned.

MICHAEL FRIS Digitally signed by MICHAEL FRIS Date: 2022.07.26 10:48:06 -07'00'

_____ _____

Michael Fris, Field Supervisor Date
Sacramento Fish and Wildlife Office
United States Fish and Wildlife Service, Region 8

INRMP APPROVAL/SIGNATURE PAGES

The Integrated Natural Resources Management Plan for the Travis Air Force Base is hereby approved by the undersigned.

DocuSigned by:
Stacy Sherman for
692D021D81CA4F7...

Erin Chappell, Regional Manager
Bay Delta Region
California Department of Fish and Wildlife

8/4/2022
Date

EXECUTIVE SUMMARY

Air Force Manual 32-7003, *Environmental Conservation* provides guidance for preparing and implementing the Travis Air Force Base (AFB) Integrated Natural Resources Management Plan (INRMP). The purpose of this 2022 INRMP is to provide interdisciplinary strategic guidance for the day-to-day management of natural resources at Travis AFB, California, for a period of five years (2022, 2023, 2024, 2025 and 2026)**.** The principal purpose of DoD lands, water, airspace, and coastal resources is to support mission-related activities. All DoD natural resources conservation program activities work to guarantee DoD continued access to its land, air, and water resources for realistic military training and testing and to sustain the long-term ecological integrity of the resource base and ecosystem services it provides. DoD shall manage its natural resources to facilitate testing and training, mission readiness, and range sustainability in a long-term comprehensive, coordinated, and cost effective manner pursuant to Department of Defense Directive (DoDD) 3200.15. The INRMP supports management practices to comply with federal, and, when applicable, state and local laws, regulations, policies, and instructions.

Travis AFB has identified the following as priorities for the installation

- Implement the INRMP through compliance, ensuring no net loss in the capability of installation lands to support the military mission.
- Protect DoD missions from wildfires through implementation of aggressive fire management procedures and proactive and innovative implementation of protective measures.
- Consider impacts of natural resources in the development of management decisions.
- Find new/innovative ways to reduce/mitigate California tiger salamander (*Ambystoma californiense*; CTS) impacts to DoD missions; including but not limited to Airfield Operations; to support construction, maintenance, and flying operations with reduced USFWS consultation.
- Reduce BASH issues for flying missions; support 60 OSS with options to minimize the BASH threat; encourage a variety of techniques as there is no single solution.
- Protect and enhance desirable wildlife and plant species and their habitats; address invasive species and wildland fire through base comprehensive planning, supporting grazing, and determine biological, logistical, and financial feasibility of developing pollinator habitat and using goat and sheep assets for habitat management.
- Encourage creation of wetlands in high wetland habitat on Travis AFB. (Figure 7 3) areas.

The specific Goals, Objectives, and Projects for the Installation are found in Chapter 8, and a ranking of priorities (high, medium, or low) can be found in Chapter 10 of this document. This edition of the INRMP substantially updates and expands discussion of special-status species that are present, are potentially present, or have critical habitat on or near Travis AFB. All present and nominated species federally listed in any category, species listed by the state of California, plant species listed by the California Native Plant Society, Although only those species that are documented as present or needing additional surveys are discussed in detail in this plan. Limiting discussion to only these species required removal of eight species for which surveys have been completed, no individuals have been detected, and suitable habitat was not observed: Crampton's tuctoria (*Tuctoria mucronata*), Colusa grass (*Neostapfia colusana*), soft salty bird's beak (*Chloropyron molle* ssp. *molle*), Delta green ground beetle (*Elaphus viridis*), Conservancy fairy shrimp (*Branchinecta conservatio*), Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California red-legged frog (*Rana draytonii*), and Western spadefoot toad (*Spea hammondii*).

1.0 OVERVIEW AND SCOPE

This Integrated Natural Resources Management Plan (INRMP) was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the United States Air Force (USAF). They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel.

1.1 Purpose and Scope

This INRMP provides a guide to natural resources management at Travis Air Force Base (AFB). The natural resource program is divided into program elements; applicable elements include wetlands, fish and wildlife management, outdoor recreation, land management, wildland fire management, and invasive species management. This plan coordinates and balances all natural resource management with Travis's mission priorities.

Signatories from the United States Fish Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) provide a partnership and the support to Travis AFB to meet Department of Defense (DoD) mission activities and are integrated and consistent with federal mandates for land stewardship.

1.2 Management Philosophy

The INRMP serves as a component of the Installation Development Plan (IDP), which provides background and rationale for the policies and programming decisions related to land use, resource conservation, facilities and infrastructure development, and operations and maintenance to ensure they meet current requirements and provide for future growth. The INRMP supports the mission by identifying the natural resources present on the installation, developing management goals for these resources, and integrating these management objectives into the military requirements for mission operations/support and regulatory compliance in order to minimize mission impacts and natural resource constraints.

This INRMP is organized into the following sections:

- An overview of the current status and conditions of the natural resources (Chapters 1 and 2).
- Identification of potential impacts to or from natural resources (Chapters 2 and 7).
- The key natural resource management areas addressed (Chapters 2 and 7).
- Management recommendations that incorporate the installation's goals and objectives for natural resource management areas (Chapters 8 and 10).
- Specific work plans for effective implementation of the INRMP (Chapters 8 and 10).

Management issues and concerns, as well as goals and objectives, are developed from analysis of all the gathered information and are reviewed by Travis AFB personnel involved with or responsible for various aspects of natural resources management. The INRMP was developed using an interdisciplinary approach

and is based on existing information of the physical and biotic environments, mission activities, and environmental management practices at Travis AFB. Information was obtained from a variety of documents, interviews with installation personnel, on-site observations, and communications with both internal and external stakeholders. Coordination and correspondence with these agencies are documented and satisfies a portion of the requirements of 32 Code of Federal Regulations (CFR) 989—*Environmental Impact Analysis Process (EIAP)*. Goals and objectives require monitoring on a continuous basis and management strategies are updated whenever there are changes in mission requirements, adverse effects to or from natural resources, or changes in regulations governing management of natural resources.

1.3 Authority

The laws, regulations, instructions, and directives that authorize the development and implementation of an INRMP include the following:

- Sikes Act Improvement Act of 1997 (16 United States Code [U.S.C.] § 670a, et seq.).
- Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*
- Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*
- Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*

The Sikes Act Improvement Act, 16 U.S.C. 670a, requires an INRMP be written and implemented for all DoD installations having significant natural resources. This plan has been developed cooperatively between Travis AFB, the USFWS and CDFW. The USAF natural resources program ensures continued access to land, air and water resources to conduct realistic military training and testing, as well as to sustain the long-term ecological integrity of the resource base.

Appendix A: Refers to the complete listing of AFIs, the Federal Registry, and the U.S.C to ensure that all applicable guidance documents, laws and regulations are reviewed.

1.4 Integration with Other Plans

INRMP revisions and concurrence with the final plan must be coordinated through the installation chain of command and the USFWS and CDFW. The Travis AFB NRM must ensure the INRMP, and any other plans that may affect natural resources, are mutually supportive and not in conflict.

Information from the INRMP is incorporated into other plans that help identify management priorities and are mutually supportive of the INRMP. The key plans that are integrated into the INRMP are listed below:

Air Installation Compatible Use Zone (AICUZ) Program—Promotes compatible land use development in areas subject to aircraft noise and accident potential.

Bird/Wildlife Aircraft Strike Hazard (BASH) Plan—Intended to provide guidance for the implementation of actions that will keep birds and other wildlife off the airfield. See Section 15.0, Tab 2.

Cypress Lakes Golf Course Environmental Management (GEM) Plan—Facilitates effective golf course management while minimizing environmental impacts and promoting the game of golf. At the Cypress Lakes Golf Course GSU of Travis AFB, the GEM Plan management approach includes ensuring natural resources of concern (water quality, wetlands, air quality and water use) are protected in daily operations (see Section 15.0, Tab 3).

Grazing Management Plan (GMP)—Outlines grazing management actions for grazing lessees that meet natural resources management goals at Travis AFB.

Installation Development Plan (IDP)—Outlines planning and programming information related to land use, resource conservation, facilities and infrastructure development, operations, and maintenance. At Travis AFB, natural resource areas are key component in planning and development throughout the base.

Integrated Cultural Resources Management Plan—Identifies, inventories, documents and protects all cultural resources on Travis AFB. The plan provides support for mission activities while maintaining compliance with cultural resource regulations and legislation (see Section 15.0, Tab 4).

Invasive Species Management Plan—Characterizes the distribution and abundance of weed and pest species at Travis AFB. This plan documents methods for pest control practices and methods for achieving reduction or control of invasive animal species through a pest control work plan. The invasive vegetation component of the plan identifies strategies to manage invasive vegetation and reduce undesirable nonnative plant species.

Installation Pest Management Plan (IPMP)—Outlines effective controls of listed pest species (insects, animals, and weeds) to minimize the impact to the military mission, natural and cultural resources, and installation structures (see Section 15.0, Tab 5).

Storm Water Pollution Prevention Plan—Outlines how the installation prevents discharges of potential pollution from industrial operations into storm water. It contains procedures intended to minimize risk of industrial storm water pollution in drainage areas located within Travis AFB's boundaries. At Travis AFB, the plan procedures help to facilitate wetland and listed species habitat management and protection.

Wildland Fire Management Plan (WFMP)—Reduces wildfire potential, protects and enhances valuable natural resources, and implements ecosystem management goals and objectives on Travis AFB. The goal of this plan is to reduce total costs and losses from wildfire by protecting assets at risk through focused pre-fire management and increasing initial attack success. At Travis AFB, this includes prescribed fire adding firebreaks and other similar methods to reduce the risk of wildland fires. See Section 15.0, Tab 1.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	The 60th Civil Engineer Squadron (CES) has overall responsibility for implementing the Natural Resources Management Program and is the lead organization for monitoring compliance with applicable federal, state and local regulations
Natural Resources Manager (NRM) (Point of Contact [POC])	Ms. Leslie Peña, NRM and team lead 60CES/ Natural Resources Management Office 707-424-0891 env.60ces@us.af.mil
State and/or local regulatory POCs (for Sikes Act cooperating agencies)	United States Fish and Wildlife Service Ms. Jennifer Norris California Department of Fish and Wildlife Regional Manager Appendix P
Total acreage managed by installation	5,137 (Travis AFB) and 357 acres (Geographically Separated Units)
Total acreage of wetlands	122
Total acreage of forested land	0
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	Yes, See Appendix L, Biological Opinions.
NR Program Applicability	☒ Management of Threatened, Endangered, and Host Nation-Protected Species ☒ Water Resource Protection ☒ Wetland Protection ☒ Grounds Maintenance ☐ Forest Management ☒ Wildland Fire Management ☒ Agricultural Outleasing ☒ Integrated Pest Management Program ☒ Bird/Wildlife Aircraft Strike Hazard (BASH) ☐ Coastal Zone and Marine Resources Management ☒ Cultural Resources Protection ☒ Public Outreach ☒ Geographic Information Systems (GIS)

2.1 Installation Overview

2.1.1 Location and Area

Travis AFB, an Air Mobility Command (AMC) base, is in northern California within the city limits of Fairfield (Figure 2-1). Travis AFB is approximately 50 miles northeast of San Francisco and 40 miles southwest of Sacramento, approximately midway between the coastal zone and the interior valley of

California. Local communities in the vicinity of Travis AFB include Vacaville to the north and Suisun City to the south. Fairfield and Suisun City lie at the northern end of the Suisun Slough Channel, an arm of the Suisun Bay, which is a reach of San Francisco Bay.

Interstate 80, located five miles northwest, is the major regional highway serving the area and connects Fairfield with San Francisco and Sacramento. Interstate 505, which intersects Interstate 80 in Vacaville, provides a regional connection to Interstate 5, which runs from Seattle to San Diego.

Travis AFB is situated on 5,137 acres of fee-owned land in northern California (Figure 2-2). There is little open space, with large residential areas occupying the northern half of the base, commercial-administrative uses just south of these residential areas, and mission and airfield operations areas along the south side of the base. Travis AFB is bordered on the east, north, and south by agricultural lands and open space. On the west, the base is bordered by mixed urban uses, including commercial uses adjacent to the main entrance north of Travis Boulevard. Additionally, the seven GSUs (Figure 2-3, Figure 2-1) total approximately 358 acres.

The host unit on Travis AFB is the 60th Air Mobility Wing (AMW), the largest air mobility organization in the USAF. The 60th AMW is responsible for strategic airlift and air refueling missions circling the globe. Team Travis includes the 349th AMW, 621st Contingency Response Wing, and more than 18 other partner organizations, with over 15,000 active members, reservists, and civilian employees assigned.

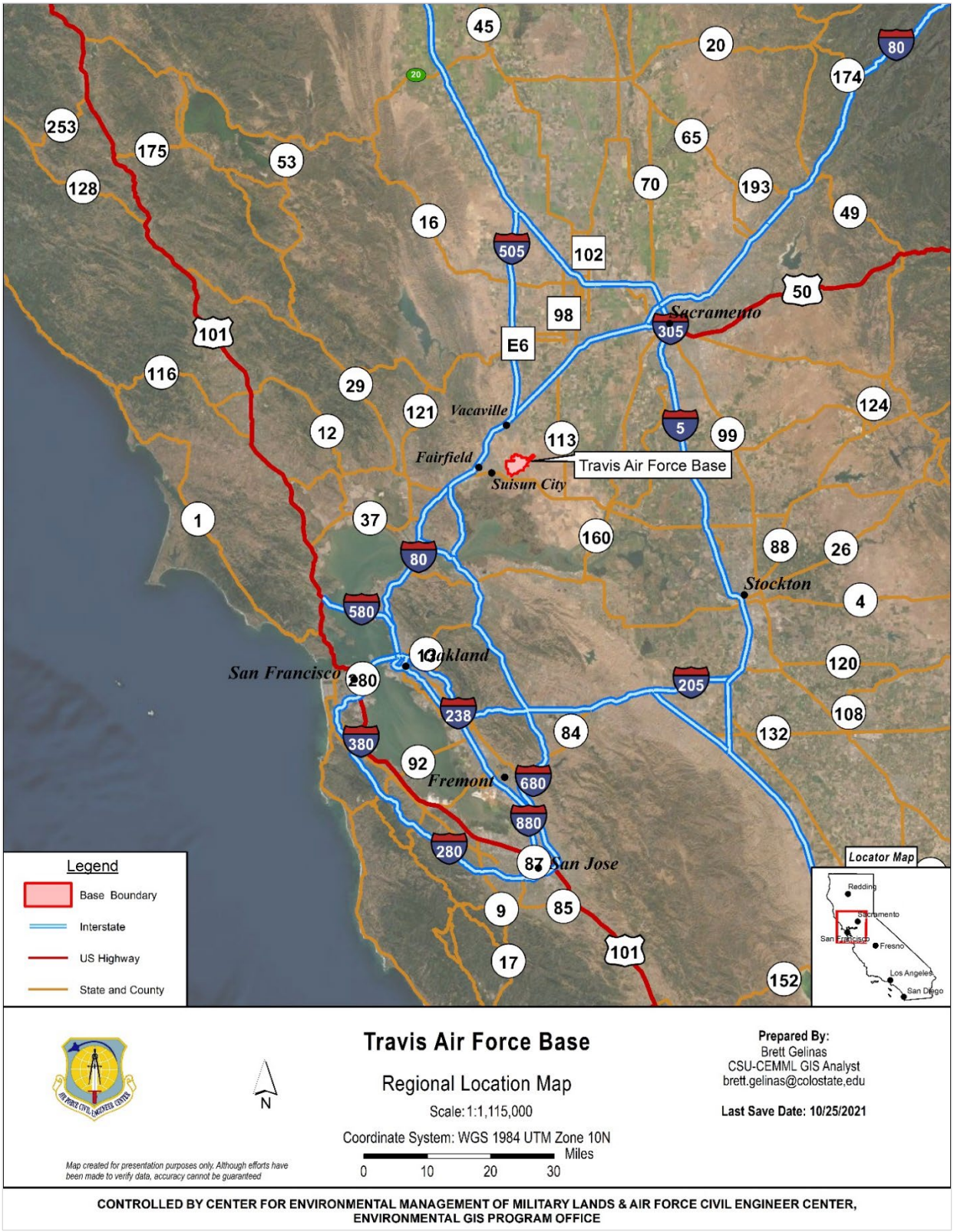

Figure 2-1. Regional map for Travis AFB.

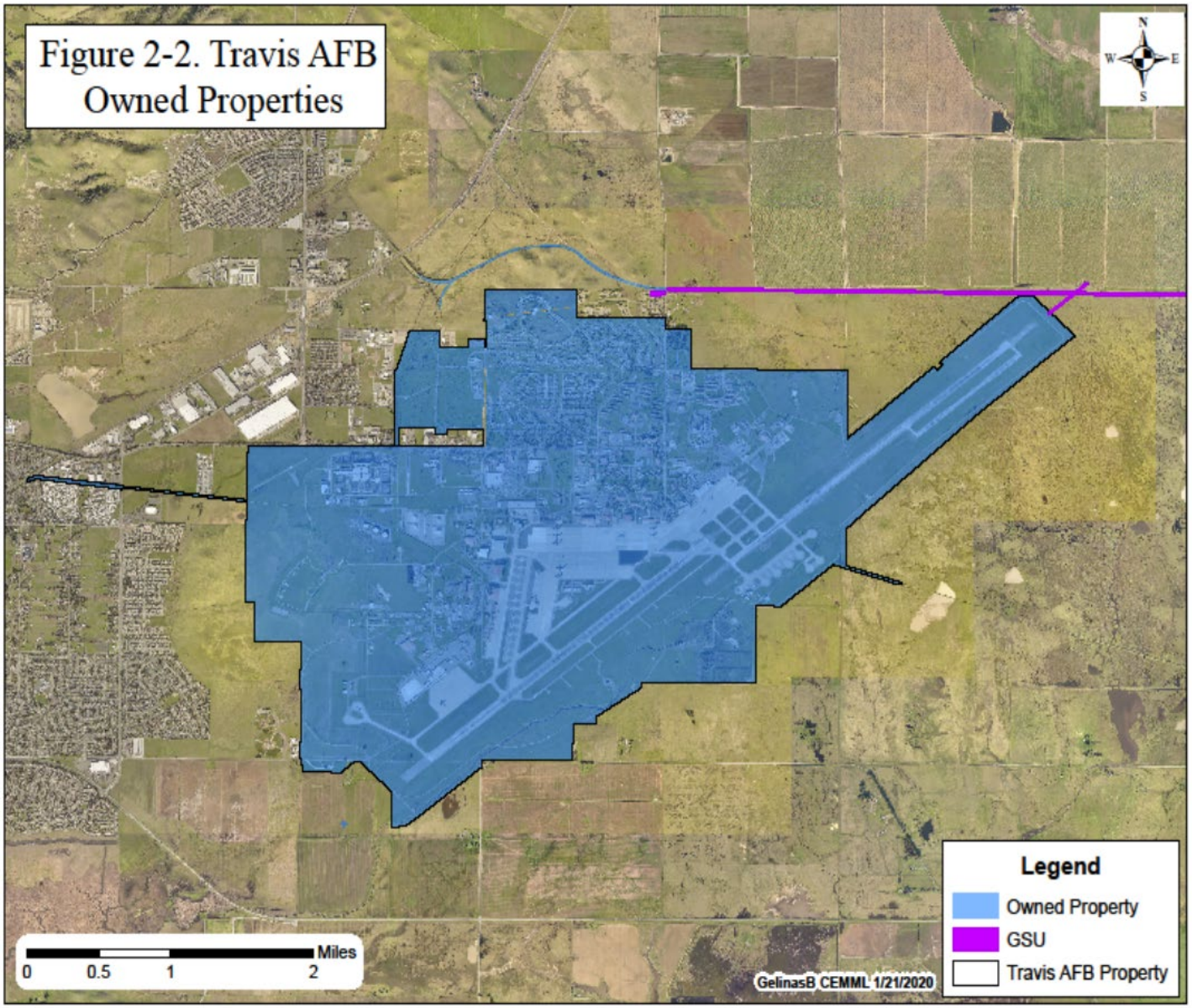

Figure 2-2. Travis AFB real property.

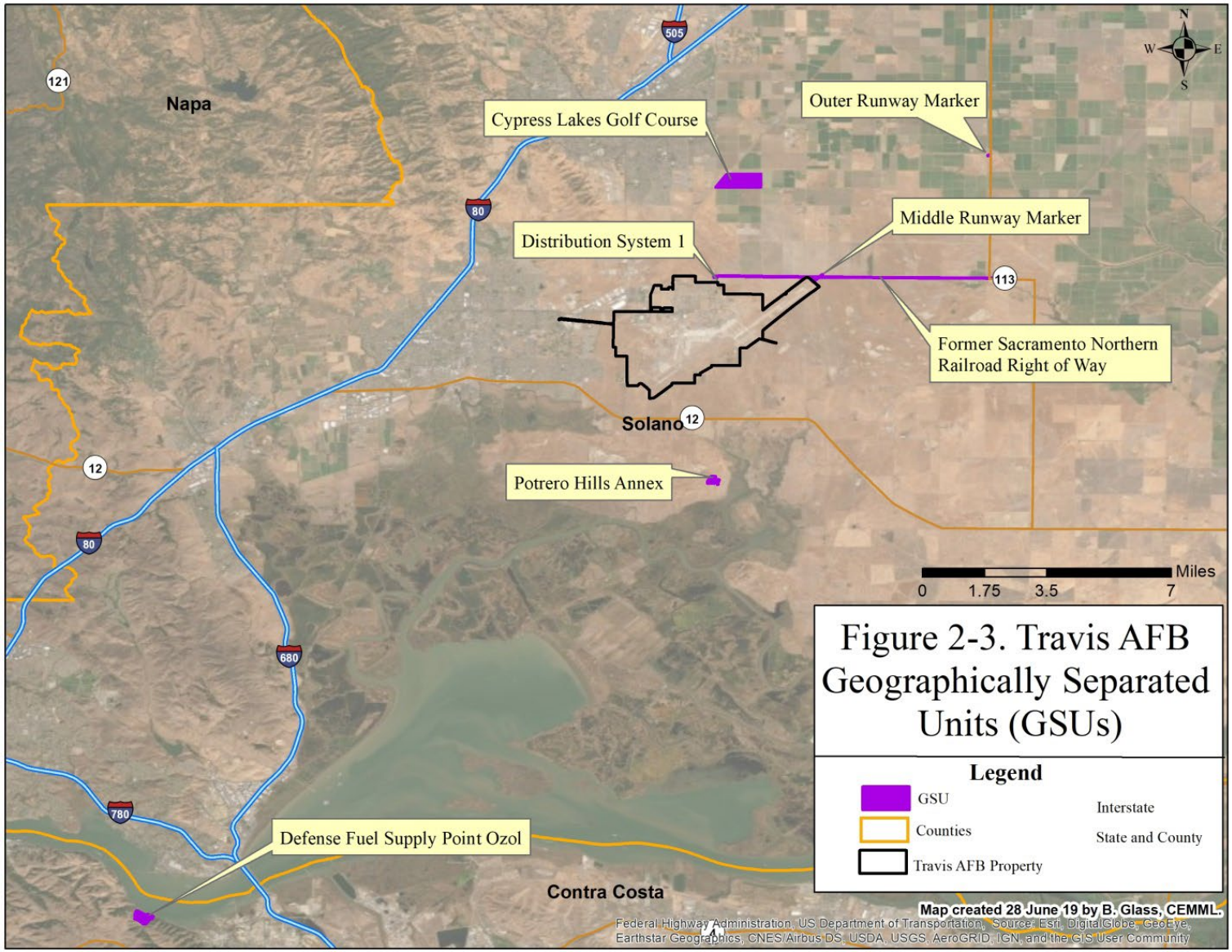

Figure 2-3. Travis AFB's geographically separated units.

Table 2-1. Installation/geographically separated unit (GSU) location and area descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
Travis AFB	Defense aviation activities including long-range reconnaissance, air logistics support, servicing and ferrying aircraft to the Pacific and humanitarian operations. Solano County.	5,137	Entire INRMP applies to Travis AFB.	Large areas of wetlands and four federally protected species (Contra Costa goldfields [CCG]), California tiger salamander (CTS), vernal pool fairy shrimp (VPFS), and vernal pool tadpole shrimp (VPTS). Critical habitat for CCG, Conservancy fairy shrimp, VPFS, and VPTS.
Defense Fuel Supply Point Ozol	Fuel facility within the Carquinez Strait, Contra Costa County	51.40	Yes	Remediation activities, wetland protection activities, special-status species surveys, maintenance grazing (goats). **Vegetation**: willow riparian, oak woodland, northern coast scrub, and non-native grassland
Potrero Hills Annex	Former Nike missile site in Potrero Hills, Solano County	24.81	Yes	Invasive species management, grazing, special-status species surveys. Potential upland CTS habitat; grassland. Critical habitat for VPFS and VPTS (~25 acres). **Vegetation**: non-native broadleaves and annual grasses
Middle Runway Marker	Airfield Infrastructure, Solano County	1.86	Yes	Mowing, special-status species surveys. **Vegetation:** Vernal pools, non-native grassland
Outer Runway Marker	Airfield Infrastructure, Solano County	0.23	Yes	Invasive weed management, potential wetland, land use agreement with surrounding land owners recommended for invasive weed management, special-status species surveys. **Vegetation:** non-native grassland
Distribution System 1	Portable water storage, Solano County	1.75	Yes	Mowing, special-status species surveys. **Vegetation:** mowed non-native grassland
Cypress Lakes Golf Course	Golf Course Facility, Solano County	207.52	Yes	Pollinator habitat addition. Native tree plantings**,** special-status species surveys. **Vegetation:** non-native grass turf, non-native trees, limited native wetland species

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
Former Sacramento Northern Railroad Right-of-Way	Former railroad	70	Yes	Wetland protection; land management, special-status species surveys. Vernal pools, CTS, VPFS, VPTS present. Critical habitat for CTS (25 acres) and delta green ground beetle (DGGB) (5.07 acres). **Vegetation:** Unvegetated/disturbed, non-native grassland, vernal pools

2.1.2 Installation History

In April 1942, shortly after the bombing of Pearl Harbor, the United States Army Corps of Engineers (USACE) authorized one million dollars to build a bomber base in the San Francisco Bay Area, and construction began on the current location of Travis AFB. On February 8, 1943, the site was named Fairfield Suisun Army Air Base and was formally assigned to the Air Transport Command. The base was officially activated on May 17, 1943, and operations began on 01 June 1943.

The primary mission for the new base was servicing and ferrying tactical aircraft from California to the Pacific Theater (the region of operations of United States [U.S.] forces during World War II). In addition to airlifting troops and supplies, the base was used to prepare new bombers and transports for their flight to the war zones. By 1945, the base had become the West Coast's largest aerial port. The base served as a home for bombers that included the B-29, B-36, and B-52. The Fairfield Suisun Army Air Base was renamed Travis AFB on 20 October 1950, in honor of Brigadier General Robert Falligant Travis, who was killed when the B-29 Superfortress he was copiloting crashed shortly after takeoff.

By 1965, Travis AFB became a primary center for air logistic support for southeast Asia during the Vietnam conflict. In 1966, the Military Airlift Command was established.

When deliveries of Lockheed C-5 Galaxy aircraft began in 1970, Travis AFB entered a new era in airlift history. In-flight refuelable and able to carry up to 100 tons in their 144-foot-long cargo holds, the C-5s were the world's largest transport aircraft.

In 1991, with the reorganization of the USAF following the end of the Cold War, Military Airlift Command was inactivated, and Travis AFB came under the control of the newly established AMC. With the inclusion of an aerial refueling mission into its long-time strategic airlift mission, the 60th day-night average a-weighted sound level and the 349 AW were designated as the 60th AMW and the 349th AMW, the designations they continue to hold today.

Before Travis AFB was established, the land was used for sheep and cattle grazing (Dingler 2002, Goerke-Shrode 2007). Travis AFB's livestock grazing program began in 1977 with 145 acres being leased for cattle (Holmes 1996). By 1996, 604 acres were being grazed by cattle and horses (Holmes 1996). The acreage for cattle and horse grazing varied across the years, depending on the amount of rain and therefore forage available. The surrounding land use includes agriculture and open space as part of the requirements for the AICUZ (Travis AFB 2016a).

In 1997, the 60th AMW also shed its C-141 aircraft, which were transferred to other USAF Reserve and Air National Guard wings, while retaining its C-5 and KC-10 aircraft. In 2006, the 60th AMW and 349 AMW (Assoc) acquired a third aircraft type in their inventory with the arrival of the C-17 Globemaster III.

2.1.3 Military Missions

Travis AFB is under the operational control of the USAF AMC and hosts the 60th, 349th AMWs and 621 CRW (Table 2-2). The 60th AMW is the largest air mobility organization within the Air Force (in terms of personnel) and supports maintaining and flying the C-5 Galaxy cargo aircraft, the KC-10 Extender refueling aircraft, and the C-17 Globemaster III cargo aircraft. In partnership with the 60th AMW the largest reserve wing, the 349th AMW, also makes its home at Travis with its four flying squadrons, three Aerial Port Squadrons, and three Aircraft Maintenance Squadrons. This partnership allows the base to handle more cargo and passengers than any other military air terminal in the United States, earning it the title "The Gateway to the Pacific."

Table 2-2. Listing of tenants and natural resources responsibility.

Tenant Organization	NR Responsibility
349 Air Mobility Wing (AMW) (Reserve)	60 AMW
621 Contingency Response Wing	60 AMW
Air Mobility Command Band of the Golden West	60 AMW
Tactical Airborne Communication and Maritime Operation	60 AMW

Note: All entities on Travis AFB have responsibilities for stewardship of maintaining the Natural environment.

60th Air Mobility Wing

The 60th AMW is responsible for strategic airlift and air refueling missions circling the globe. The unit's primary roles are to provide rapid, reliable airlift of American fighting forces anywhere on earth in support of national objectives and to extend the reach of American and Allied air power through mid-air refueling. Wing activity is primarily focused in the Pacific and Indian Oceans area, including Alaska and Antarctica. However, the 60th AMW crews fly support missions anywhere in the world to fulfill its motto of being "America's First Choice" for providing true global support.

The 60th AMW is organized into four groups: Operations, Maintenance, Mission Support, and Medical. They maintain a work force of approximately 7,000 active-duty military and more than 1,800 appropriated fund civilians and more than 1,200 non-appropriated fund civilians to support its global mission (Travis AFB 2016a). In addition, the more than 3,000 Reservists assigned to the associated 349th AMW combine with their active duty and civilian counterparts to form a fully integrated Total Force team.

The 60th Operations Group is responsible for four flying squadrons— the 21st Airlift Squadron, which flies the C-17 Globemaster III; the 22nd Airlift Squadron, which flies the C-5 Galaxy; the 6th and 9th Air Refueling Squadrons, which fly the KC-10 Extender. The 60th Operations Support Squadron handles such functions as weather, airfield management, training, and scheduling.

The 60th Maintenance Group meets the responsibility of aircraft maintenance with the 60th Maintenance Squadron, 60th Aircraft Maintenance Squadron, 660th Aircraft Maintenance Squadron, 860th Aircraft Maintenance Squadron, and 60th Aerial Port Squadron.

The 60th Mission Support Group includes the 60th Civil Engineer Squadron, 60th Logistics Readiness Squadron, 60th Contracting Squadron, 60th Communications Squadron, 60th Security Forces Squadron, and 60th Force Support Squadron that are all responsible for mission readiness and the day-to-day activities that help Travis run.

Travis AFB is home to the 60th Medical Group and is the West Coast terminal for aeromedical evacuation aircraft, returning injured or sick airmen from the Pacific area. David Grant Medical Facility (DGMC) was completed in 1988 and is the flagship of the 75 military treatment facilities in the Air Force Medical Service, providing full spectrum of care.

The 60th Medical Group manages the David Grant USAF Medical Center and composed of seven squadrons: the 60th Aerospace Medicine Squadron, 60th Dental Squadron, 60th Diagnostics and Therapeutics Squadron, 60th Medical Surgical Operations Squadron, 60th Medical Support Squadron, 60th Surgical Operations Squadron, and 60th Inpatient Squadron.

349th Air Mobility Wing

The 349th AMW (Reserve), located at Travis AFB, California, is the largest associate wing in the USAF Reserve. 349th AMW personnel fly the C-5 Galaxy, KC-10 Extender, and C-17 Globemaster III. The missions of the wing's aircrews include airlifting personnel and material worldwide as well as aerial refueling a wide variety of aircraft. The 349th AMW is also home to the 349th Aeromedical Evacuation Squadron, responsible for treating patients during medical airlift; the 349th Airlift Operations Support Flight, tasked to enter austere locations and prepare for USAF aircraft arrival; and the 349th Medical Squadron, capable of providing hospital services worldwide, in a contingency environment.

621st Contingency Response Wing

The 621th Contingency Response Wing (CRW) is a specialized wing that provides a multifunctional rapidly deployable capability designed to set up air bases, establish theater-wide command and control, conduct airfield operations, perform aircraft maintenance, and provide security and communications assets anywhere in the world within 12 hours of notification.

The 621 CRW opens forward bases and extends existing AMC infrastructure via rapid forward deployment capabilities and presents core airbase operating forces to war-fighting combatant commanders to meet the nation's National Security requirements. The 621 CRW employs mission-ready airfield assessment teams, airfield operations, command and control, aerial port, and aircraft maintenance personnel.

Tactical Airborne Communication and Maritime Operation (TACAMO)

Tactical Airborne Communication and Maritime Operation (TACAMO) is a Navy organization that maintains survivable communications in the threat of nuclear warfare. Based at Tinker Air Force Base in Oklahoma, TACAMO maintains an alerts station at Travis AFB that serves the West Coast (Travis AFB 2016a).

Many other units operate at Travis AFB, including Air Force Civil Engineer Center (AFCEC), Army Air Force Exchange Service, Air Force Audit Agency, Alternate Tanker Control Center, American Red Cross, Civil Air Patrol, Defense Commissary Agency, Defense Courier Service, Defense Reutilization and Marketing Office, Defense Security Service, and the VQ3 Detachment (Unites States Navy).

2.1.4 Natural Resources Needed to Support the Military Mission

Natural resources supports the military mission through effective management of open spaces. Open space is required for wildland fire management, clear zones, explosive safety arcs, perimeter standoffs, and security of the airfield. The open space, parks and other recreational areas (See Section 7.2) provide essential quality of life initiative by providing base personnel with outdoor recreation opportunities for camping, fishing, hiking, falconry and wildlife viewing areas.

This open space is largely grassland and vernal pools, which provide upland and breeding habitat respectively for three federally protected species. Because this habitat is largely protected, development does not occur in the vicinity of the flightline or the areas off base surrounding the flightline. This open space is essential to support military operations and training.

2.1.5 Surrounding Communities

Travis AFB is located within the incorporated area of the city of Fairfield, the county seat of Solano County and east of Suisun City. Both cities provide a large array of community services such as police and fire protection, city planning and development, roads and utilities, operation and maintenance, and parks and recreation. The major urbanized portions of these cities are west of the base. A sports complex operated by Suisun City is at the base's southwest corner.

Solano County is part of the Vallejo-Fairfield-Napa Metropolitan Statistical Area. The nine-county Bay Area region that encompasses Vacaville, Fairfield, Suisun City, and Solano County and has experienced significant growth dating back to the conclusion of World War II. Solano County demographic and employment information is available from the U.S. Census Bureau.

Regional Land Use

Land use in the immediate vicinity of Travis AFB is predominantly agricultural, with the few interspersed residences primarily associated with the agricultural use. The only area of urbanized use adjacent to the base is at the northwest corner, west of the base's main entrance. A mixture of uses, including residential, industrial and commercial, characterizes this area.

2.1.6 Local and Regional Natural Areas

There are seven natural areas in close proximity to Travis AFB. These include Wilcox Ranch, Jepson Prairie Preserve, Noonan Ranch Conservation Bank, One Lake Mitigation Areas, Alex Cook Ranch, Grizzly Island Wildlife Area and Rush Ranch.

The Wilcox Ranch is a 1,342-acre area protected by easements, which contains vernal pools with numerous large playa pools. It is owned by the Solano Land Trust, Solano County, and the City of Fairfield. This ranch directly borders the base to the south and east.

The Jepson Prairie Preserve, established to protect vernal pools, is approximately four miles east of Travis AFB and is also managed by the Solano Land Trust. Travis AFB contains vernal pools similar to those in the nearby natural areas.

Noonan Ranch Conservation Bank is located immediately north of Travis AFB and was established to protect the California tiger salamander ([CTS] *Ambystoma californiense*) and other native species and is authorized to sell credits by USFWS (Figure 2-4).

The One Lake Mitigation Areas is a 590.33-acre area location approximately 0.3 miles north of Travis AFB that is planned to be protected by a conservation easement in 2022 to preserve CTS and other native species and their habitats. It is comprised of three mitigation areas: Mitigation Area 1 is closest to Travis AFB, Mitigation Area 2 is adjacent to the northern boundary of Noonan Ranch Conservation Bank, and Mitigation Area 3 is north of Mitigation Area 2. The One Lake Mitigation Areas are owned by Canon Station LLC and One Lake Holding LLC, and Wildlife Heritage Foundation is planned to be the conservation easement holder.

Alex Cook Ranch is a 1,259.63-acre area located approximately 2.3 miles east of Travis AFB that is planned to be protected by a conservation easement in 2021 or 2022 to preserve CTS and other native species and their habitats. It is owned by Alex Cook Ranch LLC, and Solano Land Trust is planned to be the conservation easement holder. Grizzly Island Wildlife Area is managed by the California Department of Fish and Wildlife as the largest contiguous estuarine marsh in the U.S. Grizzly Island is located approximately two miles south of Travis AFB. Travis AFB does not contain any estuaries, nor does it have any tidal waters. Rush Ranch is managed by the Solano Land Trust as one of the few remaining remnant brackish tidal marsh habitats and it is located approximately four miles southeast of Travis AFB. Rush Ranch also receives funding from the San Francisco Bay National Estuarine Research Reserve and the Coastal Conservancy.

2.2 Physical Environment

2.2.1 Climate

Travis AFB is situated in an inland area with ocean or cold air influence and is classified as Zone 14 in the Geographic Subdivisions and Climate Zones of California in the Jepson Manual (Baldwin et al. 2012). This region has a Mediterranean climate characterized by mild, wet winters and warm, dry, or hot summers. The rainy season typically begins in November and continues into March. During this period, approximately 83 percent of the annual rainfall occurs. The remainder of the year, there is little to no rainfall and summer temperatures can be in the triple digits.

The mean annual precipitation for a 25-year storm is 20.05 inches, and the maximum 24-hour precipitation is 5.5 inches. The rainfall for the area averages approximately 23 inches per year (Table 2-3).

Travis AFB has an average growing season of 323 days, defined as the number of days above 32 degrees Fahrenheit (°F) (Weatherspark.com, accessed 17 August 2018). In the area, the hot summer weather (characteristic of the interior valleys of California) is tempered by cool, moist winds blowing inland from the ocean and bay. The hot north winds during the summer reduce relative humidity and substantially increase wildfire risk. Winds from the southwest or south generally bring rain and moderate temperatures during the winter.

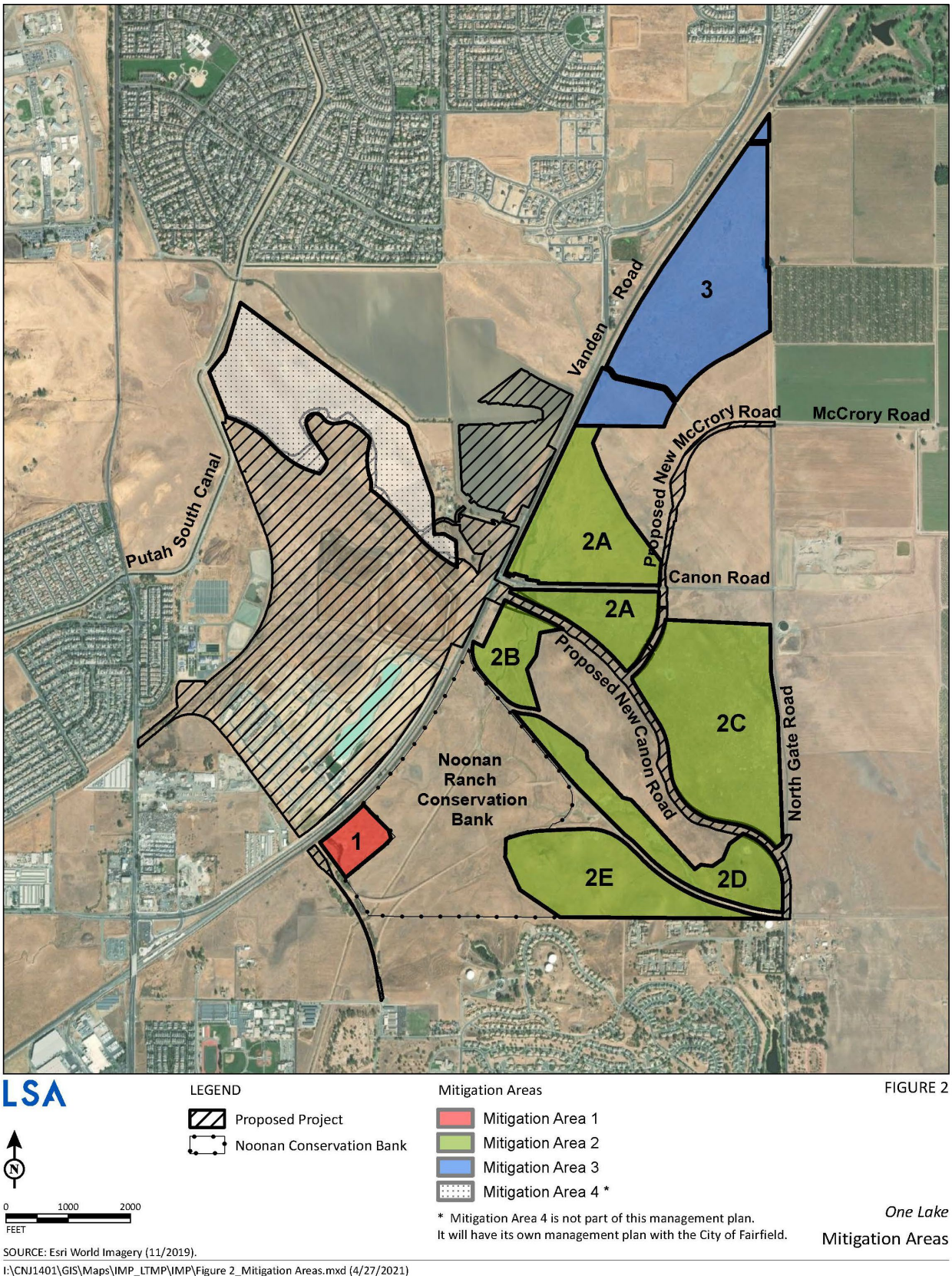

Figure 2-4. Noonan Ranch and One Lake Mitigation Areas (map courtesy of CDFW).

Table 2-3. Temperature and precipitation data for Travis AFB, California.

Month	Normal Temperature (°F)			Record Temperature (°F)		Precipitation (inches)
	Mean	Max	Min	Max	Min	Mean
January	47	55	38	77	18	4.8
February	51	62	41	80	24	4.0
March	55	66	43	89	29	3.1
April	59	71	46	98	26	1.4
May	64	78	50	111	35	0.6
June	69	84	54	111	31	0.2
July	73	89	56	114	38	0.02
August	72	89	56	111	40	0.06
September	71	87	55	110	39	0.2
October	64	78	50	102	32	1.3
November	54	65	43	87	21	2.8
December	47	56	38	78	15	4.3
Yearly Average	**59**	**73**	**47**	**114**	**19**	**22.7**

Source: Western Regional Climate Center (2018) and Northern California National Weather Service COOP Network, accessed 31 August 2018, for Fairfield, California (042934), using data from 1950–2016. Monthly Climate Summary used for normal temperature and precipitation. Record temperatures include averages for extreme maximum and minimum monthly temperatures.

2.2.1.1 Climate Change Projections

In 2019, CEMML produced a regional climate change assessment for Travis AFB (CEMML 2019a). To predict future climate conditions, they developed site-specific climate projections under two future carbon-emission scenarios: Representative Concentration Pathway (RCP) 4.5 (moderate emission levels) and RCP 8.5 (high emission levels, representing "business as usual" emissions). Models used historical daily climate data recorded from 1980 through 2009 to represent average historical (also called baseline) conditions and generate climate projections. The historical daily climate data for the installation were based on DAYMET daily data at a 1 km spatial scale (Thornton et al., 2012), averaged for the base over the 30-year historical reference point. Future climate conditions assessed under both RCP 4.5 and RCP 8.5 were projected using the U.S. National Center for Atmospheric Research (NCAR) Community Climate Model (CCSM4) (Gent et al., 2011; Hurrell et al., 2013; Moss et al., 2008).to produce two decadal time series of daily climate values for 2026–2035 and 2046–2055, represented hereafter as 2030 and 2050, respectively (CEMML 2019a).

Historical data included average daily temperature, maximum and minimum daily temperatures, and daily precipitation. For each of these variables, researchers calculated a daily anomaly (the difference of a future climate compared to the historical climate; see Methods appendix in CEMML 2019a) under each emission scenario (RCP 4.5 and RCP 8.5) for both 2030 and 2050. Daily data were then averaged within both 10-year periods for each variable and emission scenario to produce an annual average temperature (TAVE), annual average maximum and minimum temperatures, and annual average precipitation (PRECIP). Climate projections for Travis AFB (Table 2-4) suggest minimum and maximum temperatures will increase over time under both emissions scenarios. For the decade centered around 2030, both of the scenarios project a

similar degree of increase in TAVE of approximately 2.3 °F over the historical average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 3.1 °F. RCP 8.5 expresses a slightly greater warming of 4.0 °F for this period.

Table 2-4. Summary of historical and projected climate data for Travis AFB.

Variable[1]	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	22.5	26.4	24.3	22.8	26.1
TMIN (°F)	48.8	51.1	51.6	50.8	52.9
TMAX (°F)	74.4	77	77.8	76.8	78.3
TAVE (°F)	61.5	64.0	64.6	63.7	65.5
GDD (°F)	4,829	5,422	5,583	5,392	5,792
HOTDAYS	63.8	85.5	91.0	84.5	92.8
WETDAYS	0.8	0.7	0.3	0.2	0.3

[1] TAVE ºF=annual average temperature; TMAX ºF=annual average maximum temperature; TMIN °F=annual average minimum temperatures; PRECIP (inches)=average annual precipitation; GDD ºF=Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average number of days per year)=average number of days exceeding 90 °F; WETDAYS (average number of days per year)=average number of days with precipitation exceeding 2 inches in a day.

PRECIP varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the National Center for Atmospheric Research Climate System Model. For 2030, the RCP 4.5 scenario projects a moderate increase in PRECIP of 17% while RCP 8.5 shows an increase of 1%. For 2050, RCP 4.5 projects a moderate increase in PRECIP of 8% while RCP 8.5 shows an increase of 15%.

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (Table 2-5). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. Design storms for Travis AFB show a reduction in precipitation during storm events for most climate scenarios.

2.2.2 Landforms

Physiographically, the area includes part of the interior lowland of California known as the Sacramento Valley and the eastern terminus of the Coast Ranges, which bound the valley to the west. The Coast Range in the Travis AFB area is mostly composed of low hills that extend from the Vaca Mountains southeastward to connect with the Montezuma Hills southeast of the base. An isolated group of hills surrounded by a very low plain comprises the Potrero Hills. These may be considered part of the chain of low hills stretching from the Vaca Mountains to the Montezuma Hills.

The topography of Travis AFB slopes gently to the south (Figure 2-5). Elevations range from about 15 feet above mean sea level in the southwest corner to about 140 feet above mean sea level along the northern boundary.

Table 2-5. Design storm precipitation.

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	1.16	1.3	0.96	0.98	1.03
	Day 2	2.14	2.24	1.85	1.63	1.82
	Day 3	1.21	1.11	0.99	1.08	1.02
	Total	4.51	4.65	3.8	3.69	3.87
Percent change from baseline			3.1	-15.7	-18.2	-14.2

2.2.3 Geology and Soils

2.2.3.1 Geology

Travis AFB is situated on Quaternary bay sediments to the north of Suisun Bay. The generalized geology at the base shows unconsolidated silty clays at the surface yielding to silts and fine sands at depths of 15 to 20 feet. The average water table at the base is 10 feet below grade.

Part of the north portion of the base is underlain by alluvium of recent origin, consisting of sand, gravel, silt, and clays, in irregular lenticular and inter-fingering patterns. Their thickness varies from 5 feet to 60 feet. The major portion of the base is underlain by older alluvium of Pleistocene age, consisting of inter-fingering lenses of sands, gravel, silts, and clays. The thickness of these deposits reaches depths up to 200 feet southwest of Fairfield. However, at Travis AFB, these deposits are quite shallow, overlying the basement rocs that are part of the outcropping evident at Potrero Hills to the south. The older alluvium constitutes the major water-bearing units in the base vicinity to the east and west and sustains wells averaging about 200 gallons per minute. The permeability of this unit is moderate.

The San Francisco Bay Area is an area of historical and recent seismic activity, primarily due to the presence of the San Andreas, the Hayward, and the Calaveras fault zones. These faults are all more than 20 miles from the base. A smaller potentially active fault, the Green Valley Fault, is about 10 miles west of Travis AFB. The Rio Vista Fault may traverse the eastern side of the base as a Quaternary fault that is concealed with no surface evidence (Bryant 2017).

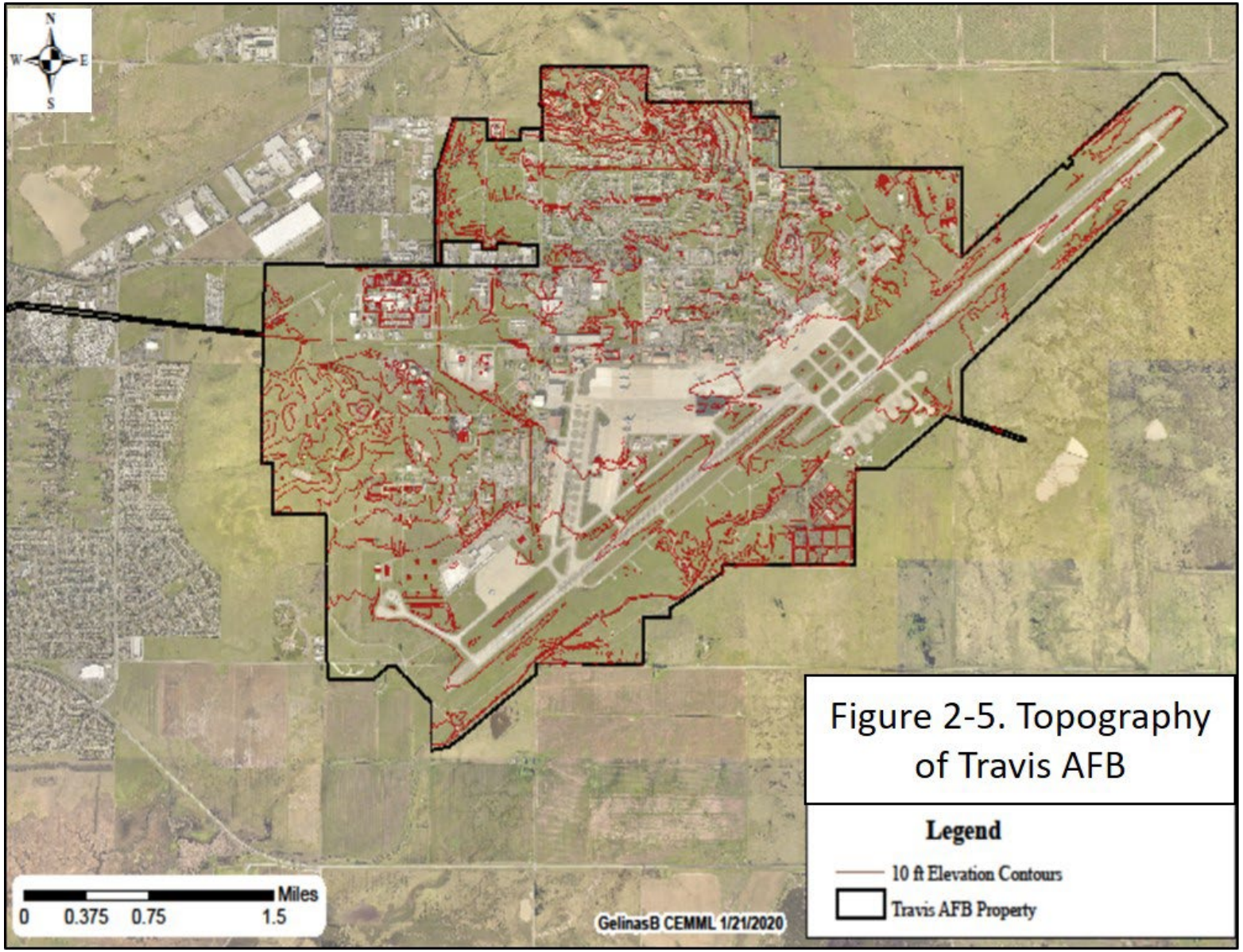

Figure 2-5. Topography of Travis AFB.

2.2.3.2 Soils

Travis AFB lies along the western margin of the part of the Central Valley drained by the Sacramento River. The soils have weathered under a distinctive climatic cycle characteristic of the Pacific coast soil region. The lower layers of most of the soils are dense and compact. They are comparatively impervious to air and retard the penetration of roots or water. Consequently, there is little drainage through the soil and much of the base supports vernal pools, an important habitat type that supports many rare plant and animal species. Under the prevailing climate, the natural vegetation growing on these soils consists largely of annual grasses and herbaceous annual forbs. Tules, sedges, and water-loving or alkali-resistant grasses cover drainages and areas with irrigation run-off. Aside from some summer-growing forb species, most of the vegetation senesces and is dry in the summer months, and the fall rains help promote decomposition. Soils on the base have been considerably altered by historic agricultural practices, heavy construction and by imported fill.

There are 14 soil types present at Travis AFB (Figure 2-6). These soil types were mapped by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in the Web Soil Survey accessed October 2018 (NRCS 2018).

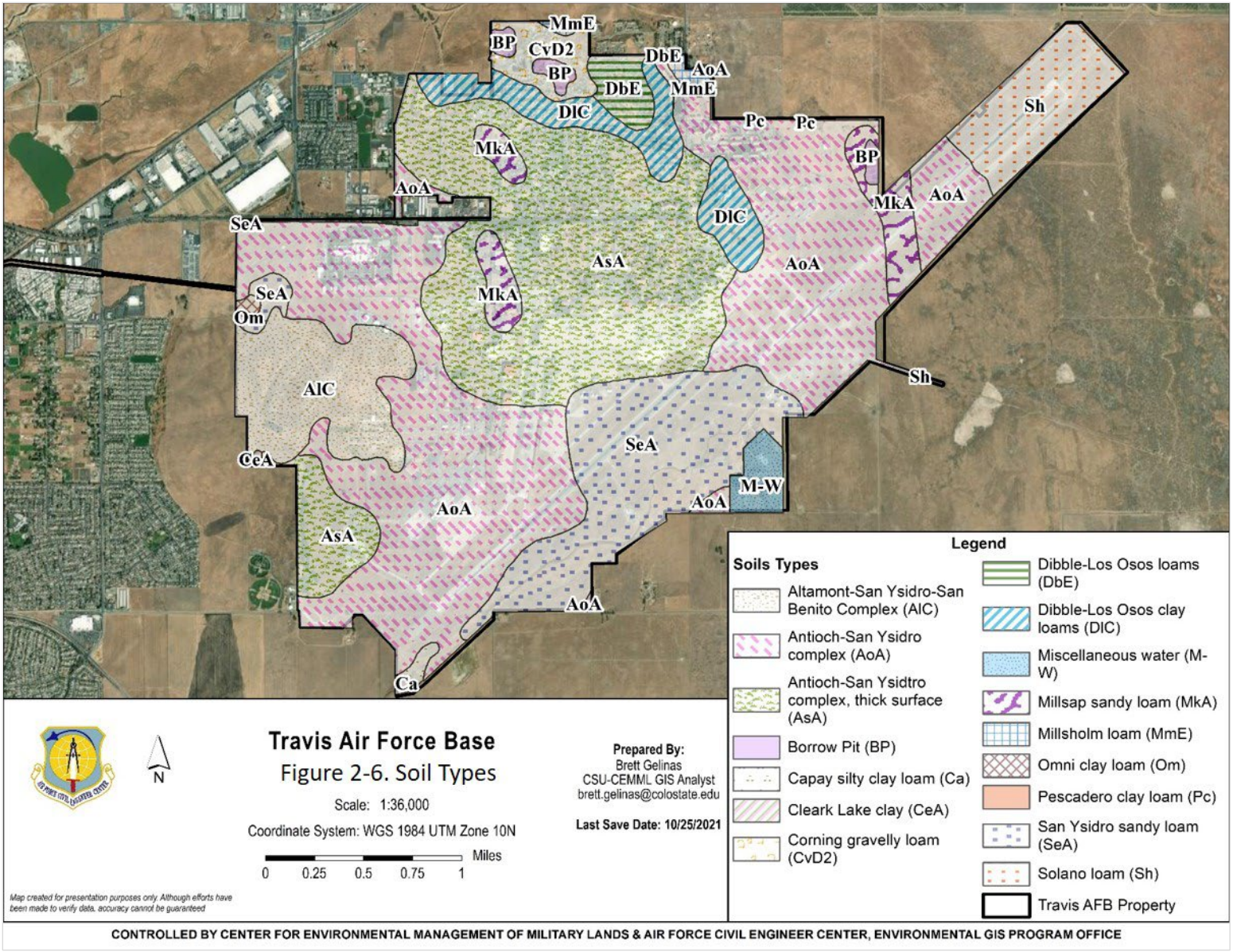

Figure 2-6. Soil types at Travis AFB.

2.2.4 Hydrology

Water resources encompass several different types of waters, including imported water, groundwater, wastewater, surface waters, and storm water/floodplains. Surface waters include natural waters supporting aquatic habitats such as floodplains, wet meadows, wetlands including vernal pools, and manmade waters (ponds), primarily for recreation. Travis AFB lies in the Union Creek watershed, which drains into the Suisun Marsh, then to the Suisun Bay, and ultimately into the San Francisco Bay (Travis AFB 2017a).

2.2.4.1 Imported Water

Imported water is supplied by the city of Vallejo's public water system and makes up approximately 90 percent, or about 750 million gallons, of the base's annual potable water supply. Lake Berryessa and Barker Slough serve as the sources of this water, which is treated by the city of Vallejo before being introduced to the distribution system.

2.2.4.2 Groundwater

Travis AFB is not underlain by extensive water-bearing materials compared to the deposits of the Great Valley (Putah Plain Area) to the northeast and Fairfield/Green Valley to the west. This is evidenced by the absence of major water supply wells near the base and the presence of extensive well fields to the northeast and west. For this reason, wells five miles to the north on Cypress Lakes Golf Course account for approximately 10 percent, or 75 million gallons, of potable water supply annually. Groundwater occurs at Travis AFB in shallow deposits and flows south of the base into the Suisun Marsh, to Suisun Bay, and ultimately into the San Francisco Bay, generally following the surface topography (Figure 2-7). Recharge to the shallow groundwater table is from the foothills of Cement Hill to the north, in channel infiltration from the draining area of nearby creeks (Union Creek, Denverton Creek, and smaller unnamed creeks northwest of the base), and through direct precipitation.

Each month, over four million gallons of groundwater are extracted from contaminated groundwater plumes under Travis AFB, treated and discharged to Union Creek (Figure 2-7), pursuant to two interim Groundwater Records of Decision with the U.S. Environmental Protection Agency, the California Department of Toxic Substances Control and the San Francisco Bay Regional Water Quality Control Board. This treated groundwater supplements the flow of the eastern branch of Union Creek.

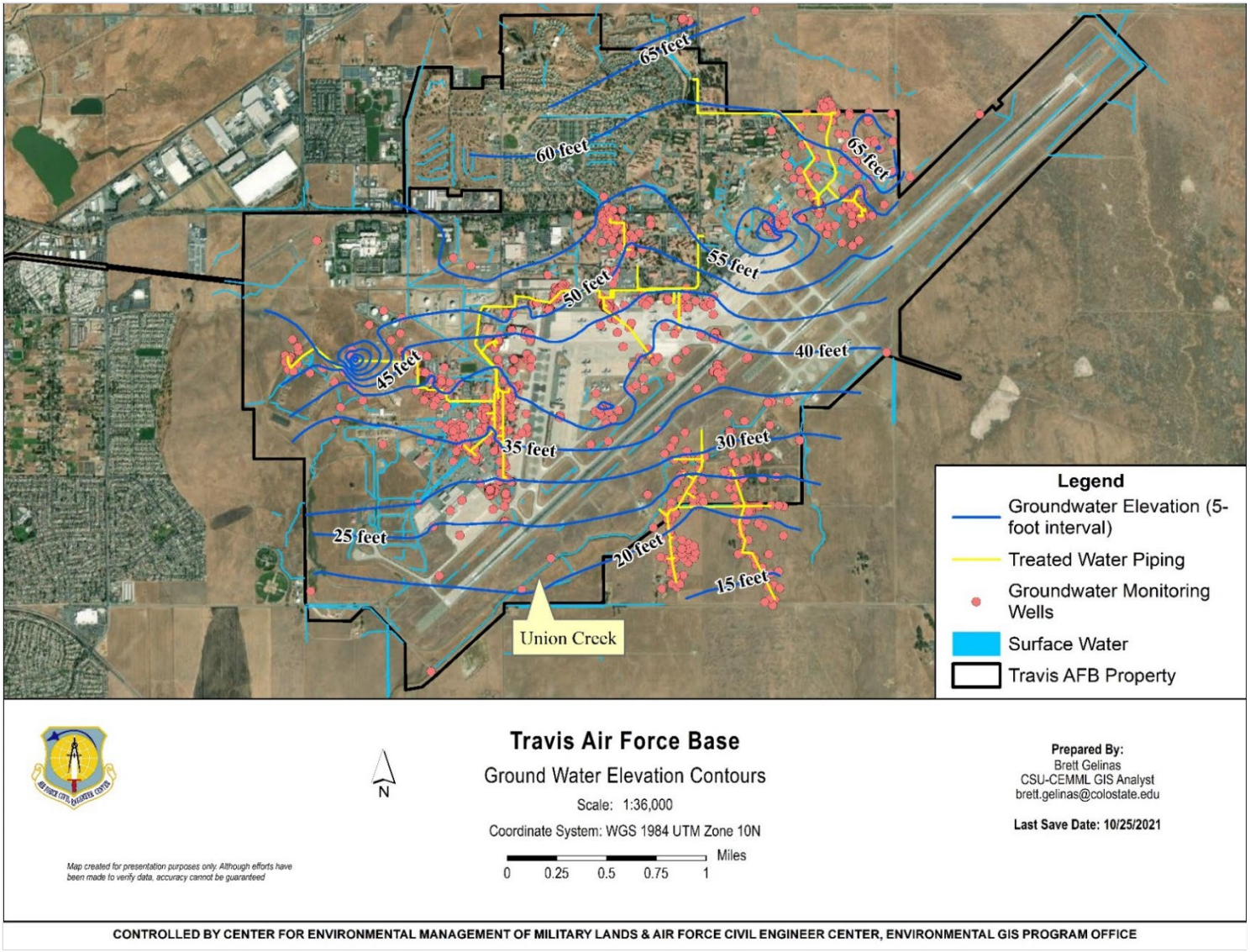

Figure 2-7. Groundwater elevation contours on Travis AFB.

2.2.4.3 Surface Water

Surface water flow onto Travis AFB is mainly comprised of the western and eastern branches of Union Creek and little to no sheet-flow from off-base. The western branch is part of Drainage Area II and has been channeled like an open ditch for most of its route across Travis AFB. This channel fills with water during heavy rains and is the main drainage for a large area of the western side of the base.

The eastern branch of Union Creek enters the base from the north through the center of the Georgetown housing area. It flows south under the flight line then continues in an above ground channel heading southwest where it joins the western branch of Union Creek. The surface water exits in the southwest corner of the base at Outfall 1.

2.2.4.4 Drainage Basins and Flooding

Travis AFB is divided into eight distinct drainage basins according to topography and drainage patterns. Six of these basins, designated as I, II, III, IV, V and VI, discharge through a series of underground piping and open ditches to storm water outfalls along Union Creek, Hill Slough and ultimately Suisun and San Francisco bays. The other basins, designated as XE and XW, sheet-flow storm water from around the Aero Club Conservation Area and east portion of Runway 21L to adjacent property outside the base. The sum of water leaving the base is comprised of surface water inflow in both branches of Union Creek, storm water collected from drainage basins I through VI, groundwater extracted and treated, and sheet-flow off the base to adjoining property from drainage basins XE and XW (Figure 2-8).

Impervious areas total approximately 38 percent of the installation property and account for the majority of storm water collected and discharged from these basins. Travis AFB's storm drain capacity is designed to handle a 10-year, 24-hour storm, and only minor temporary flooding occurs during extreme rain events in areas where storm drain piping is undersized or infiltrated by roots (Travis AFB 2017a). Routine maintenance minimizes flooding in these small areas and no damage occurs to structures.

According to Suisun city General planning 2010, the nearest floodplain mapping indicates there are no existing 100- and 500-year floodplains adjacent to Travis AFB. Major storm events have little effect on the storm water infrastructure's ability to drain the base, and natural and manmade barriers, such as elevation changes and roads, prevent floodwaters from Union Creek reaching developed areas of the base.

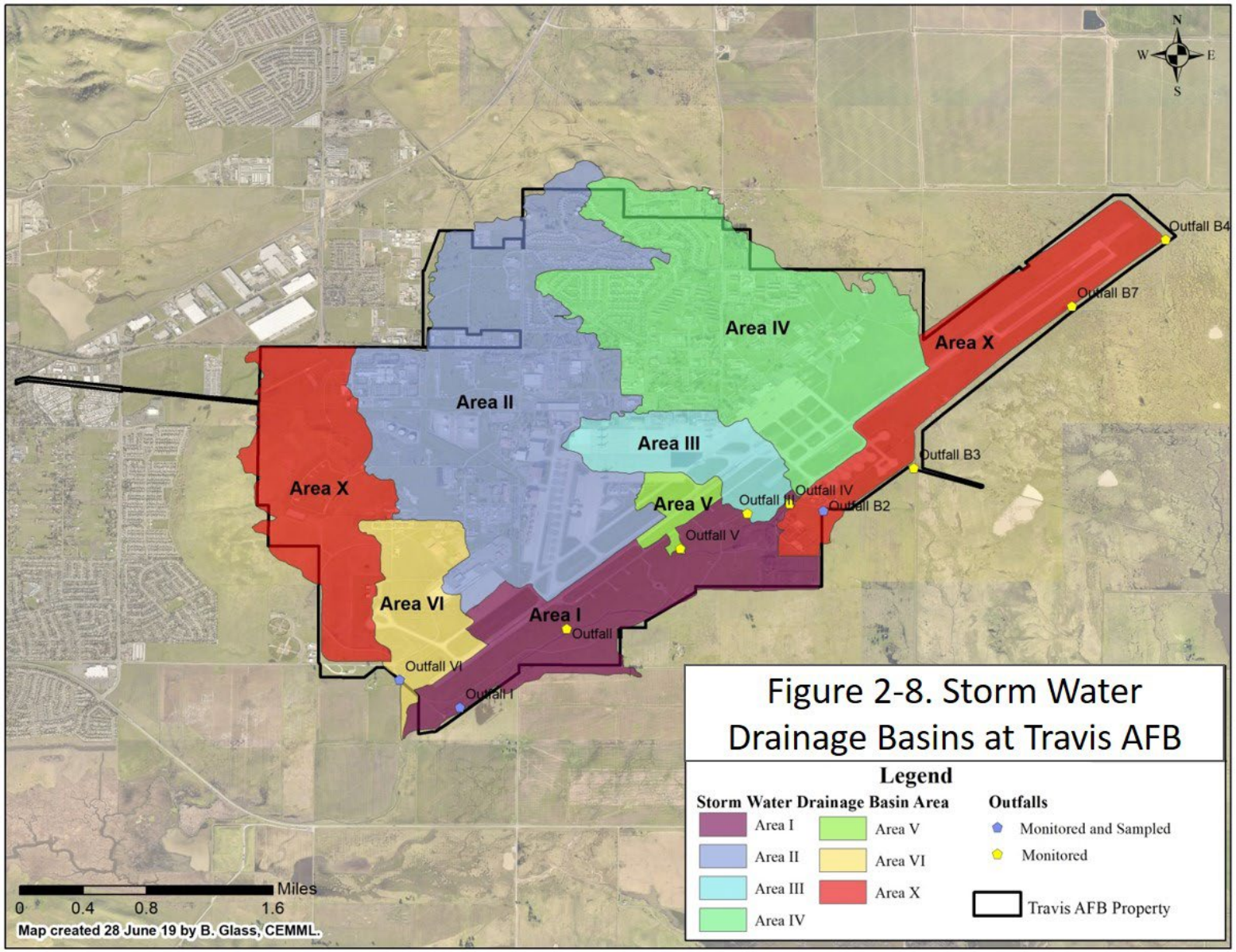

Figure 2-8. Storm water drainage basins and outfall locations on Travis AFB.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

Travis AFB is located within the Humid Temperate Domain, Mediterranean Division, California Dry Steppe Province (Bailey 2014). Ecosystems in this domain are subject to seasonal fluctuations in precipitation and temperature, since they undergo a distinctive winter season. The oscillations in environmental conditions in this domain, from lower temperatures during the winter season (due to solar radiation and the inflow of cold air streams) to the high temperatures during summer, supports diverse vegetation such as prairie, broadleaf deciduous forest and evergreen conifer forests. The climate of the California Dry Steppe Province consists of hot dry summers and mild winters with precipitation occurring mostly during the winter season as rainfall (McNab et al. 2007).

The primary ecological community is a mixture of northern claypan vernal pool and annual grassland, sometimes referred to as vernal pool grassland. This community covers over 90 percent of the natural habitat on the base and in the surrounding landscape. While vernal pools and grasslands are described separately below in order to better describe the attributes of each, they form a complex, interrelated and interdependent ecosystem. Other communities include lacustrine marsh, riparian vegetation, planted eucalyptus groves, and urban landscapes. The developed portions of Travis AFB are part of the urban landscape; within which, the ecosystem concept is further diminished by the presence of various man-made impervious surfaces.

2.3.2 Vegetation

2.3.2.1 Historical Vegetative Cover

The original vegetative cover under historic soil conditions consisted of Piedmont plain areas, upland hilly areas, waterways and low areas. Piedmont plain areas may have consisted of perennial bunch grasses, annual grasses, herbaceous annuals and some perennial forbs. Upland hilly areas were probably dominated by native oaks (*Quercus* spp.) and highly diverse associations of perennial bunch grass, annual grasses and herbaceous broadleaf annuals. Waterways and low areas consisted of willows (*Salix* spp.), cottonwoods (*Populus* spp.), tules (*Typha* and/or *Schoenoplectus* spp.), reeds (*Juncus* spp.), sedges (*Carex* spp.), salt- and alkaline- tolerant grasses, and forbs.

The land occupied by Travis AFB was originally public land that bordered on Rancho Los Putos, Rancho Los Ulpinos, and Rancho Tolenos land grants from the Mexican government dating from about 1841 (Travis AFB 2016b). Prior to this time, the inhabitants were small scattered groups of Suisun/Patwin Indians (Travis AFB 2016b). The destruction of the natural communities began in approximately 1890 when the land contained within the present-day Travis AFB was first claimed and permanently inhabited by European settlers. The early custom of free-range cattle grazing had a significant impact on the landscape, as did the subsequent practice of dry land wheat and barley farming. At the time of the original land acquisition by the federal government in June 1942, the land was acquired from approximately 20 owners.

The greatest impact to native vegetation occurred during the 20th century. The continued sowing of non-native grain, forage, and turf grasses resulted in the establishment of stands of brome (*Bromus* spp.), wild oats (*Avena* spp.), rye and fescue (*Festuca* spp.) in grasslands. Native trees were removed for agricultural operations. With settlement, windbreaks of invasive eucalyptus (*Eucalyptus globulus* and *E. viminalis*), Osage orange (*Maclura pomifera*), Monterey cypress (*Cupressus macrocarpa*), and other trees were

planted, as well as some orchard and nut trees. An approximate inventory of the trees planted is presented in Appendix C, Table C-1.

2.3.2.2 Current Vegetation Cover

Two hundred and twenty-six herbaceous plant species occur on Travis AFB (Appendix C, Table C-2). Vernal pools provide habitat for over 110 plant species or just over 44 percent of all plant taxa found on the base.

The vegetation communities that occur on Travis AFB include lacustrine marsh, riparian vegetation, vernal pools, annual grassland and urban landscapes. These are described in the following sections.

Lacustrine Marsh

A small human made, open water habitat associated with North Gate Park was created by the impoundment of Union Creek. North Gate Pond is 2.2 surface acres and has an average depth of approximately 5 feet. A well maintained recreational park with mowed grass and a jogging path adjacent to the shoreline surrounds the pond. Presently, trees and shrubs are located adjacent to the pond that provide shade and cover for picnics. Some rooted, aquatic, submerged, and floating macrophytes such as duckweed (*Lemna* sp.), Eurasian water milfoil (*Myriophyllum spicatum*), and leafy pondweed (*Potamogeton foliosus*) are located in the pond, as well as some emergent vegetation such as cattails (*Typha latifolia*), which offer cover to fish (Weston, Inc. 1995). This pond supports recreational fishing. A number of small ponds in the southeast portion of the base also exhibit this lacustrine, open water environment. The edges of these ponds support vegetation dominated by grass species (*Poaceae*) and some species of dock (*Rumex* spp.).

Riparian Vegetation

The riparian community is a component of the in-stream habitat and the exposed banks of Union Creek. The streambed is channelized, and, for the most part, the flow is sluggish. This habitat type does not extend more than a few meters from the banks of these aquatic environments. The dominant vegetative species found along Union Creek include native and non-native species such as creeping wild rye (*Elymus triticoides*), perennial pepperweed (*Lepidium latifolia*), Harding grass (*Phalaris aquatica*), saltgrass (*Distichlis spicata*), and areas of dense twig/leaf litter. Red willows (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), coyote bush (*Baccharis pilularis*), and small patches of scrub/shrub vegetation are found scattered along the creek.

Northern Claypan Vernal Pools and Swales

Vernal pools and swales are found within the grasslands. Vernal pools are shallow depressions or small, shallow ponds that fill with water during the rainy season and then dry out during the spring, becoming completely dry by late spring or early summer. This hydrologic regime supports the unique plant and animal communities characteristic of vernal pools. The vernal pools on Travis AFB are classified as northern claypan vernal pools (Marty 2016, 2019a). Vernal swales are ecologically and floristically related to vernal pools; however, vernal swales are drainage ways or poorly defined depressions that seasonally hold standing water for relatively short periods. Both of these wetland types are scattered throughout the installation but are generally absent in the highly developed central and northern areas. Perhaps the highest-quality vernal pools are found on the western side of the base and in the Castle Terrace Conservation Area. Over 600 vernal pools and swales have been identified on Travis AFB, including those delineated in 2017 and 2018 that doubled the previous number of delineated pools from 300 in 2016 to over 600 (Marty

2019a). Travis AFB has 19 seasonal wetland features, including 13 vernal pools, are over 1 acre in size; the largest is 6.57 acres. These sites are either single pools or hydrologically associated pool clusters.

Plant species identified in the vernal pools include Pacific meadow foxtail (*Alopecurus saccatus*), annual hairgrass (*Deschampsia danthonioides*), goldfields (*Lasthenia* spp., including the federally endangered Contra Costa goldfields [CCG], *Lasthenia conjugens*), wooly marbles (*Psilocarphus brevissimus* ssp. *brevissimus, P. oregonus*), popcorn-flower (*Plagiobothrys stipitatus, P. greenei*), downingia (*Downingia concolor*, *D. insignis*), meadow barley (*Hordeum brachyantherum*), coyote thistle (*Eryngium vaseyi*), hyssop loosestrife (*Lythrum hyssopifolia*), spikerush (*Eleocharis macrostachya*), and alkali milk vetch (*Astragalus tener* var. *tener*).

Annual Grassland

Grasslands comprise approximately 1,735 acres on Travis AFB. The dominant vegetation in these areas includes non-native, annual, upland species such as soft chess (*Bromus hordeaceus*), Italian ryegrass (*Lolium perennis*), rat-tail fescue (*Festuca myuros* var. *myuros*), filaree (*Erodium* spp.), wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), and Harding grass. Native perennial grasses grow in abundance in a few areas but generally in lower densities. At the site of the Aero Club Conservation Area, several acres of meadow barley (*Hordeum brachyantherum*) grow interspersed between the vernal pools. In the Castle Terrace Conservation Area, large patches of purple needlegrass (*Stipa pulchra*) can be found. This plant community supports a variety of birds, reptiles, and mammals.

Highly disturbed grassland is found in the southeastern quadrant of the base, adjacent to Union Creek in an area formerly used for pheasant hunting. In general, disturbed grasslands occur in areas such as road fills and construction sites and in areas subject to recurrent disturbances like mowing. Such habitats are widely distributed but constitute only a small portion of the land area. They are also evident on old fire training areas and landfills. Some shrub vegetation grows in the grasslands on Travis AFB. The vegetation in these areas can contain a variety of native and non-native shrub and tree species including coyote brush, California pepper tree (*Schinus molle*), and black locust (*Robinia pseudoacacia*). Common herbaceous species include yellow starthistle (*Centaurea solstitialis*), cut-leaved geranium (*Geranium dissectum*), and some annual grasses such as wild oats and ripgut brome.

2.3.2.3 Future Vegetation Cover

The dominant vegetation at Travis AFB includes non-native annual grass species such as soft chess, Italian ryegrass, rattail fescue, wild oats, ripgut brome, and perennial Harding grass. Native perennial grasses grow in abundance in a few areas, and native annual broadleaf species are abundant seasonally in grasslands and vernal pools. Slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species, and the products and services they provide. The extent of these changes will depend on changes in precipitation, temperature, and fire. In particular, invasive species' reaction to changing abiotic conditions may be complex. Invasive species by nature tend to have wide tolerances for abiotic conditions and are generally free of mutualistic or antagonistic biotic relationships that would limit spread, so they may have increased advantages over native neighbors as conditions change. Species formerly limited by temperature may expand ranges or enjoy longer growing seasons, allowing them to spread and/or increase in biomass (Hellman et al. 2008). The already highly-invaded systems at Travis AFB may see increases in non-native species richness, biomass, and effect as a result.

Changes in precipitation frequency, timing, and total amount per year and per season could cause major changes in vegetation cover. Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability will dramatically increase potential erosion rates. The combination of eroded sediment transport to streams, coupled with changes in the timing and magnitude of minimum and maximum flows can affect water quality, riparian vegetation, and aquatic fauna, and increases in disturbed area may increase opportunities for establishment of invasive species (CEMML 2019a).

2.3.2.4 Turf and Landscaped Areas

Travis AFB landscaping strives to provide an attractive, low-maintenance landscaping environment that enhances the natural and human-made features of the base. Appendix D includes recommended native plant species to be used in landscaping around Travis AFB. The base has approximately 300 acres of irrigated, improved urban landscapes. Over 80 species of trees have been planted (Appendix C, Table C-2).

2.3.3 Fish and Wildlife

Fish and Wildlife descriptions follow the format of fauna followed by classes of species, including mammals, birds, reptiles, fish, amphibians, and aquatic invertebrates, organized by the vegetation types each inhabits.

Lacustrine Marsh

Several of the ponds on Travis AFB that contain lacustrine marsh vegetation are known to support the northwestern pond turtle (*Actinemys marmorata*) a California species of special concern (Center for Integrated Research on the Environment [CIRE] 2017).

Riparian Vegetation

Representative wildlife within this habitat at Union Creek include Red-winged Blackbirds (*Agelaius phoeniceus*), Mallards (*Anas platyrhynchos*), Pacific tree frogs (*Pseudacris regilla*), northwestern pond turtles and California red-sided garter snake (*Thamnophis sirtalis infernalis*). The Tricolored Blackbird *(Agelaius tricolor)* is also found using habitat within Union Creek (CIRE 2017; Marty 2017c). Common bird names are capitalized in compliance with the naming convention established by the American Ornithological Union.

Representative wildlife species within this habitat along the edge of ponds include the Brewer's Blackbird (*Euphagus cyanocephalus*), Anna's Hummingbird (*Calypte anna*), Cliff Swallows (*Hirundo pyrrhonota*), Barn Swallows (*Hirundo rustica*), and Violet-green Swallows (*Tachycineta bicolor*). A wide variety of migratory birds also utilizes this habitat. Western fence lizards (*Sceloporus occidentalis)*, gopher snakes (*Pituophis melanoleucus*), and the house mouse (*Mus musculus*) are also abundant in this habitat (Weston, Inc. 1995).

Northern Claypan Vernal Pools and Swales

Federally protected invertebrate and vertebrate species identified within the vernal pools at Travis AFB include vernal pool fairy shrimp ([VPFS] *Branchinecta lynchi*), vernal pool tadpole shrimp ([VPTS] *Lepidurus packardi*) and CTS (CH2M Hill 2006).

Annual Grassland

The most abundant wildlife in the grasslands on the west side of the base include Red-winged Blackbird, Ring-necked Pheasant (*Phasianus colchicus*), northwestern fence lizard, Pacific gopher snake (*Pituophis catenifer*), and deer mouse (*Peromyscus maniculatus*) (Weston, Inc. 1995).

The grassland habitat next to Union Creek on the south side of the base supports numerous birds, reptiles, and small mammals. Dominant representatives include Red-winged Blackbird (*Agelaius phoeniceus*), Killdeer (*Charadrius vociferus*), White-tailed Kite (*Elanus leucurus*), Western Meadowlark (*Sturnella neglecta*), Pacific tree frog (*Pseudacris regilla*), western fence lizard (*Sceloporus occidentalis)*, gopher snakes (*Pituophis melanoleucus*), deer mouse (*Peromyscus maniculatus*), and house mouse (*Mus musculus*) (Weston, Inc. 1995). Fossorial species, including Western Burrowing Owl ([BUOW] *Athene cunicularia*), California ground squirrel (*Otospermophilus beecheyi*), and CTS also occupy grassland habitats and share burrow complexes.

Turf and Landscaped Areas

Wildlife found in the landscaped areas on the base include Song Sparrow (*Melospiza melodia*), Red-winged Blackbird, Killdeer, House Sparrow (*Passer domesticus*), western harvest mouse (*Reithrodontomys megalotis*), and California ground squirrels (Weston, Inc. 1995).

Mammals

Thirty-nine mammal species are found on the base. California ground squirrels and black-tailed jackrabbits (*Lepus californicus*) are abundant throughout Travis AFB. Four species of bats have been detected with acoustic monitoring. Table C-1 in Appendix C includes a list of all the mammals that have been observed or for which there is evidence of habitat use from scat, burrows, tracks and acoustic surveys.

Birds

Over 175 species of birds have been found on Travis AFB. Of these, 36 species were confirmed as nesting on the base; all are found commonly or regularly in vicinity of Travis AFB, and some of these are special-status species. The USAF and Partners in Flight (PIF) developed a checklist of birds which lists 153 bird species that have been identified or that have potential to occur on base (DoD n.d.). Table C-1 in Appendix C includes a list of all bird species observed on or known to occur on Travis AFB.

Reptiles

Seven species of reptiles have been recorded on the base. Northwestern fence lizards and gopher snakes were both abundant and occupied a wide range of habitats including annual grassland and riparian surrounding Union Creek. The riparian zone associated with Union Creek was the only habitat occupied by the California red-sided garter snake; and the western pond turtles were found in the riparian zone and in the N. Gate Pond habitat. California king snakes (*Lampropeltis californiae*) were observed to occupy only disturbed grassland. A striped racer (*Coluber lateralis*) was also observed in this habitat and in heavily grazed pasture. A western skink (*Plestiodon skiltonianus*) was observed in irregularly mowed grassland. Table C-1 in Appendix C includes a list of all reptile species observed or known to occur on the base.

Amphibians

The Pacific chorus frog, formerly known as the Pacific tree frog (*Pseudacris regilla*), has been identified as one of the few common amphibians on the base primarily associated with riparian and early successional habitats. Adult bullfrogs (*Rana catesbeiana*) and western toads (*Anaxyrus boreas*) have also been identified

in ponds in the Castle Terrace Conservation Area (Earth Tech 1999). Table C-1 in Appendix C includes a list of all amphibians observed or known to occur on the base.

Fish

Five species of fish have been identified in the North Gate Pond, including large-mouth bass (*Micropterus samoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), western mosquitofish (*Gambusia affinis*), and channel catfish (*Ictalurus punctatus*). Bluegills are the most abundant and share the environment with a healthy population of large-mouth bass. Size ranges of all species collected were mid- to large-size specimens, suggesting either low recruitment of juveniles into adult stocks, or that juveniles frequent upstream areas in Union Creek for cover and forage. Union Creek also supports an abundance of fish including western mosquitofish (*Gambusia affinis*), fathead minnow (*Pimephales promelas*), hitch (*Lavinia exilicauda*), threespine stickleback (*Gasterosteus aculeatus*), largemouth bass and rainwater killifish (*Lucania parva*). A list of fish species identified or known to occur on Travis AFB is provided in Appendix C, Table C-1.

Invertebrates

Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*) was found in several locations on the base and the Former Sacramento Northern Railroad right-of-way ([ROW] ManTech SRS Technologies, Inc. [ManTech] 2016). Vernal pools provide important habitat for several invertebrates that are federally-listed, including vernal pool fairy shrimp, vernal pool tadpole shrimp, and hairy water *flea (Dumontia oregonensis*). In addition, rare upland species such as Crotch's bumble bee (*Bombus crotchii*), western bumblebee (*B. occidentalis occidentalis*), and monarch butterfly (*Danaus plexippus*) could occur or are known to occur on Travis AFB.

2.3.4 Threatened and Endangered Species and Species of Concern

In accordance with (IAW) the Endangered Species Act (ESA), an "endangered species" (FE) is defined as any species that is in danger of extinction throughout all or a significant portion of its range. A "threatened species" (FT) is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The USFWS also maintains a list of species that are regarded as candidates (FC) for possible listing under the ESA, Under Review (UR) for possible listing, and a list of species of concern (SOC), which may require some conservation actions but which are not threatened with extinction. Although FC and SOC receive no statutory protection under the ESA, the USAF gives the same protection, when practical, to these species as it does to federally endangered and threatened species. Protecting species that are under increased regulatory attention and may be listed at a later date ensures that Travis AFB has a proactive and forward-looking management approach rather than being merely reactive to new listing decisions.

The state of California has varying and often overlapping protections for many species. The following categories of species receive protection from Travis AFB when such protection is not in conflict with the military mission: species listed as endangered (SE) or threatened (ST)pursuant to the California Endangered Species Act (CESA); plants with a California Rare Plant Rank (CRPR); as well as species that are California fully protected (CFP); Species of special concern (SSC), watch list (WL), or invertebrates of conservation priority (ICP) or invertebrates of conservation concern (ICC) under CDFW jurisdiction. For the purposes of this INRMP, special-status species on Travis AFB includes species in any of the above categories, and also includes (1) species protected by federal laws other than the ESA, including the Migratory Bird Treaty

Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA); and (2) avian species considered to be birds of conservation concern (BCC) by USFWS and/or a DoD Partners In Flight (PIF) mission-sensitive bird priority species. Details of these listing categories are presented below:

- CESA (SE, ST)—The CESA functions similarly to the federal ESA, in that the state may designate species as endangered or threatened after a formal listing by CDFW.
- CFP, SSC, WL, ICP, ICC— CFP status was California's initial effort (through CDFW) to identify and provide additional protection to those animals that were rare or faced possible extinction. Most of these species have subsequently been listed under the California and/or federal endangered species act, with some exceptions. SSCs are vertebrate species that have declining population levels, limited ranges, and/or continuing threats that make them vulnerable to extinction. WL are species that either: were previously designated as SSC but that no longer merit that status, or do not yet meet SSC criteria but for which there is a concern and a need for additional information. ICP are invertebrates listed as endangered at the federal or state level, as well as those with NatureServe Rank of G1, G1G2, S1, S1S2, SH or SX. ICC are invertebrates included on the CDFW Special Animals List.
- CRPR—The California Native Plant Society (CNPS) ranks rare plants using the CRPR system, which assigns rare plants one of the following ranks: 1A (presumed extirpated or extinct), 1B (rare, threatened, or endangered in California [CA] and elsewhere), 2A (presumed extirpated in CA but common elsewhere), 2B (rare, threatened, or endangered in CA but more common elsewhere), 3 (review list, more information needed), or 4 (plants of limited distribution). Each listed taxon is also assigned a Threat Rank: 0.1 (seriously threatened in CA), 0.2 (moderately threatened), or 0.3 (not very threatened in CA).
- MBTA/BGEPA—Two important Acts dictate conservation efforts for certain birds: the MBTA and the BGEPA. The MBTA was signed in 1918 and implements four international conservation treaties the U.S. entered into with Canada, Mexico, Japan, and Russia. It is intended to ensure the sustainability of bird populations shared amongst the signatories through prohibiting the take of protected migratory bird species without prior authorization by USFWS. The BGEPA was enacted in 1940, and it prohibits taking, possessing, or transporting any eagle or eagle parts without authorization from USFWS. It applies to both Bald and Golden Eagles, even after the Bald Eagle was de-listed in 2007.
- BCC—The USFWS promulgates a list of migratory and non-migratory bird species (beyond those already designated as federally endangered or threatened) that are their highest conservation priorities. The list is based on population abundance, trends, threats and range extents. Because bird species may be declining in some regions and stable in others, the BCC list recognizes four geographic zones, which are subdivided into Bird Conservation Regions: (1) Continental U.S., including Alaska; (2) Pacific Ocean Islands, including Hawai'i; (3) Puerto Rico, the U.S. Virgin Islands and Navassa; and (4) Continental and Marine Bird Conservation Regions. Travis AFB is in the Continental U.S. Zone, and the Coastal California Bird Conservation Region.
- DoD PIF—The PIF program consists of a cooperative network of natural resources personnel from military installations across the U.S. that was established in 1991 to conserve migratory and resident birds and their habitats on DoD lands. The program works beyond installation boundaries to facilitate cooperative partnerships, determine the current status of bird populations, and prevent the listing of additional birds as threatened or endangered. Within the PIF program, the Mission

Sensitive Species Working Group annually reviews the list of USFWS Birds of Conservation Concern and PIF Species of Concern and assesses which species could have the greatest impact on the military mission if federally listed under the ESA. The working group also provides information about these sensitive species to all DoD Military Services, and offers recommendations on how to avoid or minimize mission impacts while supporting the conservation of the species.

Species protected under any of these federal or state categories are collectively known as special-status species on Travis AFB, and they are considered in the day-to-day management on all Travis AFB properties. Periodic surveys (repeated every five year) are conducted to determine which species are present and their population trends. Some species are also actively managed through more frequent targeted surveys, monitoring, and/or habitat restoration efforts. Note that Travis AFB does not protect all special-status species equally, as federally-listed species receive greater protection than state or CNPS-listed species.

Table 2-6 lists 105 special-status species present, having potential to occur, or having critical habitat at Travis AFB, reflecting the high levels of biodiversity in the region as well as the existence of substantial suitable habitat for special-status species. Potential to occur was determined by consulting the California Natural Diversity Database (CNDDB 2018) records within two miles of the installation, county rare species lists, and reports and surveys conducted on Travis AFB and its GSUs. The species accounts following the table give background on those species found on Travis AFB that require management and/or monitoring. Table 2-6 includes the following categories for all species: Present, Suitable Habitat Present, Presumed Absent (species not detected during surveys), Absent (no suitable habitat), & Possibly occurs on base (needs verification).

Table 2-6. Special-status species that are present or have the potential to occur on Travis AFB properties.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Plants- 37 Species (6 present on Base and/or GSUs); 7 with federal listing status.				
Alkali milk vetch	*Astragalus tener* var. *tener*	CRPR 1B.2	Present	Suitable habitat on Railroad right-of-way (ROW) GSU, Outer Runway Marker GSU, Middle Runway Marker GSU and Point Ozol GSUs
Baker's navarretia	*Navarretia leucocephala* ssp. *bakeri*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys Suitable habitat on Railroad ROW GSU.
Bearded popcorn flower	*Plagiobothrys hystriculus*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys. Suitable habitat on Railroad ROW GSU
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys but suitable habitat may exist at the Railroad ROW.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Bolander's water hemlock	*Cicuta maculata* var. *bolanderi*	CRPR 2B.1	Absent. Base lacks suitable habitat.	Absent. GSUs lack suitable habitat.
Brittlescale	*Atriplex depressa*	CRPR 1B.2	Present.	Present on Railroad ROW GSU
California alkali grass	*Puccinellia simplex*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys. Suitable habitat on Railroad ROW GSU
Carquinez goldenbush	*Isocoma arguta*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Colusa grass	*Neostapfia colusana*	FT, SE	Presumed absent. Species not detected during floristic surveys.	Absent. GSUs lack suitable habitat to support species.
Congdon's tarplant	*Centromadia parryi ssp. congdonii*	CRPR 1B.1	Possibly occurs on base (needs verification)	Suitable habitat on Railroad ROW GSU, has been documented near Potrero Hills GSU but no suitable habitat found. Unspecified subspecies of *C. parryi* noted at Middle RW Marker, Railroad ROW. No suitable habitat found at Point Ozol in 2019.
Contra Costa goldfields	*Lasthenia conjugens*	FE, CRPR 1B.1	Present	Presumed absent. Species not detected during appropriately timed floristic surveys.
Coulter's goldfields	*Lasthenia glabrata* ssp. *coulteri*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Crampton's tuctoria/ Solano grass	*Tuctoria mucronata*	FE, SE	Presumed absent. Species not detected during floristic surveys.	Absent. GSUs lack suitable habitat to support species.
Dwarf downingia	*Downingia pusilla*	CRPR 2B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	CRPR 1B.2	Absent. Base lacks suitable habitat.	Absent. GSUs lack suitable habitat.
Fragrant fritillary	*Fritillaria liliacea*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Suitable habitat on Railroad ROW GSU
Heartscale	*Atriplex cordulata* var. *cordulata*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys but suitable habitat may exist at the Railroad ROW.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Heckard's peppergrass	*Lepidium latipes*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Hispid salty bird's-beak	*Chloropyron molle* ssp. *hispidum*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Legenere	*Legenere limosa*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys. Suitable habitat on Railroad ROW GSU.
Long-styled sand-spurrey	*Spergularia macrotheca* var. *longistyla*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Marsh microseris	*Microseris paludosa*	CRPR 1B.2	Absent. Base lacks suitable habitat.	Absent. GSUs lack suitable habitat.
Mason's lilaeopsis	*Lilaeopsis masonii*	CRPR 1B.1	Absent. Base lacks suitable habitat.	Absent. GSUs lack suitable habitat.
Mt. Diablo buckwheat	*Eriogonum truncatum*	CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Mount Diablo globelily	*Calochortus pulchellus*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Potential to occur on Point Ozol, but not detected.
Mount Diablo helianthella	*Helianthella castanea*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Potential to occur on Point Ozol, but not detected.
Pappose tarplant	*Centromadia parryi* ssp. *parryi*	CRPR 1B.2	Possibly occurs on base (needs verification)	Suitable habitat on Railroad ROW GSU
Saline clover	*Trifolium hydrophilum*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
San Joaquin spearscale	*Extriplex joaquinana*	CRPR 1B.2	Present	Present on Railroad ROW GSU. Suitable habitat on Outer Runway Marker and Middle Runway Marker GSUs.
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	FT, SE, CRPR 1B.1	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Showy Indian clover	*Trifolium amoenum*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys. Suitable habitat may exist at the Railroad ROW.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Slender-leaved pondweed	*Stuckenia filiformis* ssp. *alpina*	CRPR 2B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Soft salty bird's-beak	*Chloropyron molle* ssp. *molle*	FE, CRPR 1B.2	Absent. Base lacks suitable habitat to support species.	Absent. GSUs lack suitable habitat to support species.
Suisun Marsh aster	*Symphyotrichum lentum*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	FE, CRPR 1B.1	Absent. Base lacks suitable habitat to support species.	Presumed absent. Species not detected during floristic surveys
Two-fork clover	*Trifolium amoenum*	FE, CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Vernal pool smallscale	*Atriplex persistens*	CRPR 1B.2	Presumed absent. Species not detected during floristic surveys.	Presumed absent. Species not detected during floristic surveys.
Fish- 6 species (2 species present or possibly present); 5 with federal listing status.				
California roach	*Hesperoleucus symmetricus*	SSC	Present.	Unknown, no survey data exist, but unlikely based on lack of suitable habitat.
Central Valley Chinook salmon	*Oncorhynchus tshawytsha*	FT (Central Valley spring-run), FE (Sacramento River winter-run) ST (spring-run), SE (winter-run)	Potentially found spring-run on base in high flood event in 2017. Identification not confirmed.	Absent. GSUs lack suitable habitat.
Central Valley steelhead	*Oncorhynchus mykiss*	FT	Presumed absent. Species not detected during surveys.	Absent. GSUs lack suitable habitat.
Delta smelt	*Hypomesus transpacificus*	FT, SE	Presumed absent. Species not detected during surveys.	Absent. GSUs lack suitable habitat.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Green sturgeon	*Acipenser medirostris*	FT	Presumed absent. Species not detected during surveys.	Absent. GSUs lack suitable habitat.
Longfin smelt	*Spirinchus thaleicthys*	FC, ST	Presumed absent. Species not detected during surveys.	Absent. GSUs lack suitable habitat.
Mammals- 7 species (4 species present); 1 with federal listing status.				
Pallid bat	*Antrozous pallidus*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Salt-marsh harvest mouse	*Reithrodontomys raviventris*	FE, SE, CFP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Suisun shrew	*Sorex ornatus sinuosus*	SSC	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Western mastiff bat	*Eumops perotis*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Western red bat	*Lasiurus blossevillii*	SSC	Present	Presumed absent. Species not detected during GSU surveys.
American badger	*Taxiea taxus*	SSC	Presumed absent, no existing records	Presumed absent, no existing records
Amphibians- 4 species (2 species present); 3 with federal listing status.				
California newt or Coast range newt	*Taricha torosa*	SSC (Montere y County only)	Presumed absent. Species not detected during surveys., Not SSC in Solano County	Has been found on Point Ozol GSU. Not SSC in Contra Costa County
California red-legged frog	*Rana draytonii*	FT, SSC	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys, but upland habitat may be present at Point Ozol.
California tiger salamander	*Ambystoma californiense*	FT, ST	Present.	Suitable habitat exists on the Railroad ROW, Potrero Hills Annex and potentially the Cypress Lakes Golf Course.
Western spadefoot toad	*Spea hamondii*	UR, SSC	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Reptiles- 2 species (1 present); both with federal listing status.				
Giant garter snake	*Thamnophis gigas*	FT, ST	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Western pond turtle	*Actinemys marmorata*	UR, SSC	Present	Has been found on Cypress Lakes Golf Course and the Railroad ROW GSUs.
Birds- 37 species (6 present for nesting); 33 with federal listing status				
Allen's Hummingbird	*Selasphorus sasin*	BCC	Present	Presumed absent. Species not detected during GSU surveys.
American White Pelican	*Pelecanus erythrorhynchos*	SSC	Present	Has been found on Potrero Hills Annex, Point Ozol, and Railroad ROW GSUs
Bald Eagle	*Haliaeetus leucocephalus*	BCC[2], BGEPA, MBTA[3], SE, CFP	Present	Presumed absent. Species not detected during GSU surveys.
Barrow's Goldeneye	*Bucephala islandica*	SSC	Present	Presumed absent. Species not detected during GSU surveys
California Black Rail	*Laterallus jamaicensis coturniculus*	BCC, ST, CFP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
California Gull	*Larus californicus*	BCC, WL	Present.	Presumed present.
California Least Tern	*Sternula antillarum browni*	FE, SE, CFP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Cooper's Hawk	*Accipiter cooperii*	MBTA, WL	Present	Found on Potrero Hills Annex
Double-crested Cormorant	*Phalacrocorax auritus*	WL	Present.	Present on Point Ozol.
Ferruginous Hawk	*Buteo regalis*	WL	Present	Presumed absent. Species not detected during GSU surveys.
Golden Eagle	*Aquila chrysaetos*	BGEPA, PIFT2, MBTA[3], WL, CFP	Present	Presumed absent. Species not detected during GSU surveys.
Greater Sandhill Crane	*Grus canadensis*	MBTA, ST	Present	Presumed absent. Species not detected during GSU surveys.
Loggerhead Shrike	*Lanius ludovicianus*	MBTA, SSC	Present- nests on base	Found on Potrero Hills Annex and Railroad ROW GSU
Long-billed Curlew	*Numenius americanus*	BCC[2], MBTA	Present	Found on Cypress Lakes Golf Course
Marbled Godwit	*Limosa fedoa*	BCC, MBTA	Present	Presumed absent. Species not detected during GSU surveys.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Merlin	*Falco columbarius*	MBTA, WL	Present (incidental, not commonly observed).	Presumed present.
Northern Harrier	*Circus cyaneus*	BCC, MBTA, SSC	Present	Found on Potrero Hills Annex and Railroad ROW GSU
Nuttall's Woodpecker	*Picoides nuttallii*	BCC, MBTA	Present	Found on Point Ozol and Cypress Lakes Golf Course
Oak Titmouse	*Baeolophus inornatus*	BCC	Present	Found on Point Ozol
Osprey	*Pandion haliaetus*	MBTA, WL	Present	Found on Point Ozol
Peregrine Falcon	*Falco peregrinus*	BCC, MBTA, CFP	Present	Found on Point Ozol
Prairie Falcon	*Falco mexicanus*	BCC[2], WL	Present	Found on Point Ozol
California Ridgway's Rail	*Rallus obsoletus obsoletus*	FE, SE, CFP	Has not been identified on-base	Presumed absent. Species not detected during GSU surveys.
Rufous Hummingbird	*Selasphorus rufus*	BCC	Present.	Presumed absent. Species not detected during GSU surveys.
Saltmarsh Common Yellowthroat	*Geothlypis trichas sinuosa*	MBTA, SSC	Presumed absent. Species not detected during surveys	Presumed absent. Species not detected during GSU surveys.
Sharp-shinned Hawk	*Accipiter striatus*	MBTA, WL	Present	Found on Railroad ROW GSU
Short-billed Godwit	*Limnodromus griseus*	BCC, MBTA	Present	Presumed absent. Species not detected during GSU surveys.
Short-eared Owl	*Asio flammeus*	MBTA, SSC	Present	Presumed absent. Species not detected during GSU surveys.
Suisun song Sparrow	*Melospiza melodia maxillaris*	MBTA, SSC	Present	Presumed absent. Species not detected during GSU surveys.
Swainson's Hawk	*Buteo swainsonii*	MBTA, ST	Present- nests on base	Observed flying over Potrero Hills GSU and Cypress Lakes Golf Course
Tricolored Blackbird	*Agelaius tricolor*	BCC[2], ST	Present- nests on base	Found on Railroad ROW GSU
Western Burrowing Owl	*Athene cunicularia hypogea*	BCC[2], PIFT2, MBTA, SSC	Present- nests on base	Found on Potrero Hills Annex and Railroad ROW GSU

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Whimbrel	*Numenius phaeopus*	BCC	Present	Presumed absent. Species not detected during GSU surveys.
White-tailed Kite	*Elanus leucurus*	MBTA, CFP	Present- nests on base	Presumed absent. Species not detected during GSU surveys.
White-faced Ibis	*Plegadis chihi*	MBTA, WL	Present	Presumed absent. Species not detected during GSU surveys.
Yellow Warbler	*Dendroica petechia*	BCC, SSC	Present	Presumed absent. Species not detected during GSU surveys.
Yellow-billed Magpie	*Pica nuttalli*	BCC	Present- nests on base	Found on Cypress Lakes Golf Course
Invertebrates- 12 species (6 present or needing surveys); 6 with federal listing status				
California fairy shrimp	*Linderiella occidentalis*	ICP	Present	Presumed absent. Species not detected during surveys
Conservancy fairy shrimp	*Branchinecta conservatio*	FE, ICP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Crotch's bumble bee	*Bombus crotchii*	ICP	Possibly occurs on base (needs verification).	Presumed absent. Species not detected during GSU surveys.
Delta green ground beetle	*Elaphrus viridis*	FT, ICP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.
Hairy water flea	*Dumontia oregonensis*	ICP	Present	Presumed absent. Species not detected during GSU surveys.
Midvalley fairy shrimp	*Branchinecta mesovallensis*	ICP	Present	Presumed absent. Species not detected during GSU surveys.
Monarch butterfly	*Danaus plexippus plexippus*	FC, ICP	Present	Habitat (milkweed) identified on Railroad ROW and Point Ozol GSUs
Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	ICP	Presumed absent. Species not detected during surveys	Present on Railroad ROW.
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT, ICP	Present	Found on Railroad ROW GSU, Outer Runway Marker GSU, Middle Runway Marker GSU and potential habitat exists on Point Ozol GSU
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE, ICP	Present	Found on Railroad ROW GSU
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT, ICP	Presumed absent. Species not detected during surveys.	Presumed absent. Species not detected during GSU surveys.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Western bumble bee	*Bombus occidentalis occidentalis*	ICP	Possibly occurs on base (needs verification).	Presumed absent. Species not detected during GSU surveys.

[1] FE=Federally Endangered, FT=Federally Threatened, FC=Federal Candidate for Listing, SOC=Federal Species of Concern, SE= State Endangered, ST= State Threatened, CRPR=CA Rare Plant Rank, CFP= CA Fully Protected, BCC=Birds of Conservation Concern (USFWS), BGEPA=Bald and Golden Eagle Protection Act ICP=Invertebrate of Conservation Priority, ICC=Invertebrate of Conservation Concern, SSC=Species of Special Concern WL=Watch list (CDFW),

[2] Species is also a Department of Defense Partners in Flight mission sensitive priority bird species (DoD 2016).

[3] Only species with other federal or state status were included, not all species protected under the MBTA. Sources: USFWS 2008 Birds of Conservation Concern, ManTech 2016, USFWS 2018a, USDA list of birds observed on Travis AFB from July 2014 to June 2019.

The information in this section is based on a review of sensitive plant and animal lists included in Travis AFB documents, USFWS biological opinions, data contained in the CNDDB (CNDDB 2021); and the USFWS list of T&E plants and animals that may potentially occur in Solano County (USFWS 2018). Selected special-status species found to occur during surveys are identified in Figure 2-9. The Figure displays only those species with spatial locations in the base data, all other species listed as "Present" in Table 2-6 are documented but locations are not mapped. Nearby occurrence data for special-status species and their habitat was collected from the CNDDB to ensure Travis AFB considers all species that could occur on the base (Figure 2-14; CNDDB 2021). Travis AFB has planned several projects specific to these special-status species (Section 8, Goal 2), and the species that are known to occur (or known to nest, in the case of special status birds) are discussed in the following sections. Travis AFB will continue to survey for all of the taxa listed in Table 2-6, and if any new special-status species are detected, the INRMP will be updated with a species account and location information.

Previous editions of this INRMP have included species accounts for special-status species that have not been found on the base and for which there is no suitable habitat: Crampton's tuctoria (*Tuctoria mucronata;* FE, SE), Colusa grass (*Neostapfia colusana;* FT, SE), soft salty bird's beak (*Chloropyron molle* ssp. *molle;* FE, CRPR 1B.2), Delta green ground beetle (*Elaphus viridis;* FT, ICP; DGGB), Conservancy fairy shrimp (*Branchinecta conservatio;* FE, ICP), Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus;* FT, ICP), California red-legged frog (*Rana draytonii*; FT, SSC), and Western spadefoot toad (*Spea hammondii*; UR, SSC). This edition has removed those detailed species accounts in the interests of brevity but they remain in Table 2-6 and will continue to be included as target species in surveys. In addition, per the 2018 Programmatic Biological Opinion, Travis AFB maintains a one-mile buffer around all DGGB localities and potential habitat within which this species will be considered in project consultation (USFWS 2018b).

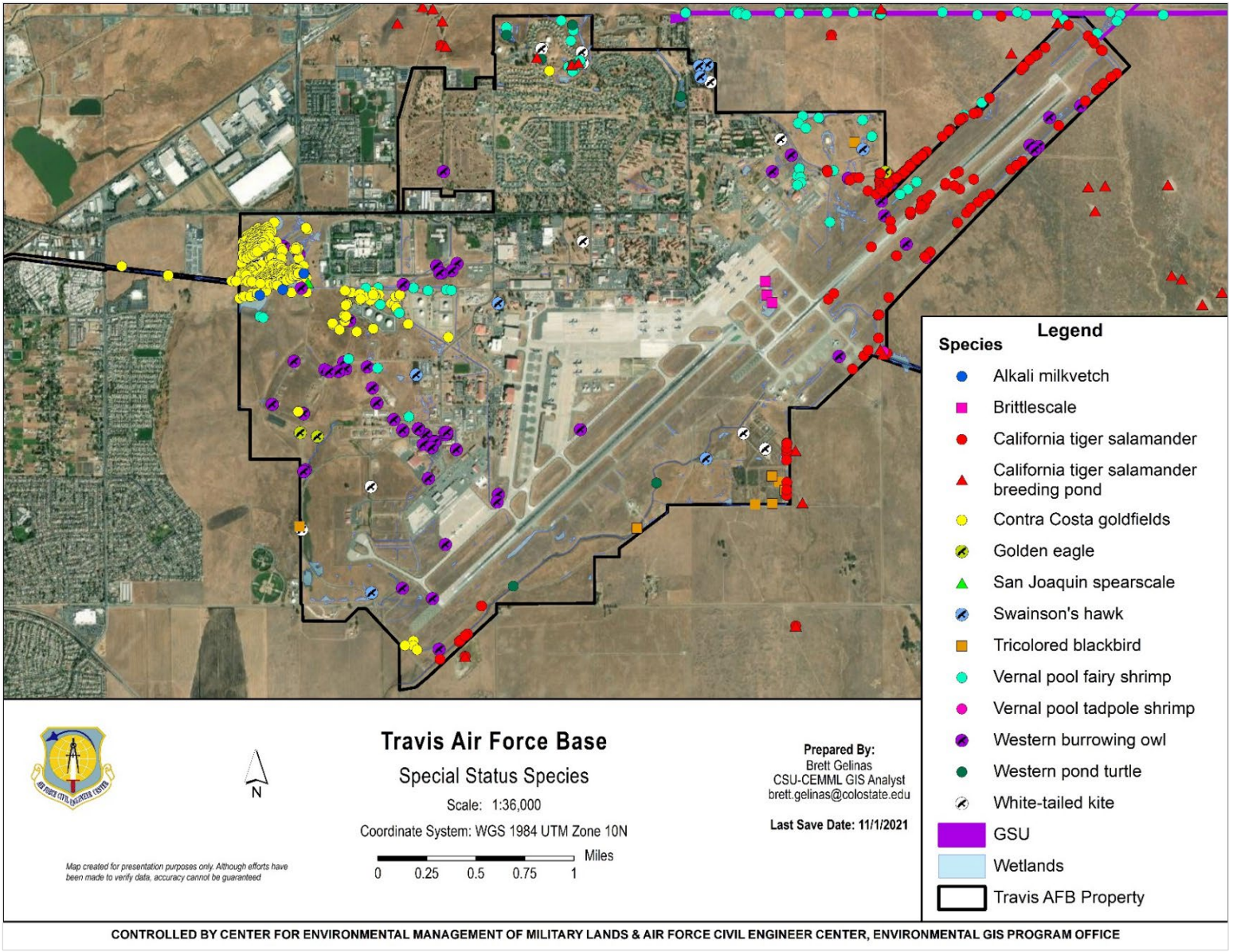

Figure 2-9. Selected special-status species occurrences on Travis AFB.

2.3.4.1 Plants

Of the 37 total special-status species of plants in Table 2-6 with the potential to occur on Travis AFB,, seven have been documented to occur or have potential to occur based on suitable habitat: alkali milkvetch (*Astragalus tener* var *tener*), brittlescale (*Atriplex depressa*), Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), Contra Costa goldfields (*Lasthenia conjugens*), pappose tarplant (*Centromadia parryi* ssp. *parryi*), San Joaquin spearscale (*Extriplex joaquinana*), and Suisun thistle (*Cirsium hydrophilum*). Of these seven species, four have been documented on Travis AFB: alkali milkvetch, brittlescale, Contra Costa goldfields, and San Joaquin spearscale, while the two tarplants and the thistle possibly occur based on habitat but have not been documented (Earth Tech 1999; BioSystems Analysis, Inc. 1994; Collinge 1999; Marty 2017d). All seven species require vernal pools, freshwater wetland, seasonally wet grassland, or other wet or seasonally wet soils. The most suitable habitat for these species exists in the northern parts of the base and the Railroad Right of Way GSU. According to the habitat values in Travis AFB's current Programmatic Biological Opinion (PBO), the entire western portion of the base is considered to be high quality for federal and state listed plant species.

The following are profiles of the seven state and/or federally listed species occurring or with potential to occur on base. The profiles include management information and data for these species including critical planning elements.

Alkali Milkvetch—Alkali milkvetch is listed as a 1B.2 species by CNPS, indicating that it is rare throughout its range and moderately threatened in California. It is endemic to California and is documented in 16 central coastal counties with the majority of records in Alameda, Solano, Conta Costa, Merced, and Yolo counties (Jepson Flora Project 2021). Alkali milkvetch is a delicate annual that can grow to approximately one foot tall. Like all members of the Fabaceae (Legume) family, it has compound leaves comprised of 7-17 leaflets. The flowers are produced in March through June and are pink-purple. Its habitat is playas and vernal pools including alkali sinks, which gives it its name. On Travis AFB, alkali milkvetch occurs in the northwest corner of the base near the Aero Club runway (Figure 2-10; CNDDB 2021)

Brittlescale—Brittlescale is also CRPR listed 1B.2, and occurs in central California from Butte County to Tulare County with possible records from as far south as Kern County. It is endemic to California. The majority of records are from Alameda, Glen, Solano, Contra Costa, and Yolo counties. A member of the Chenopodiaceae (Goosefoot) family, this plant is a small annual that generally has a sprawling habit and a silvery to reddish color (Jepson Flora Project 2021). Its flowers are inconspicuous and produced from June to October. It grows in playas, alkali sinks, and shadscale scrub vegetation. On Travis AFB, brittlescale could occur across a large undefined area southeast of the runway (Figure 2-10; CNDDB 2021)

Congdon's Tarplant—Congdon's tarplant is listed by CNPS as 1B.1, indicating that it is seriously threatened in California. It occurs in central and coastal California from Yolo to San Luis Obispo counties with the majority of records in Alameda, Contra Costa, San Luis Obispo, Monterey, and Santa Clara counties. Resembling many other members of the Sunflower (Asteraceae) family, Congdon's tarplant grows as an annual and up to two feet tall with scented, green stems and foliage and yellow flowers. It is distinguished from other the subspecies that could occur on Travis AFB (*Centromadia parryi* ssp. *parryi*) by seldom having glands and by having smaller rays (Jepson Flora Project 2021). Surveys for Congdon's tarplant have not been completed, but suitable habitat may exist on the main base and on some of the GSUs (Table 2-6).

Contra Costa Goldfields—The CCG is federally listed as endangered and has a CRPR 1B.1. This is an annual plant species that grows in vernal pools and mesic grasslands mainly in Contra Costa, Napa, and Solano counties. Mesic grasslands are defined by habitats with a moderate or well-balanced supply of moisture. CCG was first identified in the Aero Club Conservation Area during a base-wide survey (Biosystems, Inc. 1993). Figure 2-10 shows known locations on Travis AFB managed for CCG. Critical habitat for this species on Travis AFB includes the Former Sacramento Northern Railroad Right-of-Way and four locations on the base (see Figure 2-18 in Section 2.4.4.6).

Contra Costa goldfields (*Lasthenia conjugens*). Source: Dr. Jaymee Marty, Travis AFB.

A May 1998 survey (Earth Tech 1998) revealed the presence of two individual CCG plants in two separate locations on the Castle Terrace Housing property. One location was within a vernal pool and the other in grassland near a disturbed area not normally associated with its typical habitat. During spring 1999, a habitat survey on the west side of the base revealed that 23 of the 235 vernal pools surveyed had CCG (Earth Tech 2000). In 2016, Dr. Marty found 62 vernal pools containing CCG and all pools were located on the western portion of the base, concentrated in the Aero Club Conservation Area (Marty 2017d). 2016 was also the last year CCG surveys were conducted in the Castle Terrace area.

There are two main conservation areas established for CCG, Aero Club Conservation Area and Hangar Goldfields Conservation Area, and one additional area has been established at the Perimeter Goldfields area.

Primary threats to CCG's vernal pool habitat include direct and indirect impacts from development activities such as land use changes, off-highway vehicle use, inappropriate livestock grazing, and road widening. Damage to vernal pools may occur easily due to the extremely friable nature of the soil and dependency of the pool upon an intact durapan or impermeable subsurface soil layer (USFWS 1994); therefore, restoration of original soil conditions is a key to the success of compensation efforts concerning this species. Additionally, ensuring successful populations of pollinators for CCG is critical to the species' success. Mowing and grazing are also critical for management of CCG populations as those activities will reduce non-native grass competition and thatch, though mowing in a mosaic or patchy pattern is best for pollinators (Marty 2017d; Travis AFB 2017b; USFWS 2017).

The base plans to enter into an agreement with a seed bank capable of storing and increasing CCG seed in order to develop emergency seed stock and a restoration seed bank with sufficient quantity for large projects. Although CCG may be currently banked at other institutions, Travis AFB would like to ensure sufficient quantity of seed and capacity for increasing wild-collected seed by collaborating with USACE Cold Region Research and Engineering Laboratory or similar agency. The first area planned to receive seed would be in high wetland habitat on Travis AFB, which is ideal for endangered species conservation as it is required to remain free of buildings for safety reasons. In addition, CCG populations and habitat stand to benefit from Travis AFB proposed grazing projects, ongoing mowing efforts, and potentially prescribed burning.

Travis AFB has recognized the importance of grazing as a management tool for improving and maintaining CCG habitat, and began a study to determine the effects of cattle and horse grazing at the Aero Club on CCG habitat. Grazing in the study area began in December 2018 and followed the GMP prescription. In April 2019, sheep grazing was added to the study area in the Hangar Avenue CCG population for a brief period of nine days. Both study areas incorporated mowing as a second treatment, and both areas included untreated control plots. In general, the CCG population was larger and more widespread in 2019 than in 2018 and previous years, but grazing had a significant positive impact on the population. It appeared that the physical action of hooves and consumption of biomass worked to reduce live plant matter and break down senesced vegetation that helped prevent the formation of continuous algal mats during the following wet season. The hoof action of the cattle trampling within and around the basins can help break down the algal mats that naturally form, allowing the germinated plants underneath the water surface to continue to grow and eventually flower once the pool dries (Marty 2019b). This study is in its second year of data collection, and continuing to evaluate these treatments should yield valuable management data.

Pappose Tarplant—Pappose tarplant is listed as 1B.2 by CNPS, indicating it is slightly less threatened than its conspecific Congdon's tarplant. It has a much more extensive range but is still endemic to California. It occurs primarily from Glenn County south as far as San Diego County along the coast and as far inland as Merced County. Disjunct occurrences are also documented as far north as Modoc County, but the majority of the occurrences are in Napa, Solano, Colusa, and Orange Counties. It can be differentiated from Cogdon's tarplant by exhibiting more glandular hairs and by having slightly larger ray flowers. It grows in grasslands, alkaline seeps and springs, and coastal salt marshes (Jepson Flora Project 2021). Pappose tarplant has not been documented on Travis AFB, but may occur based on the presence of suitable habitat and nearby CNDDB occurrences to the southwest of the base (Figure 2-11; Table 2-6).

San Joaquin Spearscale—San Joaquin spearscale is listed as 1B.2 by CNPS and is endemic to California, ranging from Glenn County south to Kern County along the coast and Central Valley. The majority of the occurrences are in Alameda, Contra Costa, Glenn, Colusa, San Benito, Solano, and Yolo counties. Plants are monecious (bearing separate male and female flowers on each plant), and have an overall silvery-gray green color. They grow to three feet tall and have small pointed leaves that may be serrated. They grow on alkaline soils in meadows, shadscale scrub, and Valley grassland habitats and flower from April to September. San Joaquin spearscale has been documented on Travis AFB, and suitable habitat is present on several GSUs (Table 2-6). Off-base it occurs within two miles to the southwest of the installation (Figure 2-11).

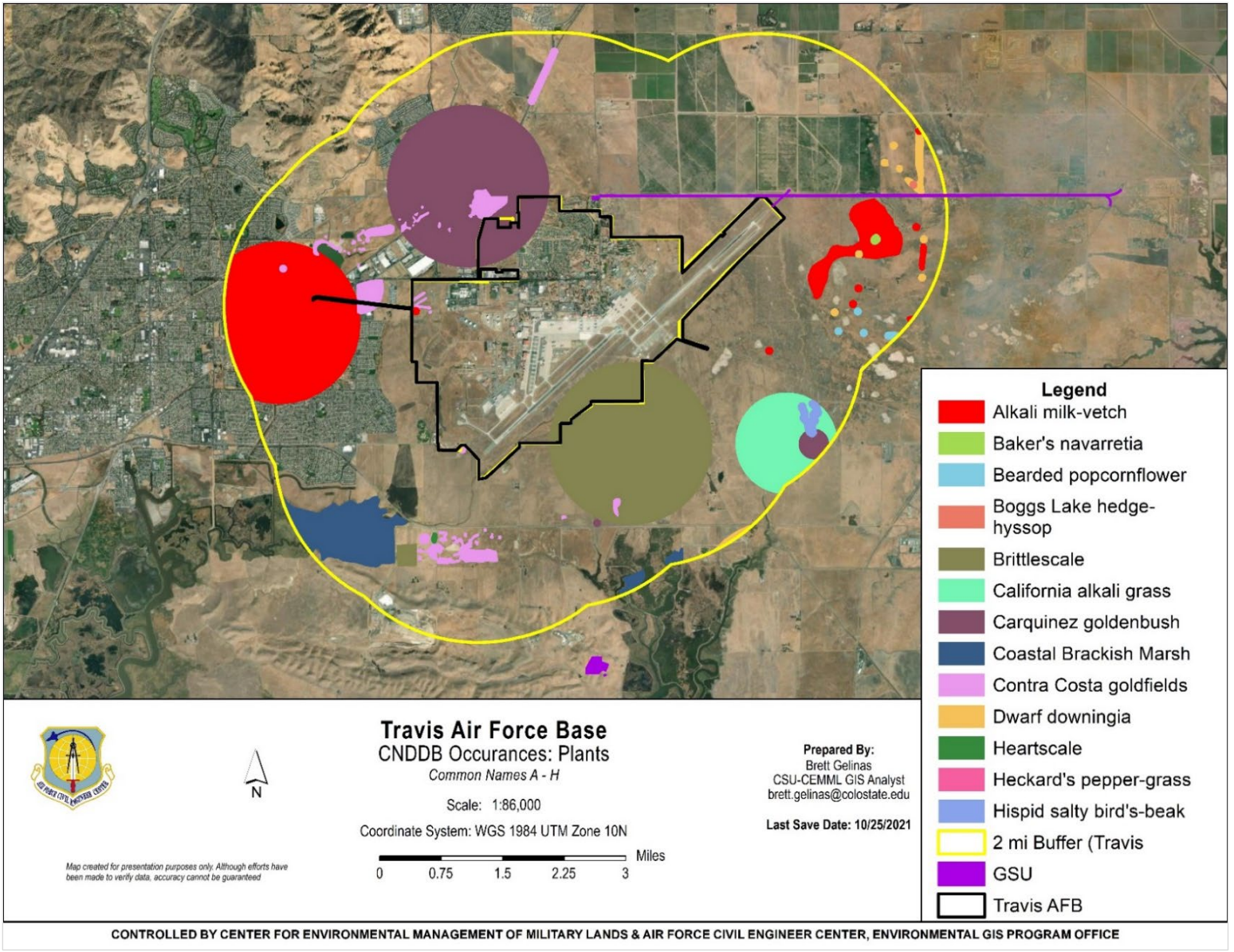

Figure 2-10. Special-status plant species (alkali milk-vetch through hispid salty birds-beak) occurrences near Travis AFB (CNDDB 2021).

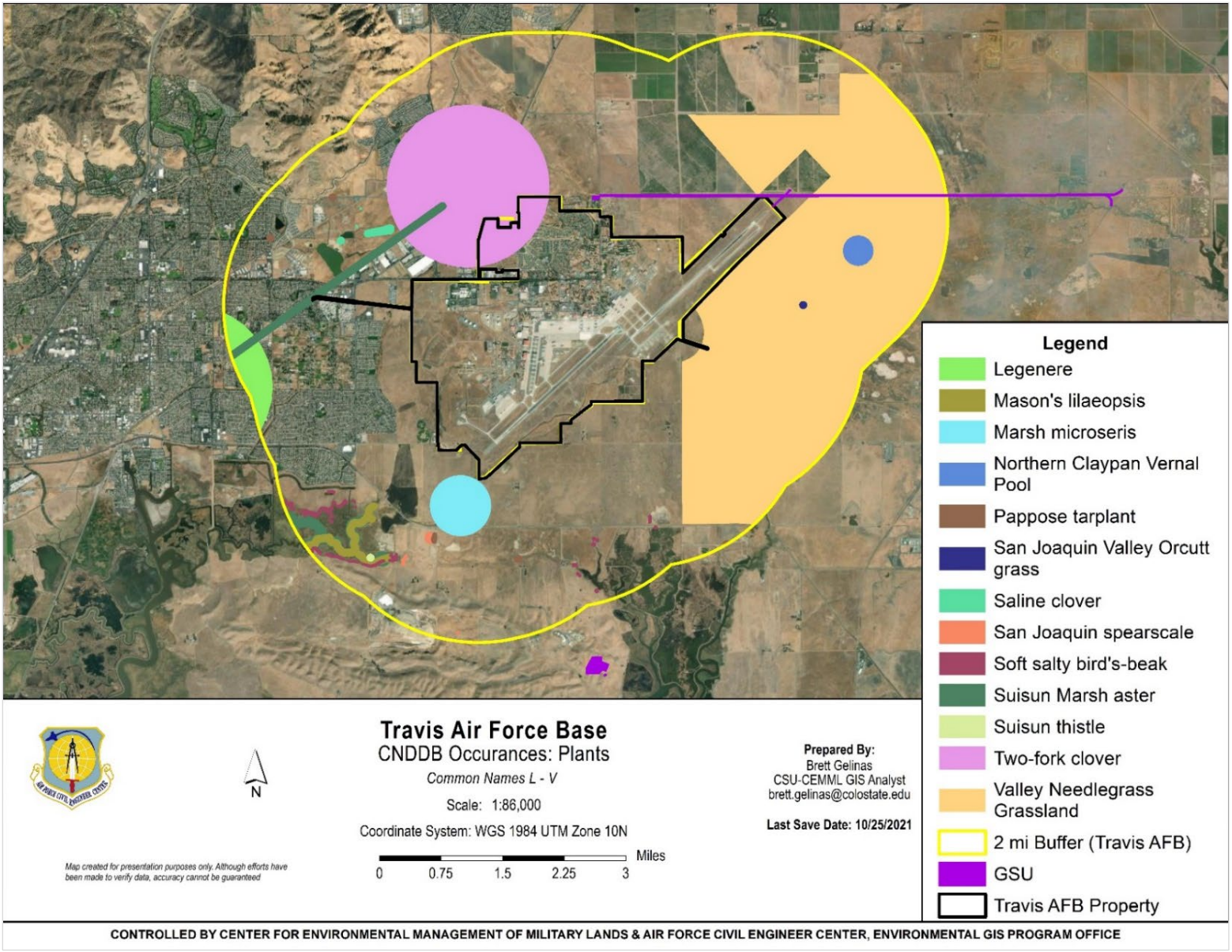

Figure 2-11. Special-status plant species occurrences (legenere through valley needlegrass grassland) near Travis AFB (CNDDB 2021).

2.3.4.2 Invertebrates

Eight out of a possible 13 invertebrates with special-status designation are known to occur or may occur on Travis AFB (Table 2-6). The VPFS occurs in vernal pools on base and is listed as federally threatened and a state ICP. The VPTS, also a vernal pool species on base, is federally listed as endangered and a state ICP. California fairy shrimp ([CAFS] *Linderiella* occidentalis) occurs in vernal pools on base and is an ICP (Marty 2016).

Crotch's bumble bee (*Bombus crotchii*) and Western bumble bee (*B. occidentalis occidentalis*) were briefly candidates for listing under the CESA and are both state ICP. TAFB initiated surveys on Travis AFB in 2020 to determine bee species presence in conservation areas, and a report on this survey is expected in 2022 (Section 8, Project 2.3.3). Monarch butterflies (*Danaus plexippus*) have been observed on base, and the species is a federal candidate for listing and an ICP. A Monarch butterfly survey project is combined with Crotch's bumble bee and Western bumble bee project in CEMML TO20 3.22. The hairy waterflea (*Dumontia oreonensis*) is listed as ICP and has been detected on Travis AFB. Midvalley fairy shrimp (*Branchinecta mesovallensis;* MVFS) is listed as ICP, and was detected during aquatic sampling in 2016 (Marty 2016). Ricksecker's water scavenger beetle (*Hyrochara ricksecker*i) is listed as an ICP and CNDDB records exist for it along the Railroad Right-of-way (CNDDB 2021).

Many base-wide surveys have been completed (including GSUs) between 2004 and 2019 that have documented the presence of the VPFS and the VPTS. Surveys conducted in 2004–2006 identified VPFS on Travis AFB and VPTS in the Former Sacramento Northern Railroad Right-of-Way GSU north of the base (CH2M Hill 2006). Other surveys conducted on Travis AFB in winter/spring 2004–2005 identified special-status vernal pool invertebrates including VPFS and the VPTS (EcoAnalysts 2006). In 2016, VPFS, MVFS, and VPTS were detected at two separate sampling times as those pools dried and then filled again with the rains (Marty 2016). A protocol-level vernal pool wet season survey of approximately 95 acres of vernal pools on Travis AFB an four GSUs completed in 2018 found VPFS, MVFS, and VPTS in many pools. VPFS and MVFS were able to capitalize on the fact that numerous pools dried and refilled during the season (Marty 2019c).

California Fairy Shrimp—The California fairy shrimp ([CAFS] *Linderiella occidentalis*) is not federally listed or petitioned, but meets the definition of a state ICP by having a NatureServe ranking of G2 & S2 (imperiled), as well as being a state ICC by being listed on the California 'Special Animals List'. This species is one of two fairy shrimp species within the *Linderiella* genus and both are endemic to California. CAFS can be distinguished from the larger *Bracnchinecta* genus by their red eyes and smaller size. Historical distribution of CAFS is not fully known as they were only identified in 1990, but is thought to include historical vernal pool habitat in the Central Valley and coastal ranges, where remnant populations occur now. As with other fairy shrimp, this species is adapted to the ephemeral nature of vernal pools, breeding when water conditions are present and producing eggs that can survive desiccation. CAFS are the most widely distributed fairy shrimp and are the longest living of the Central Valley fairy shrimp species, surviving up to 168 days. They have been documented in a wide variety of vernal pools in different landforms, geologic compositions, and soil types (USFWS 2005a). Threats are the same as other fairy shrimp species, discussed below in the VPFS section (USFWS 2005a). CAFS have been detected in wetlands in the northeastern section, cantonment area, and western section of Travis AFB (Marty 2016).

Hairy Water Flea—The hairy water flea (*Dumontia oregonensis*) is not federally listed or petitioned, but it is currently a state ICP. This species is the only member of the Dumontiidae family, and was only described

in 2003 (United States Forest Service [USFS] 2018). They are distributed in western Oregon, as well as Sacramento and Solano counties, California. Hairy water fleas are small crustacean members of the zooplankton community that live suspended within the water column of ephemeral wetlands, vernal pools, and seasonal creeks, filter feeding on algae. They have short periods of growth and reproduction during the inundation period of ephemeral pools and enter dormancy to survive dry periods. Reproduction occurs both sexually, but predominately asexually, and the sex ratio is heavily biased towards females — so much so that very few male individuals have been identified in the field. As with fairy shrimp, their eggs are resistant to desiccation and harsh external conditions, allowing them to survive long dry periods, and aid in dispersal via wind and on mobile wildlife species. Water fleas serve as an important link in the food web and nutrient cycle as freshwater filter feeders. Primary threats include loss of ephemeral wetlands from agriculture and urban development, and habitat degradation from invasive plants and animals, including the predatory mosquito fish (*Gambusia affinis*) (USFS 2018). Hairy water fleas have been identified on the southwestern portion of Travis AFB (CNDDB 2021), but not on GSU surveys.

Midvalley Fairy Shrimp—The midvalley fairy shrimp ([MVFS] *Branchinecta mesovallensis*) is not federally listed or petitioned, but meets the definition of a State ICP by having a NatureServe ranking of G2 & S2, as well as being a State ICC by being listed on the California 'Special Animals List'. This species was described in 2000 and is named after its limited range in the Central Valley of California. The range of the MVFS appears to be restricted to the following vernal pool regions: Southeastern Sacramento, Southern Sierra Foothill, San Joaquin, and Solano-Colusa. MVFS rapidly mature, with reproduction observed in only 16 days after hatching; this short time to maturity can lead to multiple hatchings within a single rainy year if vernal pools repeatedly fill and dry (USFWS 2005). Threats are the same as VPFS discussed below (USFWS 2005). Midvalley fairy shrimp were detected on Travis AFB for the first time in 2016, at a single vernal pool (Vernal Pool number VP.NU.859) in the northeast of the installation (Marty 2016).

Western North American Monarch Butterfly—The western North American monarch butterfly (*Danaus plexippus*) population is estimated to have declined by over 95% since the 1980s with estimates of a quasi-extinction risk of 72% in 20 years (Schultz et al. 2017). The widespread decline of the monarch across North America has resulted in a petition to list the species as threatened under the Endangered Species Act. Monarch butterfly is also a state ICP. The decreasing availability of larval host plants (milkweeds [*Asclepias* spp.]) has been implicated as one of the factors responsible for this decline. A number of milkweed species occur in a variety of habitats throughout California, including the invaded annual grasslands of the Central Valley. Milkweed populations and monarchs have been noted at Travis AFB; however, comprehensive habitat assessments and species surveys have not been performed for the monarch.

Ricksecker's Water Scavenger Beetle—The Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*) was petitioned for listing on the federal ESA in 1984, but listing was not warranted. This species meets the definition of a state ICP by having a NatureServe ranking of G2 & S2, as well as being a state ICC by being listed on the California 'Special Animals List'. This species is a large aquatic beetle, endemic to California with a distribution that includes the San Francisco Bay area and the Central Valley. Little information on the biology and ecology of this species is published, but it is thought to be associated with vernal pools due to the majority of identifications in this habitat. It is possible they have a short life cycle towards the end of the vernal pool hydroperiod (Short et al. 2017). A greater understanding of the biology and ecology of this species is needed to address threats, but they likely include the same impacts to vernal pools discussed below in the VPFS section (Short et al. 2017). Ricksecker's water scavenger beetles were confirmed in several vernal pools on the Former Sacramento Northern Railroad Right of Way GSU (ManTech 2016).

Vernal Pool Fairy Shrimp—The vernal pool fairy shrimp ([VPFS] *Branchinecta lynchi*) was federally listed as threatened in 1994 (*Federal Register* 59 FR 48136-48153) and is a state ICP. Critical habitat for this species occurs in four locations on Travis AFB and the Potrero Hills Annex GSU (see Figure 2-18 in Section 2.4.4.6).

Fairy shrimp swim on their backs by means of beating movements that pass along their 11 pairs of swimming legs in a wave-like motion from head to tail. They feed on algae, bacteria, protozoa, rotifers, and bits of detritus. Females carry their cysts in a brood sac on their abdomen. Fairy shrimp of the Central Valley survive the summer desiccation of vernal pools as cysts. Cysts are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. Cysts are capable of withstanding heat, cold, and prolonged dry periods. The cyst bank in the soil may comprise cysts from several years of breeding. As the vernal pools refill with rainwater, in the same or subsequent seasons, some of the cysts may hatch. Early stages of fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season, long before the vernal pools dry up.

Vernal Pool Fairy Shrimp(*Branchinecta lynchi*). Source: Dr. Jaymee Marty.

The habitat requirements for fairy shrimp are not completely understood, but factors affecting their distribution include the length of pool inundation, the chemical nature of the habitat, and water temperature (Pennak 1989; Eng et al. 1990). They can also undergo multiple hatchings in a single year if pools dry down and refill (Marty 2016).

VPFS occur in many locations on Travis AFB (BioSystems Analysis, Inc. 1994; Engineering Field Activity West 1999; EcoAnalysts 2006; Marty 2016) (Figure 2-12). Although characteristically inhabiting vernal pools, fairy shrimp can also live in temporary surface waters not considered vernal pools. Fairy shrimp have been found in a variety of temporary aquatic habitats including roadside ditches and small depressions in sandstone (Eng et al. 1990).

Primary threats to the survival of VPFS and associated species are loss of ephemeral aquatic systems, such as vernal pools from development activities, recreational impacts, hydrological modifications, degradation of water quality, and introduction of predators. Summertime inundation, such as unseasonal rainstorms resulting from climate change, that changes the hydrologic patterns is particularly detrimental because these changes disrupt the life cycle of the shrimp species by subjecting it to greater levels of predation by animals requiring more permanent sources of water.

Appropriate grazing practices can be used as a beneficial management strategy to improve habitat for VPFS and VPTS. Reducing the non-native species prevalence and removing their thatch from vernal pools with too short of hydroperiods during the shrimps' active season increases the inundation periods, which will benefit VPFS and VPTS by allowing completion of their life cycle (Marty 2005, 2015a, 2016; USFWS 2018a).

Vernal Pool Tadpole Shrimp—The vernal pools of California's Central Valley provide habitat for VPTS *Lepidurus packardi*), which was listed as a federally endangered species in 1994 and is a state ICP. Critical habitat for this species occurs in four locations on Travis AFB and the Potrero Hills Annex GSU (see Figure 2-18 in Section 2.4.4.6).

Tadpole shrimp of the Central Valley survive the summer desiccation of vernal pools as cysts (resting eggs). Cysts hatch in response to pool inundation if environmental conditions are suitable. The shrimp will grow to maturity and will reproduce if the pool remains inundated for a sufficient length of time. VPTS eggs do not need to dry out before they can hatch (Ahl 1991). The duration of adults in pools varies and depends on environmental factors (for example, air, temperature, humidity, precipitation). Tadpole shrimp can persist in pools for extended periods of time (December through April). The extended presence of tadpole shrimp, however, may represent multiple generations in one season rather than longevity (Ahl 1991).

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*). Source: Dr. Jaymee Marty.

The habitat requirements for tadpole shrimp are not completely understood, but factors affecting their distribution include the length of pool inundation, the chemical nature of the habitat, and water temperature (Pennak 1989; Eng et al. 1990).

During a 1994 base-wide ecological survey (Weston, Inc. 1995) VPTS were found in a pool located 50 feet from the eastern perimeter fence (Figure 2-12). The Jepson Prairie Preserve and the Wilcox Ranch are known habitat for vernal pool tadpole shrimp. The VPTS was found in several pools along the Former Sacramento Northern Railroad Right-of-Way GSU in 2005 just north of the base (EcoAnalysts, Inc. 2006). In 2016, no VPTS were found in the 50 vernal pools that were surveyed (Marty 2016). This species has the same threats, management considerations, and survey protocols as the VPFS.

Crotch's Bumble Bee—Crotch's bumble bee (*Bombus crotchii)* was petitioned to be listed as an endangered species under the CESA but its candidacy ended in 2020 due to legal challenges; it is currently a state ICP. This species can be found exclusively between coastal California east to the Sierra-cascade Crest (Koch et al. 2012). This species has not been surveyed for on any Travis AFB properties. There are plans to survey for bumble bees in the conservation areas on the base (Section 8, Project 2.3.3).

Western Bumble Bee—Western bumble bee (*Bombus occidentalis occidentalis*) was petitioned to be listed as an endangered species under the CESA but its candidacy ended in 2020 due to legal challenges; it is currently a state ICP. The historic distribution for this species includes much of western North America from Alaska to central California east to South Dakota and south to Arizona and New Mexico (Jepson 2014; Koch et al. 2012). This species nests in underground cavities including squirrel burrows (Jepsen 2014). Threats to this species include habitat loss, pesticides, overgrazing from livestock and climate change (Jepsen 2014). This species has not been surveyed for on any Travis AFB properties. There are plans to survey for bumble bees in the conservation areas on the base.

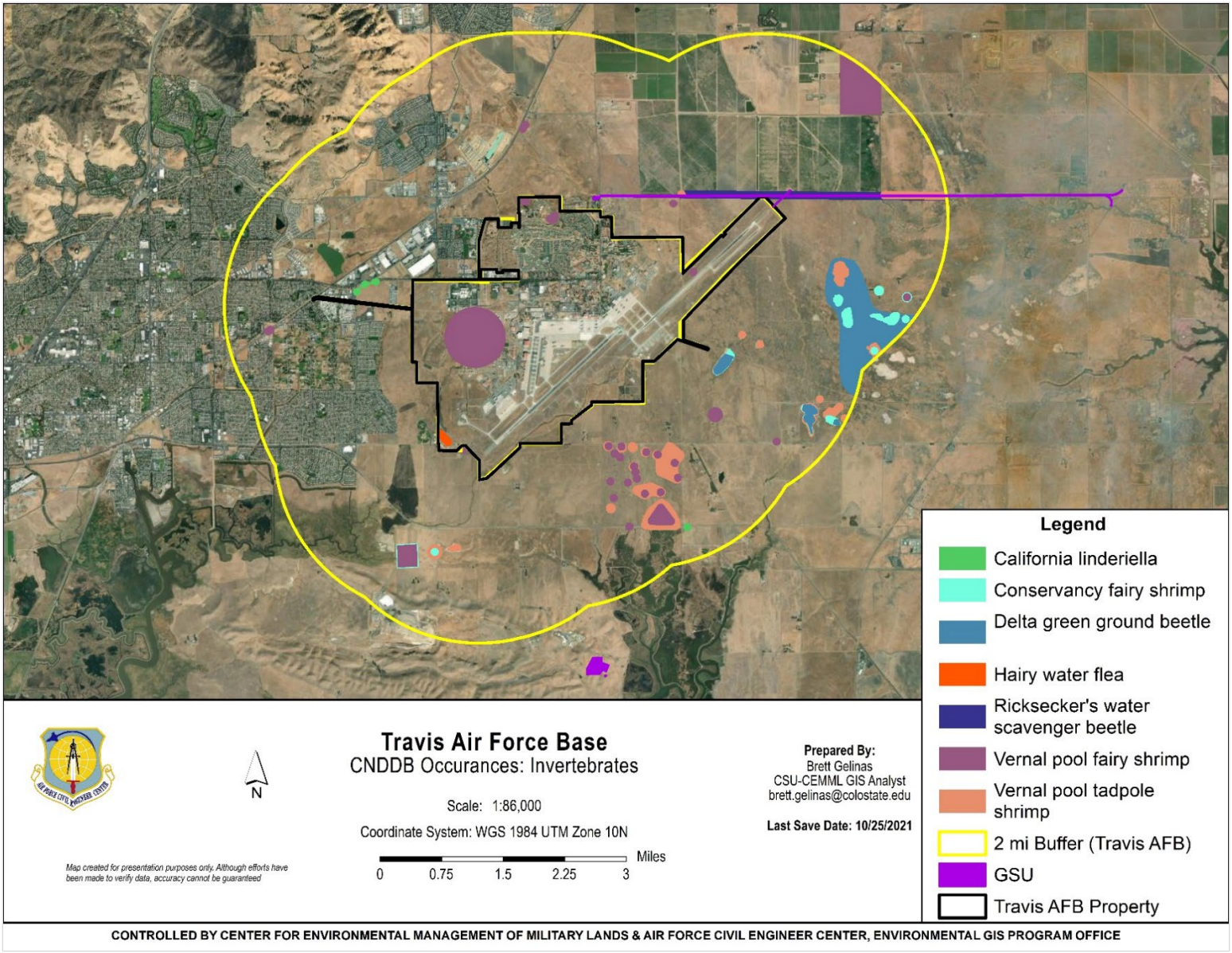

Figure 2-12. Special-status invertebrate species occurrences near Travis AFB (CNDDB 2021).

2.3.4.3 Vertebrates

Management considerations for the fish, mammals, birds, reptiles, amphibians, and invertebrate species that occur or may occur on Travis AFB are explained in more detail in the following sections.

Fish

There are six special-status fish species that could occur on Travis AFB, but only the California roach (*Hesperoleucus symmetricus*) and possibly the Central Valley chinook salmon (*Oncorhynchus tshawytscha)* have been found on the base, though species identification of the salmon was not confirmed (Table 2-6). However, the. the Central Valley Chinook salmon, Central Valley Steelhead (*Oncorhynchus mykiss)*, Delta smelt (*Hypomesus transpacificus)*, green sturgeon (*Acipenser medirostris)*, and longfin smelt (*Spirinchus thaleichthys*) all have potential to occur during high flood years when connectivity between Union Creek and more frequently-used habitat is temporarily created. The Central Valley Chinook Salmon is federally threatened and Delta smelt are legally protected by the ESA and CESA. The Central Valley steelhead and green sturgeon are legally protected by the ESA as threatened species, and the California roach is a SSC.

California Roach—The California roach (*Hesperoleucus symmetricus*) is not federally listed, or a federal candidate species. They are designated as a state SSC by CDFW. The distribution of California roach includes freshwater streams around the San Francisco Bay, and the Sacramento and San Joaquin river systems. Habitat generally includes small freshwater streams and they are well adapted to intermittent streams, with dense populations often found in isolated pools. They are tolerant of a wide variety of water temperatures and dissolved oxygen levels, but they are intolerant of salt and brackish waters. They are small minnows, rarely exceeding 3.94 inches total length, with large eyes, a narrow caudal peduncle, and deeply forked tail. Diet varies based on local stream conditions; they are omnivorous and will graze on filamentous algae, as well as consume crustaceans and aquatic insects. Spawning is temperature dependent and takes place when water temperatures exceed 60.8°F, generally March-July. Spawning habitat consists of riffles over small rock substrate. California roach are locally abundant, however some populations have been declining and they have been completely extirpated from the Fresno watershed and the Consume River (CDFW 2021a). Threats include alterations to their stream habitat from agricultural and urban development, water diversions, dams, fires, and introduced fishes — such as green sunfish (*Lepomis cyanellus*), and black basses (*Micropterus* spp.) (CDFW 2021a). California roach have been confirmed during surveys on Travis AFB in Union Creek and an irrigation ditch west of the airfield hangars (Marty 2020a).

Chinook Salmon—Spring-run chinook salmon (*Oncorhynchus tshawytsha*) are listed as federally and state threatened under the ESA and CESA, respectively. Sexually immature spring-run Chinook salmon migrate into the Sacramento and San Joaquin river systems from late March through September, holding in cool water habitats throughout the summer to reach sexual maturity, and spawning from mid-August through early October. Juvenile rearing and smolt emigration occurs from November through March. Juvenile spring-run salmon typically remain in freshwater for 12–16 months before migrating to the ocean, but some may migrate as young-of-the-year within eight months of hatching (NOAA Fisheries 2014).

Chinook salmon require cold, freshwater streams with suitable gravel for reproduction. Females deposit their eggs in nests or redds, which they excavate in the gravel bottom in areas of relatively swift water. Eggs generally hatch in approximately 6–12 weeks, and newly emerged larvae remain in the gravel for another two to four weeks until the yolk is absorbed (Moyle 1976; Beauchamp et al. 1983; Allen and Hassler 1986). For maximum survival of incubating eggs and larvae, water temperatures must be between 39 °F and 57 °F. After emerging, Chinook salmon fry tend to seek shallow, near-shore habitat with slow water

velocities and then move to progressively deeper, faster water as they grow. Juveniles typically rear in fresh water for up to five months before migrating to sea. Chinook salmon spend two to four years maturing in the ocean before returning to their natal streams to spawn. All the adult salmon die after spawning (NOAA Fisheries 2014).

Declines in Chinook salmon are attributed primarily to the degradation and removal of suitable habitat through such mechanisms as increases in water temperature, changes in flow, creation of migration barriers, decreases in the quantity and quality of spawning gravel, and deteriorating water quality. Activities that have caused these habitat alterations include construction and operation of dams and reservoirs, water diversions, removal of riparian vegetation, logging, urban and agricultural runoff, and channelization of streams and rivers (NOAA Fisheries 2014).

Chinook salmon were possibly found on Travis AFB during a high flood event in 2017, however identification was not confirmed. Furthermore, Marty (2020) observed an unidentified salmonid species in Union Creek in 2019. Union Creek is hydrologically connected to the San Francisco Bay Delta, and it is possible Chinook salmon will enter the creek during high flow years.

Mammals

There are seven special-status mammal species (Table 2-6) that have the potential to occur on Travis AFB. Of these, four bat species have been identified by software analysis of acoustic surveys (Schwab 2018) to include the Pallid bat (*Antrozous pallidus)*, Townsend's big-eared bat (*Corynorhinus townsendii)*, western mastiff bat (*Eumops perotis)*, and western red bat (*Lasiurus blossevillii)*. Western red bat was the only bat species that was manually verified during recording reviews. All of these bat species are considered species of special concern by the CDFW (see Section 7.1 for more details).

Pallid bat—The pallid bat (*Antrozous pallidus*) is not federally listed, or a federal candidate species. They are designated as an SSC by CDFW. Pallid bats are distributed throughout western North America. In California they are located in low elevations, using a wide variety of habitat types, including grasslands, shrublands, woodlands, and forests. They are most common in open, dry habitats with rocky areas for roosting. They are year-round residents in California, making local movements to hibernation sites and during post-breeding season dispersal. Mating occurs from late October–February; fertilization is delayed and young are born between April–July. Pallid bats roost communally in groups of 20–160 in caves, crevices, mines, and occasionally hollow trees or buildings that protect them from high temperatures. They emerge 30–60 minutes after sunset to feed on larger, hard-shelled prey, such as scorpions, crickets and beetles. Most prey are taken on the ground and carried to perches for consumption, but they will also glean foliage and occasionally take prey aerially (CDFW 2021b).

Pallid bats are sensitive to disturbance at roost sites, including mine entrance closures, recreational activities such as rock climbing, and timber harvest. They are also threatened by loss of foraging habitat from urban development, agricultural expansion, and pesticide use (WBWG 2021). Pallid bats were detected by software analyzing acoustic recordings at five sites on Travis AFB: two in the airfield, and three in the cantonment area. However, they were not confirmed during manual review of these acoustic recordings suggesting that additional surveys are required, preferably mist-netting surveys (Schwab 2018). Marty (2020) acoustically detected pallid bats foraging on Travis AFB during mist netting surveys, however, no bats were caught in the mist nets.

Townsend's big-eared bat—Townsend's big-eared bat (*Corynorhinus townsendii*) is not federally listed, or a federal candidate species. They are designated a state SSC by CDFW. This species was petitioned for listing under the CESA in 2012; however, after becoming a candidate species in 2013, the California Fish

and Game commission determine that listing was unwarranted under the CESA. Townsend's big-eared bat are distributed throughout western Canada, the western United States and central Mexico, with isolated populations in the central and eastern United States (WBWG 2021). Once common throughout California, they are now uncommon in low elevation, mesic habitats. They feed primarily on moths, but will also capture other flying insects using echolocation in flight or gleaning them from foliage. Their flight is slow and maneuverable, and they are capable of hovering briefly. Roosting in caves, mines, tunnels, and buildings, they will undertake small, localized movements to hibernacula sites. This species is particularly sensitive to roost site disturbance and are known to abandon roosts after one human visit (CDFW 2021c). Threats to Townsend's big-eared bats are the same as those to the pallid bat above (WBWG 2021). They were detected by software analyzing acoustic recordings at four sites on Travis AFB: one in the airfield, and three in the cantonment areas. However, they were not confirmed during manual review of these acoustic recordings suggesting that additional surveys are required, preferably mist-netting surveys (Schwab 2018). Mist netting and acoustic surveys in 2019 did not detect Townsend's big-eared bats on Travis AFB (Marty 2020a).

Western mastiff bat—The western mastiff bat (*Eumops perotis californicus*) is not federally listed, or a federal candidate species. They are designated a state SSC by CDFW. *Eumops perotis* has three subspecies, two in South America and one in North America (*E. perotis californicus*). This subspecies is distributed throughout central Mexico and across the southwestern United States, including California, Nevada, Arizona, New Mexico, and Texas (WBWG 2021). They are uncommon year-round residents in the San Joaquin Valley and coastal areas of California. Western mastiff bats occur in open, semi-arid habitats, including coastal scrub, woodlands, grasslands, chaparral, desert scrub, and urban areas. This subspecies primarily feeds on night-flying hymenopterous insects and they can forage up to 200 ft above ground level. They are active year-round, but will enter a daily torpor from December–February. They continue feeding at night in the winter months when temperatures exceed 41°F and have longer foraging periods of 6–7 hours compared to most other bats, due to their long and narrow wings that are adapted for sustained flight. Reproduction is more varied than other bats, with young born from April–September. They roost in crevices, high buildings, trees, and tunnels and they will alternate between day-time roost locations; other than these localized movements, they are non-migratory (CDFW 2021d).

Threats to western mastiff bats are the same as the pallid bat above (WBWG 2021). They were detected by software analyzing acoustic records from one site in the cantonment area on Travis AFB, however, they were not confirmed during manual review of the acoustic recordings, therefore, they also require additional survey effort (Schwab 2018). Mist netting and acoustic surveys in 2019 did not detected western mastiff bats on Travis AFB (Marty 2020a).

Western red bat—The western red bat (*Lasiurus blossevillii*) is not federally listed, or a federal candidate species. They are designated a state SSC by CDFW. Western red bats have a wide distribution that includes southern British Columbia in Canada, much of the western United States, Mexico, Central America and northern Chile (WBWG 2021). They are locally common in California, occurring west of the Sierra Nevada and in the California deserts in the summer, and south of the San Francisco Bay in winter. Roosting habitat consists of forest and woodlands, while foraging habitats include open grasslands, shrublands and croplands. During the summer the sexes occupy different portions of their range. They feed on moths, crickets, cicadas, and beetles, using echolocation to locate prey, capturing them in their wing and tail membranes. Western red bats roost primarily in trees in edge habitats adjacent to water sources, fields, or urban areas. They migrate relatively short distances between summer habitat and winter hibernacula. Rabies presence in western red bats is relatively high (CDFW 2021e).

Threats are the same as other bats, described in the pallid bat section above (WBWG 2021). They were detected by software analyzing acoustic recordings at five sites on Travis AFB in 2018 and 2019: two in the airfield, and three in the cantonment area. They were confirmed present on Travis AFB during the manual review of acoustic recordings in 2018 and 2019 (Schwab 2018, Marty 2020a).

Amphibians

There are four special-status amphibian species that have the potential to occur on Travis AFB or its GSUs, and two of them are documented as present (Table 2-6). The California or Coast Range newt (*Taricha torosa)* occurs on the Point Ozol GSU, and the CTS occurs on base and Former Sacramento Northern Railroad Right-of-Way GSU.

California Newt—The California or Coast Range Newt (*Taricha torosa)*, is a SSC species in Monterey county south so although it was found in 2015 on the Point Ozol GSU (Mantech 2016), the population is not part of the SSC designation (Thomson et al. 2016). Point Ozol contains vernal pools and upland habitat that support populations of the California newt. Large numbers of breeding adult newts and egg masses were found in the vernal pool on the western side of the GSU in January 2015. In early May of 2015, many newt larvae were found in the pool.

California Tiger Salamander—The CTS is legally protected by the state and federal government. It occurs as both adult and larval forms on the north and eastern sections of Travis AFB (Figure 2-13). On 4 August 2004, the USFWS listed the central California Distinct Population Segment of the CTS as endangered throughout its range. Critical habitat was designated on 23 August 2005, for the central California population on approximately 199,109 acres in 19 counties. Approximately 5,670 acres of critical habitat for CTS was designated on the Jepson Prairie Preserve located approximately four miles to the east of the base. Critical habitat for CTS is found at Travis AFB on the Former Sacramento Northern Railroad Right-of-Way (see Figure 2-18 in Section 2.4.4.6).

California tiger salamander (*Ambystoma californiense*). Source: Dr. Jaymee Marty, Travis AFB.

This large salamander, which has striking dorsal yellow spots or bars, lives in grasslands or open oak woodlands (Stebbins 1985). Tiger salamanders spend most of their lives in burrows dug by ground squirrels or other small mammals. Adults emerge at night after the first heavy rains in the fall and migrate to temporary ponds to breed. Larvae transform and leave the ponds by late April or early May when the ponds begin to dry. Successful breeding ponds must contain water long enough for larvae to transform (a minimum of 10 weeks). Population declines for this species have been attributed to agricultural and urban development, inappropriate grazing practices, and predation by introduced fish and bullfrogs. The most effective means of determining the presence of tiger salamanders is to seine for larvae in temporary ponds during the breeding season. Several introduced predators of California tiger salamanders pose a threat to their populations and survival. These include bullfrogs, African clawed frogs, red swamp crayfish, bass, catfish, sunfish, and mosquitofish (USFWS 2009).

Appropriate grazing practices can be used as a beneficial management strategy to improve habitat for the CTS. By reducing the non-native species and their thatch from vernal pools, inundation periods have been shown to increase, which will benefit the CTS by allowing completion of breeding and emergence from pools (Marty 2005, 2015a; USFWS 2018a). Additionally, tall grass can provide a barrier to movement for

the CTS; thus, by appropriately implementing grazing and invasive species control, Travis AFB will allow CTSs to move more freely across the landscape (Ford et al. 2013).

CTS breeding pond occurrences, including 1.3-mile impact buffers, are shown in Figure 2-13. To date, 14 breeding ponds have been identified within approximately 1.3 miles of Travis AFB, and three breeding ponds have been identified on Travis AFB property. Necessary habitat components for CTS include small mammal burrows, particularly California ground squirrel and Botta's pocket gopher (*Thomomys bottae*), for underground retreats and breeding ponds such as artificial stock ponds, seasonal wetlands, vernal pools, or slow-moving streams that do not support predators such as fish.

Also shown in Figure 2-13 are areas of risk of encountering CTS. These were developed by mapping landscape resistance for CTS, distance from known breeding pools, and known occurrences for CTS. Landscape resistance (a measure of the ecological cost of travel through a given area) include obstacles such as square curbs and dense vegetation that impede passage by migrating adult and juvenile CTS. Areas marked in red are those where projects will have a high risk of encountering CTS, while those in green are lower-risk. A full description of this method and the results derived is available in the report Update to Habitat connectivity mapping for CTS on TAFB 2020 (Marty 2020b).

Many surveys conducted from 1995 through 2019 have identified CTS larvae at the CATM area. Additionally, upland grassland areas and breeding ponds both on and off base provide habitat for CTS. More recently, from May 31 through mid-July 2017, over 800 juvenile CTS were removed and relocated from the airfield and surrounding area (Perimeter Road, CATM, and Fire Station 3). In 2019 more than 2000 CTS were relocated after juveniles were found dispersing from a nearby, off-base CTS breeding pond. Future plans involve managing CTS by improving habitat away from the airfield so it is suitable for relocating CTS. This will ensure protection of the species while minimizing flying operation impacts and downtime.

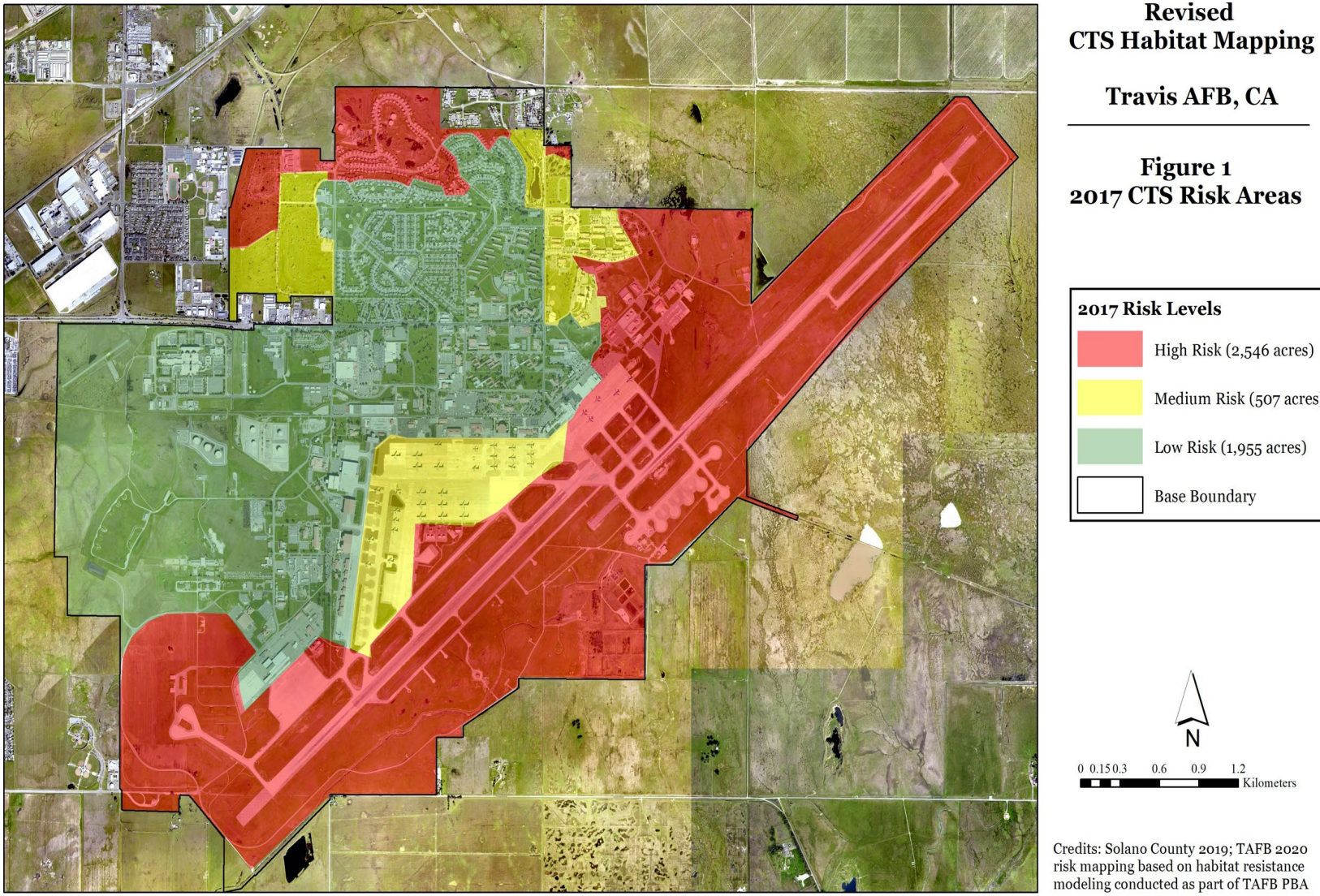

Figure 2-13. Known California tiger salamander breeding ponds and areas of risk of encountering CTS on Travis AFB.

Reptiles

Out of the two possible special-status reptiles, only the western pond turtle (*Actinemys marmorata*) occurs on Travis AFB (Table 2-6). The giant garter snake (*Thamnophis gigas*), both state and federally listed as a threatened species, has never been identified on the base. The Solano Habitat Conservation Plan recognizes that this species only has the potential to occur in eastern Solano County.

Western Pond Turtle—The western pond turtle is actually recognized as two species: the northwestern pond turtle (*Actinemys marmorata*) and southwestern pond turtle (*Actinemys pallida*). Both species are currently under federal review for listing under the ESA, and are designated as state SSCs. Travis AFB is close to the range overlap of both species. Genetic studies have determined that the species on Travis is the northwestern pond turtle. The INRMP will use 'western pond turtle' to refer to the northwestern pond turtle.

The distribution of the northwestern species includes northern California, the Central Valley, western Oregon and Washington. The distribution of the southwestern species includes the San Francisco Bay southwards along the coast of California, and Baja California. Aquatic habitats include areas with amble basking habitat (logs, floating vegetation, and exposed rocks) in permanent and seasonal rivers, sloughs, lakes, ponds, and irrigation canals. Nesting habitat includes well-drained soil with good solar exposure and sparse vegetation. Overwintering habitat includes the bottom of muddy ponds, forested areas with abundant leaf litter, and undercut banks along streams. Breeding takes place from February–November; clutch size is variable from 1–13 eggs and hatchlings will overwinter in the nest in northern parts of the range, while southwestern hatchlings will leave the nest in the fall in southern California. Sex-determination is temperature dependent, with temperatures below 86 °F producing males, and above 86 °F producing females.

Threats include habitat loss, fragmentation and degradation from urban and agricultural development, road mortality, drought, predation by introduced species (such as the American bullfrog, smallmouth bass, crayfish, and largemouth bass), competition and disease from introduced pet turtles, and recreation activities that damage their nests or cause them to repeatedly flee from basking sites (USFWS 2020). Western pond turtles have been found on Travis AFB within Union Creek, ponds in the Castle Terrace Conservation Area, the North Gate Pond, and the perennial stream (Wetland Delineation ID # - PS.CA.702) that flows into the North Gate Pond (Marty 2020a).

WPT habitat suitability at TAFB was modeled in 2017 by Center for Integrated Research on the Environment (CIRE). The areas of highest habitat suitability were in the Castle Terrace area and along stretches of Union Creek. Habitat suitability at Cypress Lakes Golf Course varied across ponds largely because of differences in canopy cover and suitability of upland vegetation. WPT are currently using AF lands for habitat, and effectively all areas around ponds and rivers represent possible habitat for WPT, regardless of the level of habitat suitability (CIRE, 2017).

Birds

Travis AFB protects many bird species under (1) the MBTA, which protects nests and adult migratory species; (2) the Avian Protection Plan, which provides a framework for addressing electrical pole configurations that can harm and/or kill birds; (3) Construction Project Guidance, which provides nesting avoidance strategies; (4) Nesting bird surveys (01 February–31 August) prior to the start of any project with potential to disturb nesting birds; (5) Incorporating distance buffers as based on the scope of work; and (6) E.O. 13186, which directs federal agencies that take actions that either directly or indirectly affect migratory birds to develop a Memorandum of Understanding with the USFWS. DoD provides guidance in a technical

memorandum on addressing migratory birds in INRMPs (Office of the Assistant Secretary of Defense 2017).

Of the 34 possible special-status bird species, six nest on Travis AFB (Table 2-6): Swainson's Hawk (*Buteo swainsoni*), Tricolored Blackbird (*Ageliaus tricolor*), Western Burrowing Owl (*Athene cunicularia*), White-tailed Kite (*Elanus leucurus)*, Loggerhead Shrike (*Lanius ludovicianus*), and Yellow-billed Magpie (*Pica nuttalli*). The annual grasslands scattered across the base and the riparian zone surrounding Union Creek, toward the south end of the base, provide suitable foraging and/or nesting habitat for these species. Species profiles for the species nesting on Travis AFB are included below.

Loggerhead Shrike—The Loggerhead Shrike (*Lanius ludovicianus*) is not federally listed, or a federal candidate species. They are designated a state SSC by CDFW. Loggerhead Shrikes are distributed throughout central Canada, most of the continental United States (except the northwest, northeast, and high elevations), and in western Mexico. In California, they are present throughout most of the state, except for the forested coastal slope and the mountain ranges. Loggerhead Shrikes breed in shrubland or open woodland, with grasses and bare ground patches for hunting. They use tall shrubs, trees, fence posts, or power lines for perching while hunting, mate attraction, and territory defense. They also need thorny vegetation or barbed wire fences for prey manipulation and storage. Loggerhead Shrikes predate on grasshoppers, crickets, beetles, caterpillars, reptiles amphibians, small rodents, and birds, which they impale on thorns or spikes as their feet are incapable of holding the prey item for consumption. They nest in shrubs or small trees 3.3–6.6 feet above the ground.

Threats include loss of habitat, and habitat fragmentation from conversion to row crop agriculture and urban development. Invasive grasses, such as cheat grass (*Bromus tectorum*), have also contributed to conversion of shrubland habitat into grassland-dominated habitat through altered, increased fire regimes, particularly in the Great Basin portion of the Loggerhead Shrike range (Shuford and Gardali 2008). Loggerhead Shrikes were identified throughout Travis AFB across all seasons, with abundance greatest in the summer surveys, as well as on the Potrero Hills GSU, and the Former Sacramento Northern Railroad Right of Way GSU (ManTech 2016, CEMML 2020). CEMML (2020) noted a decreasing trend in Loggerhead Shrike abundance at Travis AFB from 2014–2019, with 10 individuals as the greatest number of Loggerhead Shrikes per point count location in 2014, to six individuals in 2019. A Loggerhead Shrike nest was also incidentally observed in the northeastern section of the installation in 2019, adjacent to Meridian Road (Marty 2020a).

Swainson's Hawk—The Swainson's Hawk is federally protected under the Migratory Bird Treaty Act and was listed as a state threatened species in 2016 (CDFW 2016). They are primarily a neotropical migrant, wintering in South America and Mexico from approximately October to February and then returning to North America to nest in the spring. Nesting is often associated with riparian systems, as well as lone trees or groves in agricultural fields. They forage in grasslands, irrigated pastures, and croplands. The species nests from April to September. Swainson's Hawks are known to nest in large trees on base and at the Cypress Lakes Golf Course GSU. Three active nests were found on the base in 2016 (Marty 2017c; Figure 2-14). Grazing can be used as a conservation management tool to improve foraging habitat by reducing vegetation so prey become more visible (Travis AFB 2017b).

Tricolored Blackbird—The Tricolored Blackbird is federally protected under the MBTA. The USFWS decision in 2019 was not to list the Tricolored Blackbird under the ESA; however, it was listed as state threatened species in April 2018. One of the biggest reasons for decline is the loss of suitable breeding habitat. Grazing can be used as a management tool on Travis AFB to improve habitat in conservation areas

and reduce habitat near the flightline to discourage blackbird flock usage that can lead to a human and flight safety risk (Travis AFB 2017b).

Tricolored Blackbirds nest in large flocks, with greater than 50 breeding pairs, in dense vegetation near water or by emergent wetlands. Nesting sites are typically associated with cattails, tules, willows, blackberry (*Rubus* sp.), mustard (*Brassica* sp.), and wild rose (*Rosa californica*). Nests can be built a few centimeters above the ground or from water level to two meters high. Nesting typically occurs from April to July, though it may extend later into the year. Within the Sacramento Valley, breeding has been observed as late as October and November. During the non-breeding season, they can be found foraging in open habitats such as croplands and grassy fields.

Tricolored Blackbirds occur on Travis AFB in vegetation growing in Union Creek in the vicinity of the runway and near the wastewater treatment pond (Marty 2017c; Figure 2-14). In 2016, Tricolored Blackbirds were confirmed to be nesting on base with a peak in population in April and then no birds detected by July (Marty 2017c). Tricolored Blackbirds were found to be nesting in recently burned mustard patches along Union Creek, which provided appropriate nesting substrate. In April 2017, nesting was confirmed in mustard plants across from TACAMO (CIRE 2017). In 2018 and 2019, Tricolored Blackbirds were spotted nesting in mustard behind the hazardous waste facility near the old landfill (CEMML 2019b, 2020). Because of the proximity of suitable habitat near the airfield and confirmed nesting in proximity to the airfield, Travis AFB has been concerned that this species could present a BASH risk, but it is rarely implicated in BASH incidents, with zero recorded hits between 2017 and 2021 (USDA/BASH Wildlife Strike Record 2021).

Burrowing Owl (*Athene cunicularia* ssp. *hypugea*). Source: Michelle Ocken.

Western Burrowing Owl—The Western Burrowing Owl is a state species of special concern and is federally protected under the MBTA. The subspecies of burrowing owl found in California is the western burrowing owl (*Athene cunicularia hypugea*).

Burrowing Owl habitat is typically annual and perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Fossorial mammal burrows are typically used for protection, shelter, and nesting. Travis AFB supports a population of resident Burrowing Owls within the annual grasslands sporadically spaced across the base (Figure 2-14). A Burrowing Owl survey was conducted in the spring of 2014 and in 2018 and a Burrowing Owl management plan for Travis AFB is an appendix to this INRMP (Appendix D; CEMML 2018).

Burrowing Owls occur in several locations on Travis AFB especially within the main cantonment area (e.g., the Q-District area), near the dirt berms behind the skeet range, structures within the Munitions Area and occasionally near the runway and taxiway (Marty 2017c). The most recent airfield monitoring data indicate no nesting on the airfield by BUOWs (USDA/BASH Wildlife Strike Record 2021). However, the base is monitoring specific nesting locations and the number of adults on Base. This baseline data will enable us to determine the success of our Burrowing Owl management program. Due to the decline in the population of Burrowing Owls elsewhere in Solano County, our partners the USFWS and CDFW are working closely with us to maintain Travis AFB Burrowing Owl population. It should be noted nesting success has improved

over the three years surveyed from 2014–2016, and the population appeared to be relatively stable in 2018 (Marty 2017c, CEMML 2018).

White-tailed Kite—The White-tailed Kite (*Elanus leucurus)* is a California Fully Protected species and is protected by the MBTA. White-tailed Kites are usually non-migratory, but can nomadically follow prey resources in California, Oregon, Washington and coastal areas in Mexico; they are also uncommon in Arizona and Florida. They use open grasslands, meadows, agricultural land, and emergent wetlands, all with variable tree heights for perching and nesting. They nest in isolated trees in open grassland or on the edge of forests. White-tailed Kites feed on small mammals such as voles and mice and will rarely forage far from the nest when breeding. Breeding peaks between May–August, and young fledge in 35–40 days. Once uncommon, this species is now increasing in numbers and extending their range (CDFW 2021f). This species has been found throughout much of the base, including on the south side of the base by the obsolete Waste Water Treatment Plant (WWTP), within the grazing pastures on the west side of the base, near the Castle Terrace housing area, and at the Cypress Lakes Golf Course (CEMML 2020). Nesting has also been observed in the cantonment area and near the WWTP (CEMML 2020).

Yellow-billed Magpie—The Yellow-billed Magpie (*Pica nuttalli)* is considered a BCC by the USFWS and is endemic to California, occurring west of the Sierra Nevada Mountains. They nest in open oak savanna and riparian habitat, and forage in grasslands, agricultural fields and orchards. Yellow-billed magpies feed on invertebrates, grain, acorns, carrion, and small mammals. They are present year-round in California, nesting in small colonies on large trees with domed bowl nests. Threats to this species include pesticides, contaminants (including rodent and predator-control compounds), West Nile virus, and habitat degradation from agricultural and urban development (USFWS 2021). This species has been detected infrequently during BASH and avian point count surveys on Travis AFB and the Cypress Lakes Golf Course GSU (CEMML 2020).

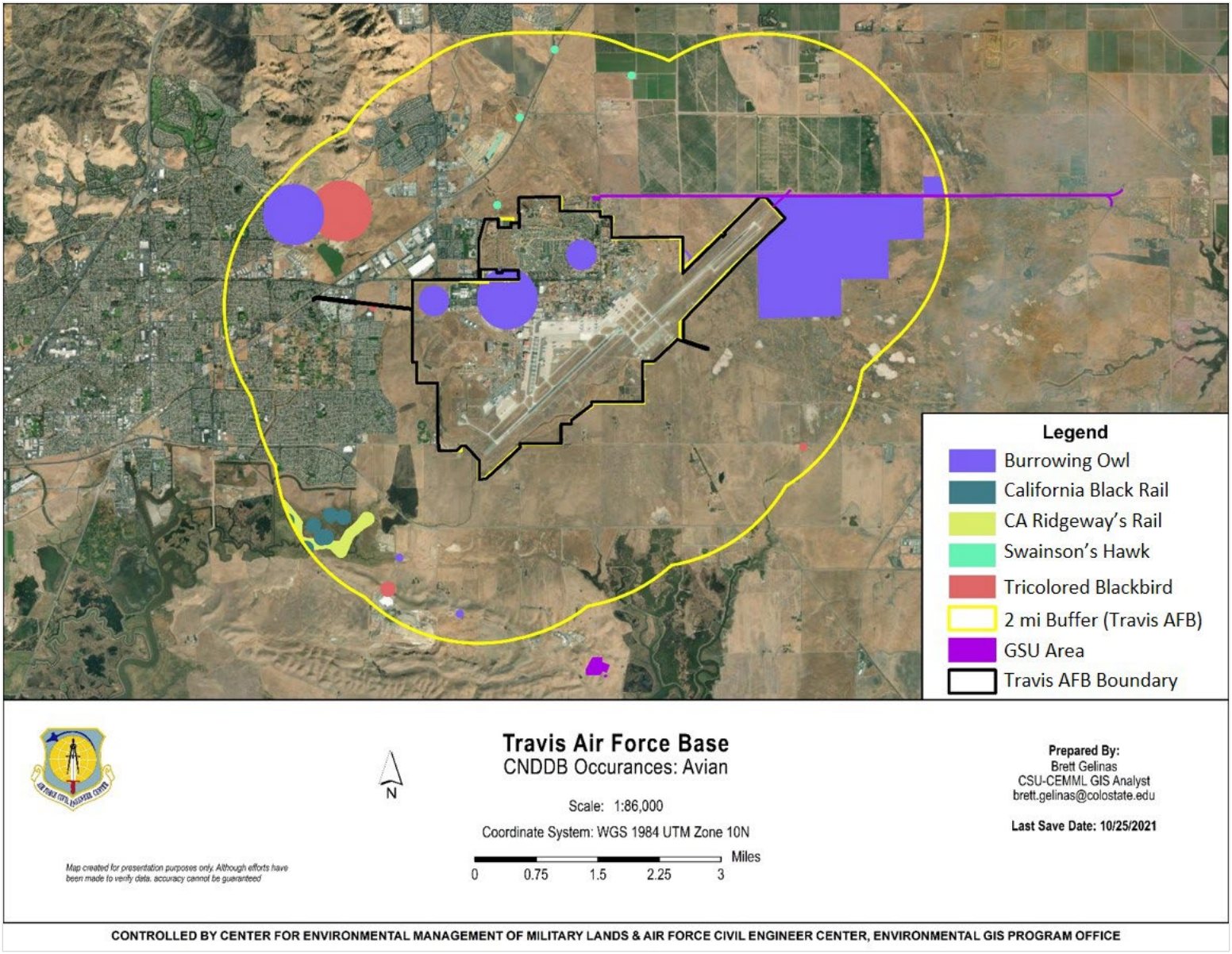

Figure 2-14. Nesting special-status bird species occurrences near Travis AFB from CNDDB data (CNDDB 2021).

2.3.4.4 Climate Impacts on Threatened and Endangered Species

Multiple special-status species on Travis AFB are vulnerable to projected changes in climate, and these species will continue to be a high monitoring and management priority. Management actions needed to protect special-status species will be influenced by the speed at which the climate changes, the nature of the climatic changes, and the ability of managers and the species to respond to those changes. Climate adaptation (i.e., making changes to natural or human systems that minimize the impacts or promote the benefits of climate change) will be an important management tool for protecting special-status species from the most severe climate change impacts; however, single-species approaches to climate adaptation can risk interrupting ecosystem function and further imperiling other species.

DoDI 4715.03 advises adaptive and ecosystem-based management. As such, many current special-status species management activities are appropriate for increasing resilience or facilitating adaptation to climate change. For example, an ecosystem approach that prioritizes functional diversity, habitat maintenance, habitat variability, and habitat connectivity can help support genetic and functional diversity, particularly in the context of vernal pool complexes at Travis AFB and surrounding the installation that support a wide range of special-status species. In turn, genetic and functional diversity can facilitate adaptation and help species migrate to favorable habitats. As many of the special-status species on Travis AFB are plants, seed banking can be a valuable tool in preserving genetic diversity. As temperatures increase, it will be increasingly important to plant or retain more drought tolerant native plant species to buffer against invasive species introduction.

A regional awareness of special-status species and potential new regulatory issues is critical to management on Travis AFB, as changing weather patterns may force species into new areas or change listing statuses. For instance, increasing storm severity may increase the number of extreme flood events capable of washing special-status fish onto Travis AFB, and potentially stranding them in unsuitable habitats. Likewise, potential for increased frequency or severity of droughts may further endanger already imperiled vernal pool-dependent species, necessitating changes in listing status or additional conservation efforts. These types of events would increase the regulatory burden on the installation and result in the need for additional monitoring, restoration, and conservation effort.

Climate change threats to sensitive plant species include the potential for increased competition from invasive species, changing temperature and rainfall regimes that may be unsuitable, and possibly loss of key pollinators. As narrow endemics that rely solely on vernal pool habitat, the sensitive plant species at Travis AFB may be particularly at risk from the increased rainfall variability and the associated changes in localized hydrology projected. Similarly, invertebrates that rely on vernal pool habitat may face the same challenges, as well as water quality degradation if vernal pool temperatures change. CTS in particular may be subject to adverse impacts from drought and more irregular and intense rainfall patterns that may reduce the availability and/or suitability of vernal pools for breeding and also degrade upland and migratory habitat with invasive plant species.

Habitat change and disruption to food availability are two major climate-related threats to all wildlife species at Travis AFB. Habitat requirements such as need for refugia for some species may change as they employ behavioral adaptations. Prey populations or forage abundance may also be affected by changes in temperature and precipitation. Seasonal cues for prey or forage emergence may change, resulting in a mismatch between food availability and food needs.

Populations of some special-status species, particularly aquatic invertebrates, are further imperiled by life stages that are sensitive to temperature and precipitation changes projected in the CEMML climate scenarios. Disease incidence and severity may change in the future and could interact with climate factors to further stress populations of sensitive species. For instance, outbreaks of chytrid fungus, which has been implicated in declines of amphibians world-wide may correlate to temperature and humidity variables, although the exact nature of the relationship is unclear (Bosch et al. 2007).

In some portions of their range, the CTS is threatened by hybridization with introduced barred tiger salamanders (*Ambystoma mavortium*). Both barred tiger salamanders and hybrids have a higher thermal tolerance than pure CTS, indicating that they may be better equipped to handle rising temperatures, which would put further competitive pressure on the native CTS (Cooper and Shaffer 2020). Invasive species in general are predicted to become increasingly problematic as climate change disrupts abiotic and biotic conditions and the relationships between the two (Hellman et al. 2008).

Effective approaches to climate adaptation require site-specific climate projections as well as local knowledge of species and their habitats. Adaptation actions can focus on addressing changes as they occur (i.e., reactive strategies) or can seek to avoid impacts of changes (i.e., proactive strategies). In the context of special-status species with limited habitats such as vernal pool-dependent species, it may be prudent to focus on proactive strategies to avoid losses that may hinder species recovery; however, if changes in the environment are already affecting priority species, a reactive approach could still improve long-term species survival. Managers can further refine actions, whether proactive or reactive, by considering how they intend to manage change in the system.

Change management strategies change can take the form of resistance, resilience, or realignment. Resistance strategies seek to maintain the status quo and prevent change from affecting the species, for instance using seed collection during high-yield years to bolster populations of annual plants in low-yield years. Resilience strategies are those that support ecosystem function without fundamental change, such as by preventing introduction of invasive species through continuing proper grazing management. Realignment strategies focus on understanding that some changes will occur, and support transitioning to a new ecosystem state; these can be implemented by participating in regional-scale efforts to ensure habitat connectivity and genetic diversity (Holling 1973; Millar et al. 2007).

2.3.5 Wetlands and Floodplains

Wetlands are an important natural system and habitat because of the diverse biologic and hydrologic functions they perform (Figure 2-15). These functions include water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, wildlife habitat provision, unique flora and fauna niche provision, storm water attenuation and storage, sediment detention, and erosion protection. Wetlands for which the USACE has jurisdiction are protected under Section 404 of the Clean Water Act (CWA). The USACE defines wetlands as “those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 CFR 328) including vernal pools and vernal pool swales. The "no net loss" requirement in the CWA and Executive Order (EO) 11990, *Protection of Wetlands*, require federal actions to protect natural values of all wetlands. Mitigation of potential impacts by federal actions include approaches to avoid impacts first, minimize impacts if avoidance is not possible, and mitigate at last resort by creation, restoration, or enhancement of wetland function. Travis AFB attempts to either avoid or minimize impacts to wetlands. When impacts to wetlands are unavoidable, the wetland

habitat is mitigated through on-site restoration or purchase of off-base wetland mitigation credits. EO 11990 requires a Finding of No Practicable Alternative when wetlands may be impacted by a project.

Wetlands on Travis AFB primarily exist as vernal pools. Vernal pools and swales are found within the grasslands throughout Travis AFB. They generally occur in undeveloped areas of the base with the highest quality pools found on the western side of Travis AFB.

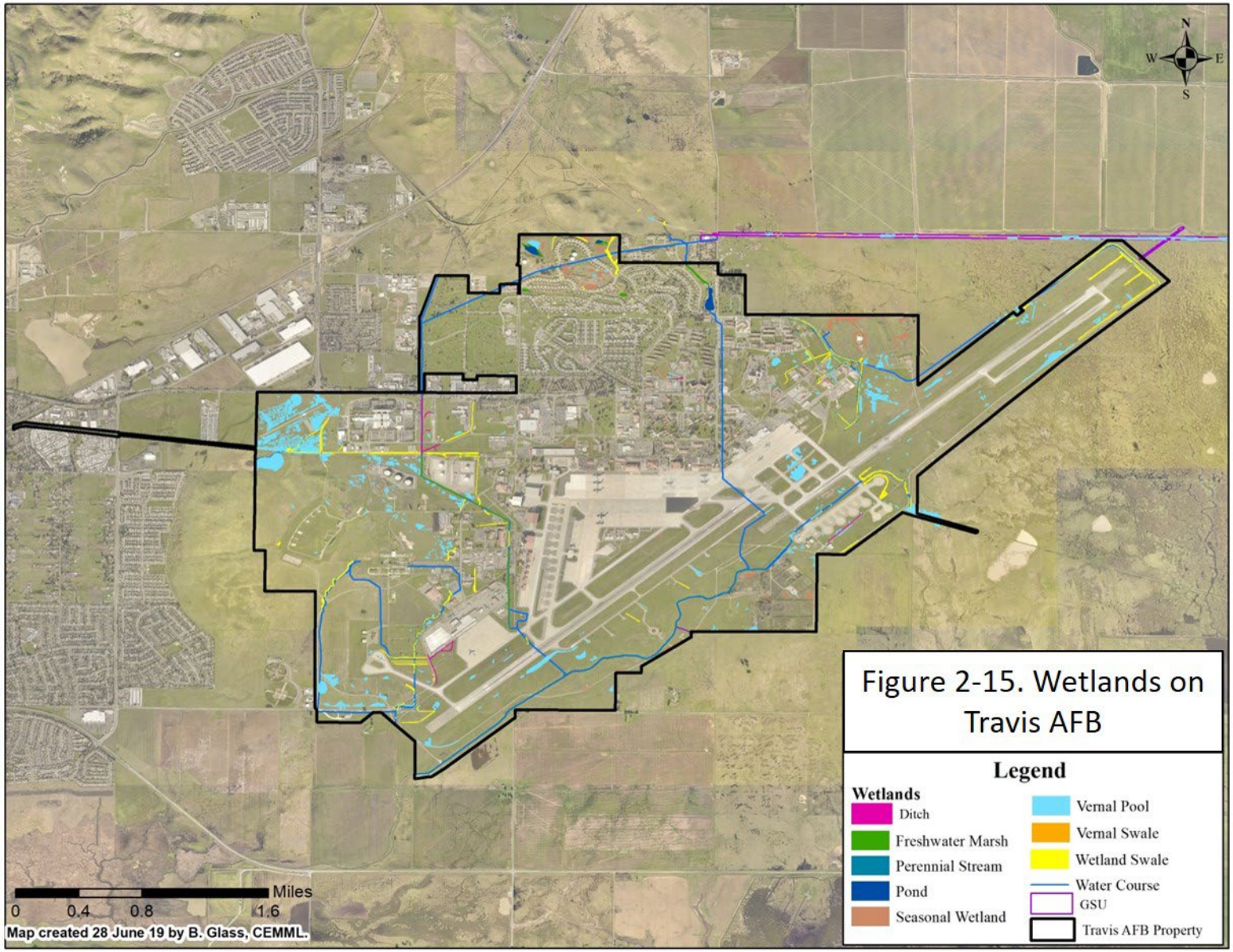

Figure 2-15. Wetlands on Travis AFB.

A wetland delineation of the base was conducted in the spring of 2014 with additional work completed in winter 2015 (Auxilio Management Services 2015). On 7 May 2015, Travis AFB requested a preliminary jurisdictional determination, which was received from the USACE on 19 July 2016. Appendix F contains all wetlands certified by the USACE on 5 July 2016, which found 96.01 wetlands on Travis AFB. A study measuring the hydrological functioning of vernal pools on the base was conducted in the spring of 2014. Another jurisdictional delineation was conducted in spring 2017 and spring 2018 to evaluate approximately 1,272 acres for jurisdictional wetlands (Marty 2019a). This delineation included parts of the base and several GSUs including Cypress Lakes Golf Course, the Former Sacramento Northern Railroad Right-of-Way, and the Middle runway marker (Marty 2019a). These recent delineations have determined that there are 122 acres of wetlands on Travis AFB and its GSUs and a total of over 600 vernal pools.

2.3.6 Other Natural Resource Information

See Appendix G for a list of the natural resource surveys completed on Travis AFB.

2.4 Mission and Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

For successful natural resource management, it is necessary to recognize natural resource protection issues that have the potential to pose a constraint to future development and mission expansion. The natural resources constraints to future development and mission expansion are summarized below:

Travis AFB supports legally protected species. Protection of habitat for legally protected species currently limits available area for mission expansion and future development particularly in areas designated for protection under existing biological opinions (i.e., Castle Terrace Conservation Area, Aero Club Conservation Area, Hangar Goldfields Conservation Area and Perimeter Goldfields Conservation Area).

Bird aircraft strikes are an ongoing hazard. Habitat for migratory birds, especially raptors, exists on the base both in unimproved and improved areas as well as adjacent to the base on private lands. Union Creek is a bird attractant as it provides a water source but can become more of a bird attractant if vegetation is left unmanaged. There is a short-term and a long-term management plan for controlling the excessive vegetation along Union Creek. The short-term plan includes removing approximately 25 trees around and near the WWTP (completed in 2019), updating mowing contracts to include up to the bank, and cleaning out basins behind the WWTP that are holding water and sludge. The long-term plan includes returning Union Creek to its natural ephemeral stream state by developing infrastructure for diverting Environmental Restoration Program (ERP) treated water from being pumped into Union Creek. The presence of legally protected species on the flightline may impact primary USAF missions.

Habitat requirements for sensitive species adversely affect timing and expense of ground maintenance or construction activities.

Much of the open space surrounding Travis AFB to the east is currently protected through conservation easements or deed restrictions that would not allow for expansion of the base boundary. While this also protects the base from urban encroachment, in areas that are not permanently protected, the cost of land acquisition and mitigation if expansion is necessary are extremely high.

Land management on adjacent private lands could reduce available habitat for wildlife or attract BASH risks both posing an increased hazard to airfield and flying operations. Proliferation of weeds on adjacent private lands increases threat of dispersal onto the base, which could increase cost of control. Travis AFB has an existing easement for vegetation clearing at its expense along the length of Union Creek on private

property located southwest of the base and some lineal easements for access to what used to be a marker off the end of the runway in the middle of the property.

The presence of legally protected species on the flightline poses pest management limitations that may impact flight safety.

Effective natural resource regulatory compliance requires early integration in the mission planning process, adequate funding and ample time to document potential impacts and complete agency consultations in order to minimize these constraints due to development or future mission activities. The conservation of natural resources is an important DoD and Air Force mission, but this is not the primary mission for the Department of the Air Force.

As per the ESA, consultation with the USFWS must occur for any proposed or ongoing actions that may affect a legally protected species or its habitat. Actions that impact jurisdictional wetlands to include dredging, filling, and activities that displace soil in a wetland, require a 404 permit from the USACE and a 401 water quality certification from the San Francisco Bay Regional Water Quality Control Board. The 404 permit and 401 water quality certification must be obtained prior to any land disturbance activity located in a jurisdictional wetland. Additionally, the Air Force is required to complete a Finding of No Practical Alternative for any proposed action in a wetland per EO 11990. The Air Force is further required to mitigate for actions in and the loss of non-jurisdictional wetlands under EO 11990.

2.4.1.1 Potential Future Mission Impacts due to Climate Change

Travis AFB's missions of providing materiel and service support around the globe do not require specific habitat or vegetation types that would be an integral part of mission readiness at other installations. The primary resources required for sustainment of the mission are adequate air space and predictable weather conditions.

Future impacts to the mission at Travis AFB linked to climate change could include:

- Increases in temperature and wind velocity leading to unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, requirements for new equipment, or decreased launch capacity (DoD 2014);
- Increased dust generation effecting equipment and visibility (DoD 2014);
- Increased wind velocities damaging vital mission infrastructure (Sydeman et al. 2014);
- Increased drought potential (Glick et al. 2011);
- Potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.
- Changing regulatory burdens associated with listing decision changes or species' range shifts

In addition to these direct effects, climate change has the potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (DoD 2014). Further discussion of the installation's vulnerability to climate change can be found in Section 7.16.

2.4.2 Land Use

Travis AFB occupies 5,137 acres and Travis AFB GSUs occupy 357 acres. Residential areas primarily occupy the northern portion of the base. The commercial-administrative developments just south of the

residential area extend across the entire base from east to west. The southwest portion of the base is predominantly open space, industrial, or outdoor recreation (Figure 2-16).

2.4.3 Current Major Mission Impacts on Natural Resources

2.4.3.1 Environmental Restoration Program

The Travis AFB ERP is to remediate all accident/disposal/spill sites (from 1984 or earlier) that may pose an immediate or potential threat to public health, welfare, or the environment. There are many ERP sites on the base (Figure 2-17). As such these project fall under the Comprehensive Environmental Response, Compensation, and Liability Act cleanup process and therefore National Environmental Policy Act (NEPA) is not required. Soil and groundwater clean-up sites include landfills, fire protection training areas, spill sites, waste disposal sites, drum storage areas, leaking underground storage tanks and piping, oil/water separators (OWSs), waste treatment plants, and other areas.

In addition to clean-up activities, ERP has resulted in increased habitat surveys, mapping of endangered species, and fostering a general base-wide increase in the awareness of natural and cultural resources.

The ERP operates three groundwater treatment plants under the authority of two Interim Groundwater Records of Decision signed with the U.S. Environmental Protection Agency, Department of Toxic Substances Control and the SF Bay Regional Water Quality Control Board. Each treatment plant extracts contaminated groundwater from principally trichloroethylene-contaminated shallow groundwater plumes underneath Travis AFB and, after treatment, discharges the water to the North Gate Pond or Union Creek. The influent and effluent are both tested at the treatment plants to ensure all contaminants are remediated below regulatory thresholds prior to discharge.

2.4.4 Potential Future Mission Impacts on Natural Resources

The limited land areas available for new development restrict the scope of any land use initiatives to fine-tuning existing land use rather than wholesale relocation of functions to new areas. The Travis AFB IDP proposes consolidating existing land use areas and provides for siting related facilities in compatible areas. All these proposed projects will go through an environmental analysis for evaluation of potential impacts to natural resources.

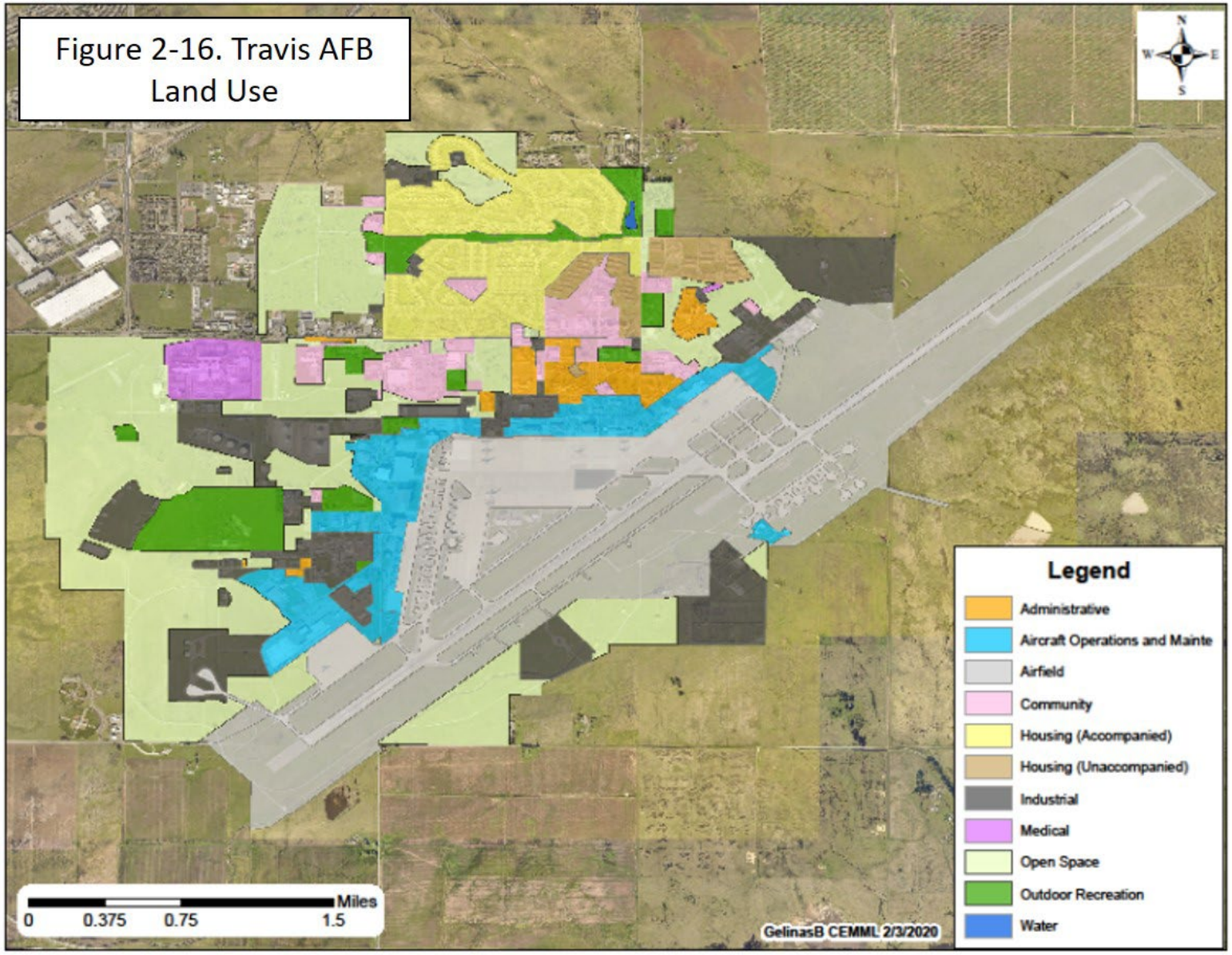

Figure 2-16. Land use on Travis AFB.

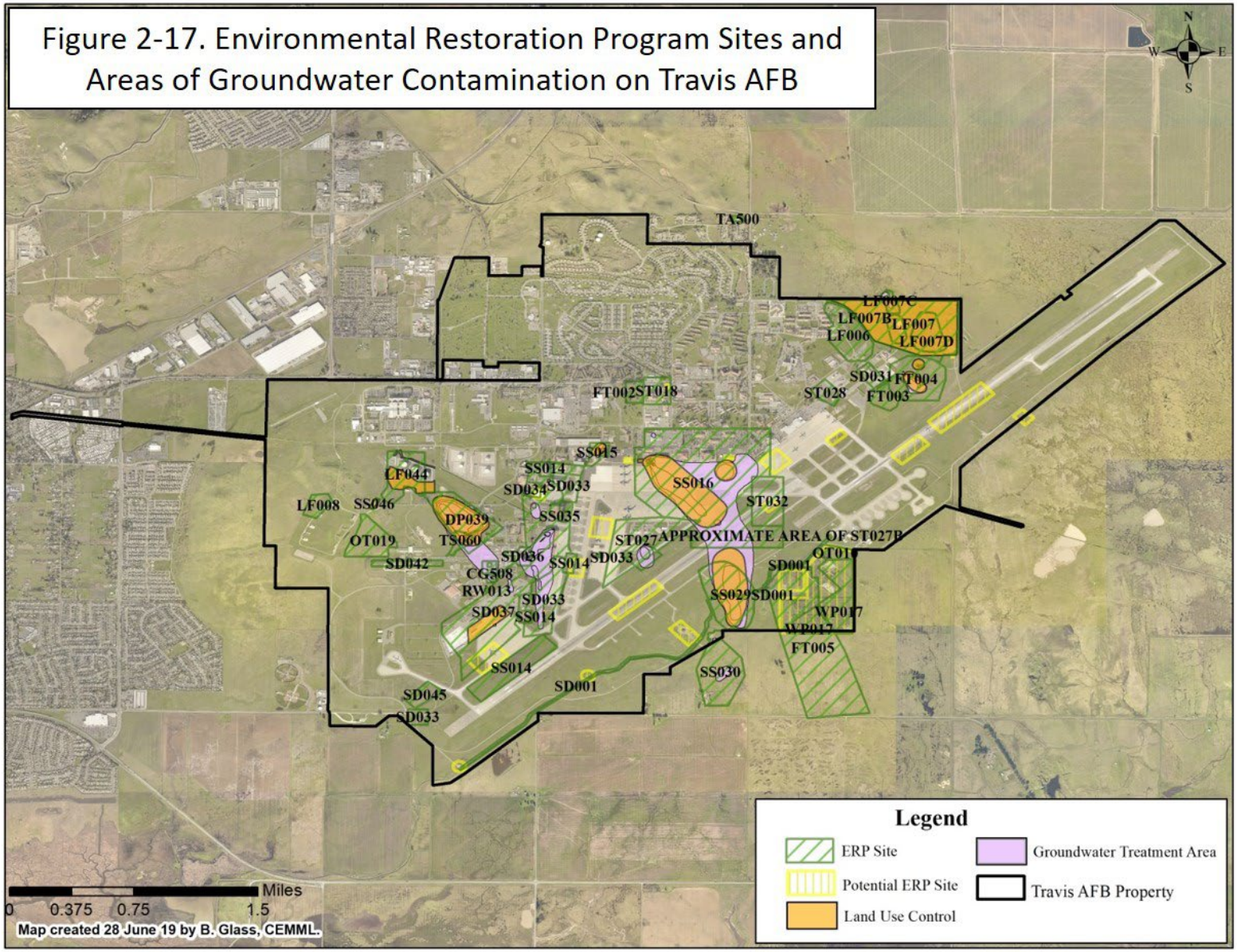

Figure 2-17. Environmental Restoration Program (ERP) sites and groundwater contamination on Travis AFB.

2.4.4.1 Mission

Future land use changes are slated mainly for the southwest part of the base. Planned projects include facilities such as base Civil Engineer Shops, warehouses, a passenger terminal, and renovated aerial port. Those facilities are all part of an overall mobility hub that will remove several facilities that are within the airfield clear zone from the northeast part of the base to consolidate them in the southwest part of the base with compatible functions. Existing plans and current projects include five constructions and a possible major renovation project to support the mobility complex. Other projects around Travis AFB include a 144-room dormitory construction project near the North Gate, a new Child Development Center in the area west of Twin Peaks, and a new school age facility in the same vicinity. Other minor construction projects in the area west of Twin Peaks are planned as part of an overall recreational complex. The USAF plans to recapitalize portions of its existing fleet of tankers, the 4 KC-135 Stratotanker (KC-135) and KC-10 Extender (KC-10), with the KC-46A Pegasus 5 (KC-46A), which will be the newest aerial refueling aircraft in the USAF fleet. The KC46 MOB4 mission with 24 KC-46A PAA would replace the KC-10 fleet and is planned to be completed in two stages: a beddown stage and an operational stage. The beddown stage involves construction/retrofit of required facilities, infrastructure, and prepared surfaces, which includes renovation, alteration and demolition. The beddown stage also includes preparing support six facilities for new personnel and students to support the mission. The operational stage involves conducting day-to-day activities (e.g., operational missions, maintenance) at the installation, including flight operations and training in the existing regional airspace. The Travis AFB IDP provides detail on future development (Travis 2016a). These future mission operations will be planned with minimizing impacts to natural resources and critical habitat areas located off base.

2.4.4.2 Community

Future land use changes will involve both commercial and service facilities such as dining halls, service stations, clubs, schools, chapels, libraries, and the family support center. A major park/sports complex area is also planned. Since most of these projects occur in improved areas, few impacts to natural resources are expected.

2.4.4.3 Medical

The Department of Veterans' Affairs (DVA) and the USAF launched a joint venture to share facilities at DGMC. This allows more diverse and expanded treatment for veterans and military personnel, as well as potential cost savings for both agencies. The USAF and the DVA make joint use of certain functions within DGMC. The DVA constructed an addition to DGMC that increased DGMC's capacity. DGMC currently uses the runway located within the Aero Club Conservation Area as a helipad for medical transport.

2.4.4.4 Off-Base Development Plans

Solano County is one of the fastest growing counties in northern California, and the adjacent communities of Fairfield and Suisun City have extensive plans for expansion of their developed areas to provide for a growing population and expanded local economy. Because the existing land use pattern in the vicinity of Travis AFB has extensive agricultural and open land to the north, east, and south, there is a relatively high degree of land use compatibility between the base and its surroundings. Protection of this land use compatibility is extremely important both for the base and its mission and, ultimately, for the surrounding communities. Some of the owners of these agricultural lands are considering development of wetland mitigation banks in immediate proximity to the Travis AFB flight path. While the preservation of existing

agricultural land uses (i.e., Wilcox Ranch to the east) is compatible with the USAF mission, additional wetland development may present BASH issues by attracting waterfowl to the runway flight path. Wind power generation and solar power farms on adjacent lands may also present unique and incompatible land uses as wind turbine structures interfere with radar and cause an obstruction to navigation.

2.4.4.5 Air Installation Compatible Use Zone

Air Force AICUZ Land Use Guidelines reflect land use recommendations for clear zones, accident potential, and five noise zones. These guidelines have been established on the basis of studies prepared and sponsored by several federal agencies. For AICUZ planning purposes, noise contours are plotted at increments of five decibels (dB), ranging from 60 day-night average a-weighted sound level (DNL) dB to 85 DNL dB, where DNL is defined as the Day-Night Average A-Weighted Sound Level. Nearly all studies on residential aircraft noise compatibility recommend no residential uses in noise zones above DNL 75 dB. Usually, no restrictions are recommended below DNL 65 dB. USAF land use recommendations state that, whenever possible, residential land use levels should be below DNL 65 dB.

The Travis AFB Land Use Compatibility Plan (Shutt Moen Associates 2002), adopted by Solano County Airport Land Use Commission, is more restrictive than the Travis 2009 AICUZ and is used to determine outside development proposals compatibility. This plan is known as the Maximum Mission Scenario document. The flight tracks generally extend from American Canyon to Dixon and from Vacaville to the Suisun Marsh. On departure, heavily loaded aircraft require maximum power and longer time to gain cruising altitude, and as a result, generate greater noise impact. In an effort to minimize noise levels and reduce community disturbances, only mission-essential operations are performed during night hours (10 p.m.–7 a.m.).

Travis AFB published a new AICUZ Study in 2009 (Travis AFB 2009). The study concluded that there are no currently identified zoned incompatible land uses within Travis AFB's Clear Zones and Accident Potential Zones or resulting from Travis aircraft noise when considering the Land Use Compatibility Guidelines used in the study.

In addition to the land set aside for the CCG bank, Travis AFB has been working toward conservation easements through the Readiness and Environmental Protection Integration (REPI) program with annual efforts to stop encroachment and increase regional special-status species conservation. In 2010, Travis AFB purchased an easement on half of the Thomas Ranch property. In 2017, Travis AFB received funding to purchase the second half of the Thomas Ranch property, totaling 292 acres. Travis AFB is currently in the process of acquiring this property while also working toward an appraisal of another property just north of the base. Travis AFB intends to put both of these properties into conservation easements, which will serve not only as buffers to the base but also as compensation for special-status species. Additional funds have been received for 2018 to acquire more easements and applications have been submitted for 2019 to continue the acquisition. These conservation easements will allow the USAF to continue its mission while protecting and conserving the resources. On the property north of the base, environmental restoration work is ongoing, and access to the land through acquisition and then transferal to a conservation easement will ensure the base can perform the restoration and cleanup work necessary to restore the site.

2.4.4.6 Critical Habitat

It should be noted: Pursuant to Section 4(a)(3)(B)(i) of the Endangered Species Act (16 U.S.C. §1533(a)(3)(B)(i)), the Secretary of Interior ". . . shall not designate as critical habitat any lands or other

geographical areas owned or controlled by the DoD, 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."

Travis AFB, including its GSUs, contain critical habitat for four listed species on the base and two GSUs (Figure 2-18). Although the majority of the base is excluded from designated critical habitat, a small portion near the south gate was purchased after the designation, and this remains critical habitat for several species.

Critical habitat for Conservancy fairy shrimp VPFS, CCG and VPTS occurs on the main Base at the South Gate; a triangular parcel south of Runway 03R/21L not within the fenced boundary of the Base; and south of Runway 03R/21L; however, the deep, long-hydroperiod pools vernal pool species require to successfully reproduce in are not present on the base.

Although appropriate habitat for the delta green ground beetle likely does not exist on the main base at Travis AFB and extensive surveys have not detected them, critical habitat for the species was designated on lands owned by Travis AFB at the former Sacramento Northern Railroad ROW GSU. Because little is known about the ecology of the species including dispersal distances and upland habitat use, Travis AFB has established a 1-mile buffer around known and potential delta green ground beetle habitat. Projects within the one-mile buffer will consider the delta green ground beetle in informal project consultation.

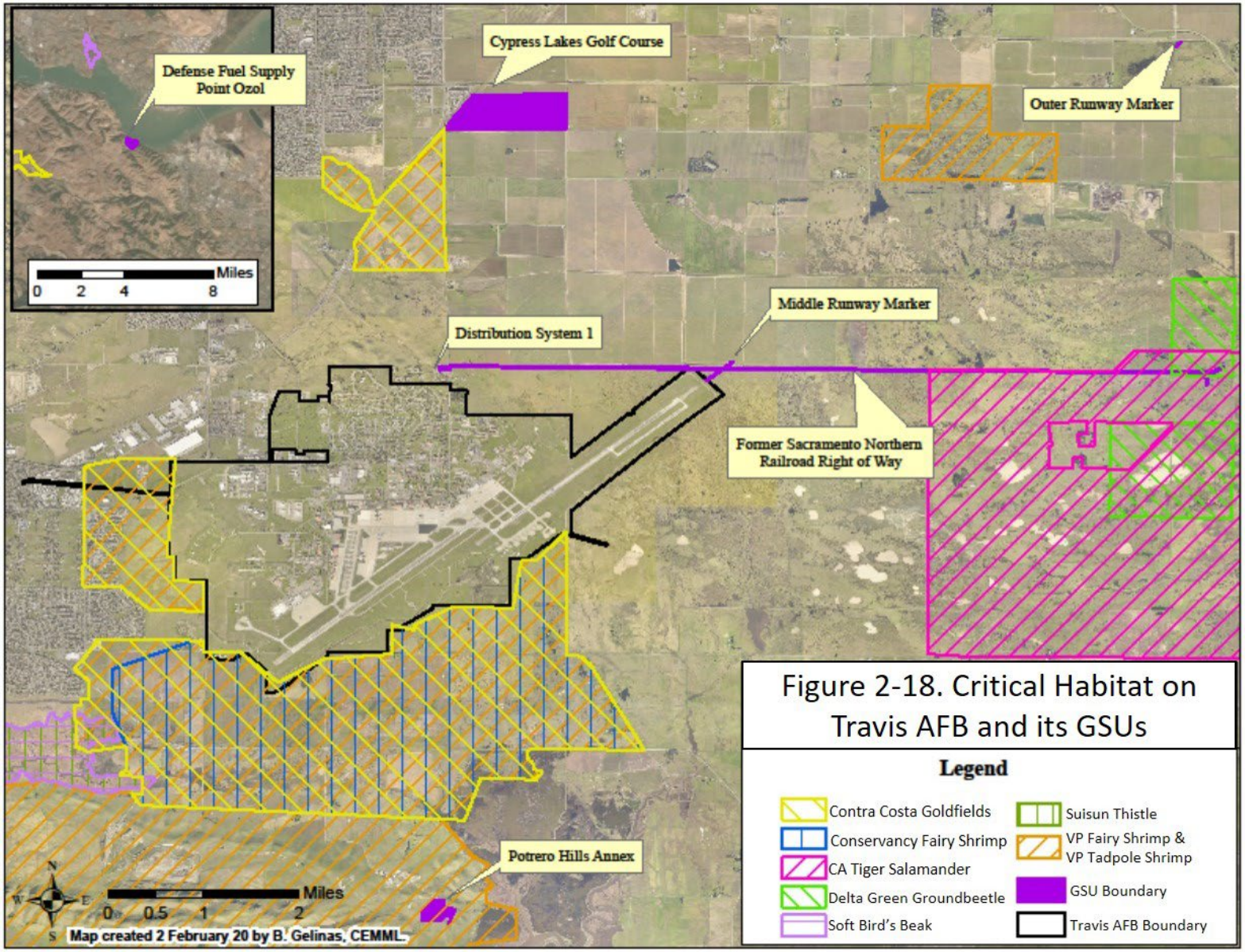

Figure 2-18. Critical Habitat on and near Travis AFB and its GSUs.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. EO 13693, *Planning for Federal Sustainability in the Next Decade*; DoDI 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management*; and International Standard 14001:2004 provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and instilling a culture of continuous improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
Installation Commander	Approves the INRMP and is responsible for ensuring that base-assigned and tenant units comply with the laws and requirements associated with the management of natural resources and that funding and staffing are sufficient to accomplish the projects and objectives of the INRMP. Controls access to and use of the installation natural resources. The 60 AMW Commander signs the INRMP during major revisions that are done at least once every five years. During years where no major revisions were needed and an annual review is required, the Base Civil Engineer is delegated by the 60 AMW Commander to sign the Annual Review.
Air Force Civil Engineer Center Natural Resources Media Manager/Subject Matter Expert/ Subject Matter Specialist	Provide expertise and allocate funding for projects specified in this INRMP.
Installation NRMr/Point of Contact (POC)	Primary responsibility for natural resources management. The NRM is the principal POC for determining consistency of proposed actions and projects with the INRMP. Plan and direct the activities of the Natural Resources Element. Establish goals for that element that contribute to the success of Wing and Civil Engineer mission objectives. Ensure that integrated programs meet customer needs and comply with legal and regulatory requirements.
Installation Security Forces	Provides for law enforcement of natural resources regulations.
Installation Unit Environmental Coordinators; see AFI 32-7001 for role description	Currently not applicable.
Installation Wildland Fire Program Manager	Development of Wildland Fire Management Plan. Review and approve plans for prescribed burns. Ensure that all personnel are trained, and the program meets legal and regulatory requirements. This position is staffed through an Interagency Agreement for the Wildlife Fire Support Module at Beale.
Pest Manager	Ensures that pesticides do not negatively affect the legally protected species or negatively affect wetlands and streams. Reviews contract language for work including herbicides and review pesticide use reports submitted by contractors.
Range Operating Agency	NA

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
Conservation Law Enforcement Officer (CLEO)	No hunting and very little fishing on Base. It has been determined that the CLEO is not needed at this time (will revisit this issue in the future)
NEPA/Environmental Impact Analysis Process (EIAP) Manager	The National Environmental Policy Act (NEPA) requires all federal agencies to consider the potential impacts of proposed projects on the human environment and natural resources. The EIAP is the Air Force procedure for implementing NEPA.
National Oceanic and Atmospheric Administration, National Marine Fisheries Service	Not applicable.
United States Forest Service	Not applicable.
United States Fish and Wildlife Service	See Coordinating Agencies below.
Coordinating Agencies	The U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW), in addition to being signatory agencies, to the Integrated natural Resources Management Plan (INRMP), provide technical assistance to Travis AFB when requested. Specifically, these agencies can help support the INRMP by notifying the NRM. These agencies may support Travis AFB personnel during scheduled wildlife and vegetation surveys. The USFWS and CDFW will also support the development of operational component plans to be developed in conjunction with implementation of this INRMP. Coordinating agencies are not mandated but rather provide assistance to Travis AFB such as, Natural Resources Conservation Service for soil conservation and the USACE for jurisdictional wetlands.
Wing/Vice Commander	Chairman, Environmental Safety and Occupational Health Committee (ESOHC)
Wing/Judge Advocate	Regulatory interpretation and off base dispute/complaint resolution legal representation.
Wing/ Flight Safety	Bird/Wildlife Air-Strike Hazard (BASH) monitoring and minimization (on and off base)
Medical Group/Bioenvironmental	Drinking water quality monitoring
Medical Group/ Public Health	Vector surveillance
Operations Group/Operations Support/Airfield Management	Airfield Grounds Maintenance, BASH monitoring and minimization. Organize and conduct Bird Hazard Working Group and hold required meetings.
Mission Support Group (MSG)/Deputy Commander/ Environmental Management System (EMS) Cross-Functional Team (CFT) Chair	Chair of Installation EMS CFT

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
MSG/Civil Engineering (CE) /Programs	Storm water/erosion control and landscaping specifications for new construction
MSG/CE/Operations	Oil/Water Separator Maintenance, General Grounds Maintenance, Pest Management (including airfield animal dispersal and control), Removal of BASH from Airfield, Other Pest Control
MSG/CE/Installation Management	INRMP, Natural Resources Management, Cultural Resources Management, Nature Education, Hazardous Materials Management, Air Quality Monitoring/Compliance, Water Quality Compliance, EIAP, Environmental Regulatory Coordination, Pollution Prevention, Base Comprehensive Plan, Installation Development Plan, Grounds Maintenance in Housing Areas
MSG/CE/Environmental Element Chief	Oversee the NRM, support the natural resources program and have approval authority over the planned/directed activities of the Natural Resources Element.
MSG/Force Support/Outdoor Recreation	Nature Education/Outdoor Recreation Activities. Outdoor Recreation Equipment Rental/Check Out
EMS CFT	The Travis EMS CFT supports the ESOHC by implementing, establishing and maintaining AFI 32-7001, Environmental Management. The team may work with other ad hoc working groups based upon the identified EMS CFT objectives. Due to the impact on the Installation from threatened and endangered species and BASH considerations, the EMS CFT has selected natural resources as one of its significant environmental aspects that requires that an Environmental Management Plan with objectives and targets be established, tracked and communicated routinely to the Installation leadership and Installation personnel.
MSG/Public Affairs Office	Communicate projects, events and activities with the public.

5.0 TRAINING

USAF installation Natural Resources Managers (NRMs)/Points of Contact (POCs) and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change or to fulfill a permitting requirement.

Installation Supplement—Training

Natural resources management provides training to ensure that Travis AFB personnel, contractors, and visitors doing work on the installation are aware of their role in the program and the importance of their participation to its success. Natural resource awareness training includes ecology, California vernal pool information, branchiopods information, wetland awareness, CTS, and habitat training. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System records disposition schedule. Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook and in referenced documents.

Installation Supplement—Recordkeeping

- Hard Copy and Electronic
- Biological Monitoring and Survey Reports
- Construction Project Status Tracking
- Compensatory Mitigation
- Monitoring of Biological Opinions
- Monitoring CWA Permits
- Costs paid by construction contracts for T&E species monitoring and compensation

6.2 Reporting

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement—Reporting

- ESOHC-EMR Semi-Annual Data Call
- Annual Biological Opinion Reports
- CWA 404/401 Monitoring Reports
- INRMP Annual Implementation Status Report to USFWS and CDFW
- Management and Internal Control Toolset

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement –Natural Resources Program Management

The INRMP is a large document containing both historic and current information about Travis AFB. Such information includes the Installation mission, location, and surrounding area information but most of this information is non-essential to the day-to-day management of natural resources on Travis AFB.

7.1 Fish and Wildlife Management

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. Travis AFB **IS** required to implement this element.

Program Overview/Current Management Practices

Fish and wildlife management is defined as the attempt to balance the needs of wildlife with the needs of people using the best available science. Management might be performed in a manner that enhances biodiversity through the re-establishment of native natural areas. Conversely, wildlife habitat management could be required to decrease the abundance of certain wildlife species to reduce animal damage or bird strike hazards. At Travis AFB the airfield is approximately 2,500 acres in close proximity to Union Creek resulting in an ongoing conflict between wildlife and aircraft.

The Air Force has determined that State permitting regulations (such as State requirements for permits to handle sensitive species) do not apply to Federal employees performing their official duties (Department of the Air Force Office of the Judge Advocate General Operations and International Law, 2021). Similarly, installations are only required to comply with Federal (not State) requirements when addressing BASH hazards created by migratory birds, deer, or other animals. An installation may voluntarily coordinate its depredation activities with State officials or apply for low-cost or no-cost State permits as a matter of comity, when doing so would be beneficial to species management. Note that this does not affect the need for valid hunting permits on installations, which are still required because the Federal government has explicitly waived immunity to State fish and game laws, making all such regulations applicable to Federal employees and on Federal lands.

7.1.1 Fish and Wildlife Program Management

The primary fish and wildlife management objective is to protect, conserve, and enhance the natural resources on the base to sustain suitable habitat for the various species of fish and wildlife, including special-status species, which inhabit the base. The secondary objective of the program is to manage natural resources to improve the outdoor recreation opportunities for base personnel, residents, and retirees.

Fish and wildlife are managed to meet multiple objectives that include addressing opportunities for effective management of wildlife populations, with a focus on the conservation, restoration, protection, and enhancement of habitats, rather than on individual species' management.

Travis AFB has approximately 1,735 acres requiring wildlife management. This includes a 206-acre golf course, a 20-acre park containing a 2.2-surface-acre lake, and approximately 1,500 acres of annual grasslands with 600 vernal pools scattered throughout. These vernal pools are potential habitat for the federally endangered CCG, threatened VPFS and the endangered VPTS, among other special-status species with varying regulatory statuses. One of the focus species at Travis AFB is the CTS whose potential habitat covers much of Travis AFB undeveloped grasslands including gopher and ground squirrel burrows. Additionally, Travis AFB manages natural resources to reduce BASH impacts on the airfield and utilizes grazing, mowing, and prescribed burning to enhance native species while reducing fire fuel loads throughout the base.

7.1.1.1 Hunting and Fishing Programs

Per 10 U.S.C. Section 2671(a)(1) requires that all hunting, fishing, or trapping at military installations be IAW the fish and game laws of the state or territory in which it is located. Per U.S.C. 10 Section 2671 (a)(2) requires that the Installation Commander ensure that individuals fishing on the base obtain the appropriate State of California issued fishing license. Currently, security and force protection requirements on Travis AFB do not permit a hunting program on the installation; however, this is at the discretion of the Base Civil Engineer. Fishing is allowed at two ponds on base.

7.1.1.2 Wildlife Education Areas

Travis AFB is currently planning two watchable wildlife areas in addition to the education and outreach projects in this INRMP to increase awareness of natural resources for base personnel, residents, retirees and the public. Some of the activities planned include establishment of interpretive signs and center(s), and active outreach to the community, schools, and base visitors. Education will help protect legally protected and non-legally protected species and will help minimize the need for additional regulatory protection for these species and areas.

7.1.1.3 Wildlife Pests and Feral Animals

The 2017 Travis AFB Pest Management Plan (PMP) provides guidance and information integral to the quick and effective control of pests (insect, animal, and plant). This plan applies to all activities and contractors that use pesticides or perform any pest management activities on the base. The CES, Pest Management Section is responsible for the Installation Pest Management Program. All herbicides and pesticides used on Travis AFB are in accordance with DoDI 4150.07, *DoD Pest Management Program*; AFMAN 32-1053, *Integrated Pest Management Program*; Manufactures Labels; and the Travis AFB Pest Management Plan.

The CES Pest Management Office is responsible for controlling the pond vegetation which includes undesirable aquatic weeds and algae under the installation pest management program by using Aquatic herbicides and food grade dyes to prevent UV ray penetration and slow the growth of algae. Left unchecked, Eurasian watermilfoil (*Myriophyllum spicatum*) and various species of algae can degrade the pond water quality rapidly. Algal blooms occur as temperatures start rising in the spring months as both sunlight and day length increase. Once the algae die, the algae are decomposed by aerobic bacteria that use oxygen. This may result in hypoxic conditions that leave the lake with low oxygen levels that lead to fish kills.

Common vertebrate pests include skunks, opossums, wild turkeys, ground squirrels and raccoons. Pests are removed on an as-needed basis. The main control measure is to keep them from living under or around homes by replacing or repairing crawl space vents in housing. Physical removal and relocation of these

animals is done with HAVAHART® live traps. Snakes are physically removed and relocated to an open field away from buildings.

Ground squirrels are found nesting along ditch banks and in open fields. Controls used are live traps, bait, fumigation, and shooting. Squirrel control is allowed using Wilco Ground Squirrel Bait in areas with low risk of encountering CTS according to resistance and habitat mapping for CTS (Marty 2017b) (Figure 2-13). If control is required in Medium and High-Risk Areas, the NRM is consulted to develop a plan that minimizes the risk to legally protected species.

The Travis AFB PMP calls for all feral animal control issues to be handled by the Security Forces Squadron as outlined in Travis AFB Instruction 31-102, *Control of Feral Animals on Travis AFB* (see Section 7.11 for more details).

The AMC Command Entomologist is responsible for researching the state and federal laws and ensuring that the PMP complies. The NRM maintains sensitive species maps that are used to identify potentially impacted species based on location alone. These maps are used as a starting point and supplemented with more recent and up-to-date knowledge, surveys and maps.

USDA/BASH team performs the majority of integrated pest management measures for the control of birds on the airfield (see Section 15.0, Tab 2). Pest Management may provide integrated pest management measures in conjunction with the contractor in certain circumstances. No pesticides for the control of birds are used without approval from the AMC Command Entomologist. The base maintains a separate pest management contract for the abatement of birds and bats from hangars and selected base buildings.

7.1.1.4 Bat Management

In 2017, a bat acoustic monitoring survey was conducted throughout Travis AFB (Schwab 2018). This survey was part of a nationwide survey for legally protected bat species and general monitoring of bat presence on Air Force Bases (Schwab 2018). Of the four federally (T&E) endangered bat species in the U.S., the lesser long-nosed bat is the only potentially occurring species, but with a low likelihood of occurrence. Multiple special-status bat species occur in California, with several being possibly present at Travis AFB. Schwab (2018) auto-detected 13 species of bat with acoustic monitors, and five species were later manually confirmed: Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), western red bat (*Lasiurus blossevillii;* SSC), and Yuma myotis (*Myotis yumanensis*).

Bats are found throughout Travis AFB in several buildings and in bat houses. Recent human/bat conflicts beginning in 2016 prompted Travis AFB to develop guidance for managing bats when they become a nuisance. In 2016, Travis AFB biologists conducted day and nighttime surveys for bats after complaints about guano and bats in the Commissary. They determined that Mexican free-tailed and likely big brown bats were roosting in the building, and occupants requested that they be removed for health reasons. After an assessment by the biologists, a removal project was initiated and the building occupants reported a successful reduction in bat traffic and odor. In 2019, a similar issue in the Commissary Building occurred with bats roosting and producing guano in the exterior flashing. However, because the bats were not found in the interior of the building, the biologists determined that excluding the bats in this case would be unlikely to solve the problem and could exacerbate it, should the bats attempt to roost inside instead.

Bats may pose a human health risk from disease when allowed to come in close contact with people, although disease transmission risk is fairly low in California. Bats may pose a larger problem as a nuisance

from noise, odor, and activity which may be objectionable. Bats, however, are extremely important components of the ecosystem and provide direct benefits to humans primarily through insect control; thus, it is important to strike a balance between allowing bats to remain under some circumstances but excluding them from access in other cases.

Any bat handling or exclusion activities should be reviewed, approved, and monitored by the Travis Environmental Office's NRM. Several bat species are listed as CA Species of Concern and thus warrant special management. In all cases, any exclusion or removal actions must be conducted according to bat lifecycles and with awareness of their periods of sensitivity. If bats need to be excluded from buildings, those activities should be conducted outside the winter season in order to maximize bat survivorship and outside of the maternity season, which often occurs from April through August. Ideal times to conduct bat exclusion are 15 August–30 October and 15 February–01 April.

TAFB has developed the following procedures and recommendations for addressing human-bat conflicts.

- Biologists should visit the site during the appropriate season for a day and a night survey to determine the extent of the problem and species of bat, locate entry points, and evaluate the site for mitigation measures that may allow co-existence of the bat and human building occupants.
- Determine whether alterations can be made to the building, human occupant practices, or site that would reduce the interactions between human and bat occupants. Building occupants may co-exist with the bats so long as guano is not disturbed, bats are not handled, and the building is well ventilated. A guano catchment system could be created and installed to prevent guano accumulation on the floor and to accommodate an efficient or automatic guano cleanup system. Where guano is falling onto walkways or public areas from external roost sites, install shields that can be cleaned to prevent guano from accumulating and falling where it is not wanted, or consider partial exclusion of only those areas that are causing the problem, allowing the bats to continue to access the remaining sites.
- If bats are roosting only externally, ensure that any possible access routes to the interior of the building are closed to prevent the colony from exploring interior roost sites (vents, gaps, rolling door tops, etc.). If bats are entering through open bay doors or windows, these may need to be closed and/or have screens installed to discourage bat occupancy. From a biological, health, and safety perspective, allowing bats to roost on building exterior surfaces is appropriate as long as bats cannot access the interior of the building because (1) exclusion may cause them to investigate other access points and begin roosting inside the building, (2) if exclusion is required and is successful, bats will most likely move into other buildings on Travis AFB, and/or (3) complete exclusion of all bats will be extremely difficult to achieve and labor intensive.
- If co-existence is not an option, the colony may have to be excluded. This will only be conducted during the appropriate season and under guidance of the NRM and by a highly experienced company. One-way exits will be installed in each entry point for at least one week prior to installation of permanent seals to prevent trapping animals inside.
- In cases where bats are evicted from a building, an alternate roost site such as a bat house should be installed at the nearest suitable site to encourage the bats to fully vacate the building. Bat houses should be located and established in coordination with the BASH team to avoid increasing the bat traffic near the airfield. Bat houses should be established one year before the

exclusion, and some bats may be relocated by hand to increase the likelihood bats will be aware of the new site prior to eviction.

Bat populations in the U.S. have experienced huge declines with the introduction of white-nose syndrome (WNS). Travis AFB will implement new scientific guidance and collection procedures to reduce the threat of spread of WNS if/when it is detected on Travis AFB (Appendix J).

7.1.2 Climate Impacts on Fish and Wildlife Management

Climate change will not necessitate substantial changes in fish and wildlife management at Travis AFB, as ecosystem-based management, special-status species monitoring, and habitat management practices such as proper grazing management and mowing are already in place. If temperatures rise in lentic systems, oxygen levels will decrease and fish, amphibian, and macroinvertebrate populations will need to be monitored. As water temperatures rise, so will the risk of algal blooms. Efforts to remove invasive aquatic plants and algae from ponds should continue, and planting shade trees around water sources such as fishing and recreation ponds to prevent overheating may need to be considered (Poff et al. 2002).

Climate change on Travis AFB may benefit generalist species such as skunks, raccoons, gophers, and ground squirrels. Trapping and relocation programs conducted by entomology will need to be maintained to reduce pest incidents on the installation. Fish, wildlife, and plant surveys should be conducted routinely to monitor for potential arrival and spread of invasive species as well as expanding native populations. Management plans should be flexible enough to adapt to changing concerns (Hellmann et al. 2008).

Increased temperatures and precipitation will likely favor vectors for diseases such as mosquitoes and ticks (Süss et al. 2008). Minimization of stagnant water in and around the cantonment area can help to reduce mosquito related infections. Tick populations in urban settings can be restricted by keeping lawns mowed and by preventing overabundances of hosts such as deer and rodents.

The Travis AFB WFMP is in place to address potential increases in fire activity as a result of increasing drought severity, increasing temperatures, and changes in vegetation.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. Travis AFB **IS** required to implement this element.

Program Overview/Current Management Practices

Outdoor recreation activities for base personnel, residents and retirees on Travis AFB are limited due to the amount of open space and public use that is restricted by the current military mission (Figure 7-1). Off-road vehicular use, including mountain bikes, is not permitted on the base. An interpretive nature trail is available to those on base in the Castle Terrace Conservation Area and includes “ecosystem observation” sites and interpretive signs (Appendix K). It is the policy of the USAF to promote public access to outdoor recreation resources to the greatest degree possible, consistent with the installation’s safety and security requirements. The Cypress Lakes Golf Course GSU is open to the public. The other GSUs and Travis AFB are restricted to public access. The public may attend events on base after review and approval by Security Forces, as long as they are accompanied by base personnel, residents or retirees.

In all cases, outdoor recreation on allowed areas is secondary to other base uses. The primary use is either as a safety zone around the airfield and industrial areas or open space used for the separation of various base areas. Outdoor recreation activities are the responsibility of the Force Support Squadron (FSS), Recreation Office.

AFI 34-101, Air Force Morale, Welfare and Recreation Programs and Use Eligibility, provides guidance for starting and running outdoor recreational programs at USAF installations. It outlines roles and responsibilities, safety considerations, program goals, and funding categories. A number of DoD, federal, and state guidelines and restrictions provide policy guidance for management of specific recreational programs.

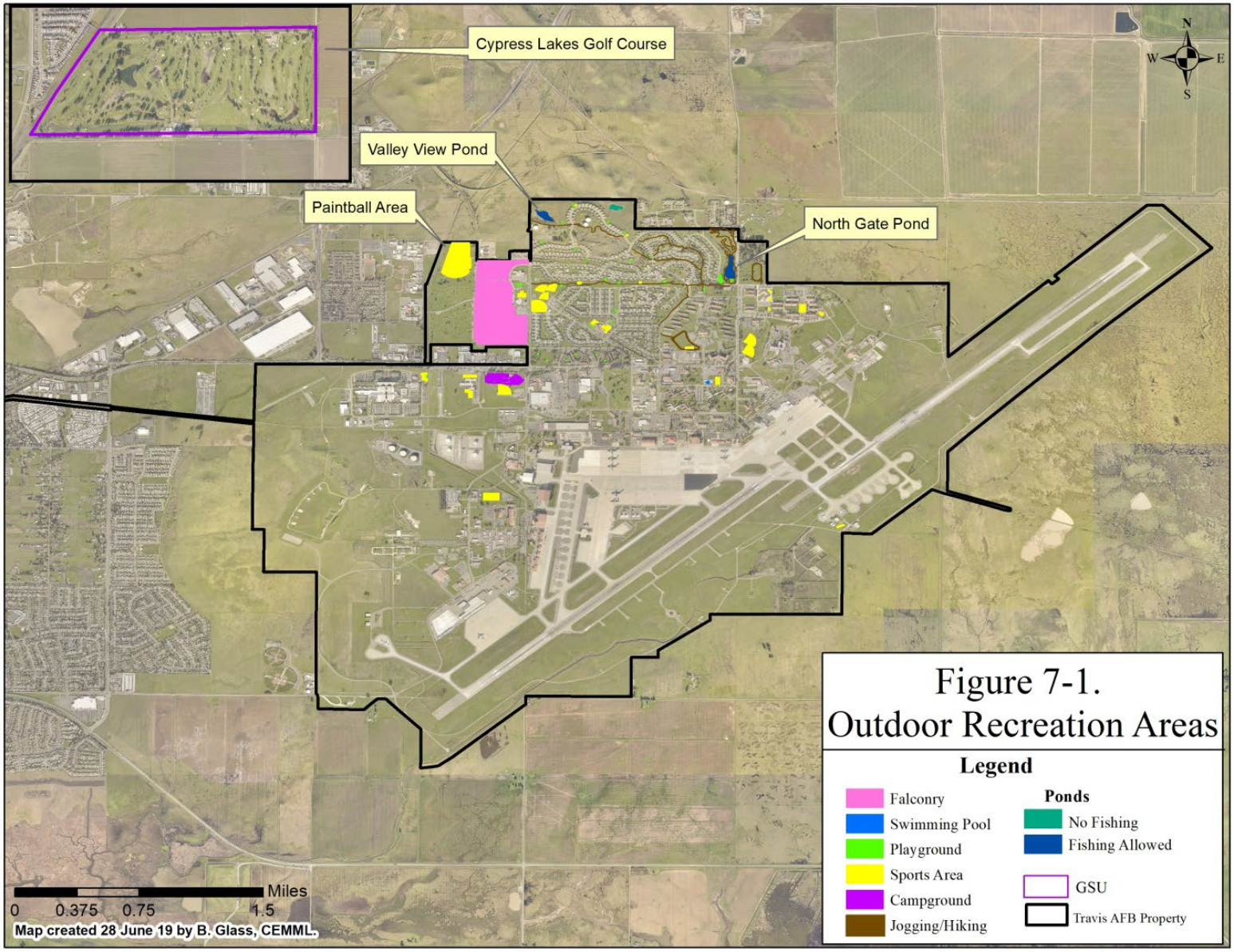

Figure 7-1. Outdoor recreation areas on Travis AFB.

7.2.1 Recreation Programs

There are numerous recreational programs sponsored and operated by Travis AFB personnel to support the moral, welfare and recreation of military personnel, their families and civilian personnel.

7.2.1.1 Equestrian Center

The base equestrian area consists of a set of two linear barns containing stalls as well as a pasture area and arena. Membership is growing and will most likely continue to grow for the next few years. Presently, the stall/paddock facilities are being utilized at near their maximum rate for animal boarding, which is 60 animals. The covered arena is at about 50 percent usage, including the periodic horse shows held there. Use is limited to Saddle Club members and is controlled by the FSS regulations. Saddle Club facilities are maintained by the club and the FSS, with the CES performing only those tasks that cannot be done by the club. Financing for maintenance and facility improvements is currently through non-appropriated funds; however, in the future, membership funds for the equestrian club will go into the Conservation Fund maintained by CES and the NRM. This will allow CES to support facility maintenance and repair including fencing.

7.2.1.2 Fishing

Fishing is allowed at the North Gate and Valley View ponds on Travis AFB; the only locations on the base that maintain a population of game fish with the proper aquatic conditions. North Gate Pond is 2.2 surface acres with a volume of approximately 12 acre-feet. Valley View Pond is 1.2 surface acres.

The CES Pest Management Office is responsible for controlling the pond vegetation, which includes undesirable aquatic weeds and algae under the installation pest management program. Run-off from the fertilized area surrounding the pond has the potential to supply excess nutrients that negatively affect the water quality and fish habitat in those ponds. The North Gate Pond Management Plan addresses specific management strategies (CEMML 2019c, Appendix I).

To ensure compliance with CDFW fishing regulations, all individuals 16 years and older are required to have a California fishing license when fishing in ponds on Travis AFB. In addition, all individuals fishing must obey California fishing regulations, including catch limit.

Travis AFB does not allow salamanders to be used as bait for fishing. This reduces the risk of non-native salamanders invading natural areas and hybridizing or competing with the native California tiger salamander. A list of fish species identified or known to occur on the base is provided in Appendix C, Table C-1.

Actual use of fishing areas is not tracked. The estimated use, on a per-year basis, is 200 visitor days. The use pattern has remained stable for the last several years and is not likely to increase. The use of this resource is managed by the Outdoor Recreation Manager with input from the NRM. The management of the pond is described in Section 7.1 of this INRMP.

7.2.1.3 Watchable Wildlife

A watchable wildlife program is currently being planned in two specific areas on Travis AFB in the Castle Terrace Conservation Area. New educational signs and a picnic table have been installed. Construction of a gazebo by the picnic table is also planned.

7.2.1.4 Family Camp

The Family Camp consists of 72 recreational vehicle (RV) campsites with six tent sites on 3.5 acres. All RV sites have water and electric hook-ups. Additionally, the Family Camp has shower and restroom facilities. Grounds are maintained by the FSS on an as-needed basis, with facilities work that is beyond the FSS's capability accomplished by the CES. Financing for maintenance and facility improvement is through non-appropriated funds. The usage rate for the RV daily sites ranges from 85 to 100 percent, with the lower usage occurring during the November to February period. During the rest of the year, the sites are in constant use, with a demand for additional spaces. An expansion of the Family Camp is currently being designed and the environmental review has been completed.

7.2.1.5 Picnic/Park Areas

Ten acres throughout the base have been developed for picnic and park areas (Figure 7-1). Twenty-two picnic sites are located on Travis AFB, two of which are group sites. All sites are within a park-type setting, and some have covered structures in addition to the picnic benches and barbecue grills. These facilities are available for use from daylight to dusk, and those hours are enforced by the Security Forces Squadron. There is no overnight camping permitted in the picnic/park areas. In addition, a designated handicap accessible playground is located in North Gate Park. Use of all facilities is high but has not exceeded the maximum use rate that the existing facilities can support.

7.2.1.6 Parkour and Jogging Courses

The exercise course and running trail, situated within North Gate Park adjacent to North Gate Pond, covers 1.4 miles and contains 20 exercise stations. The all-weather, running/walking surface is composed of compacted, decomposed granite and is in constant use, even during inclement weather. Use of this recreational facility is limited to daylight hours, seven days per week. No other use restrictions apply. Utilization is not tracked, and the only guidance for the user is on safety issues. Additionally, two rubber running tracks exist on the base: (1) behind the Fitness Center, and (2) east of North Gate Park.

7.2.1.7 Skeet and Trap Range

The 10-acre range consists of a skeet course, trap course, and range safety zones. As a private organization, the Rod and Gun Club controls use and maintenance under the guidance of the FSS. Funding for range maintenance and operation is generated from user fees.

7.2.1.8 Cypress Lakes Golf Course

The golf course is on about 206 acres, situated about two miles north of the base (Figure 2-3); about 130 acres are irrigated or improved. The course has 18 holes plus a driving range. Day-to-day operations and course maintenance are performed by the FSS. Major work or infrastructure work is performed by the CES. Landscaping and pesticide application are conducted by the FSS Greenskeeper. Golfing is open to all interested parties including the general public. A detailed description of all grounds maintenance activities at the Cypress Lakes Golf Course is found in the Cypress Lakes GEM Plan (2017; see Section 15.0, Tab 3).

7.2.1.9 Falconry

General, Master, and Apprentice falconers, when accompanied by a Master or General falconer, can exercise falconry raptors on Travis AFB on a case-by-case basis using accepted falconry practices for training and conditioning, and with a falconry license from the state of California. These techniques include,

but are not limited to, the use of creance (tethered) flying, lures, balloons, or kites according to 50 CFR 20. Training, exercising, or conditioning of falconry raptors can take place in the northwest part of the base surrounded by Twin Peaks Drive, Armstrong Street, and Upson Avenue on Travis AFB (Figure 7-1). Falconers must receive permission from the NRM prior to use. Additionally, hunting and collection of wild raptors is prohibited on Travis AFB.

7.2.2 Climate Impacts on Outdoor Recreation and Public Access to Natural Resources

Outdoor recreation and public access to natural areas at Travis AFB is not likely to be impacted by climate change. Activities such as hiking on nature trails, horseback riding, camping at FAM Camp, picnicking in the park, using the parkour and jogging course, use of the skeet and trap range, and golfing at Cypress Lake Golf Course are expected to continue as normal. Fish populations at Duck Pond may need to be monitored more closely to ensure healthy populations are sustained under the changing climate conditions.

7.3 Conservation Law Enforcement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. Travis AFB **IS** required to implement this element.

Program Overview/Current Management Practices

Travis AFB has areas of both exclusive and proprietary jurisdiction for conservation law enforcement. For areas under exclusive jurisdiction, the federal government takes over all the law enforcement responsibilities (CEMML 2015).

Per AFMAN 32-7003 3.33.1, an agreement is currently being investigated to establish/ develop a Cooperative Agreement with local CDFW law enforcement for conservation enforcement issues if it is necessary. The base has several options for conservation law enforcement available. AFCEC developed and programmed for a Conservation Law Enforcement Program (CLEO) Operations plan with USFWS at Beale AFB and offered to do the same at Travis AFB, however, base leadership determined this wasn't an added value to the program.

7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats

Applicability Statement

This section applies to USAF installations that have T&E species on USAF property. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

This section documents the status of T&E species inventories and ongoing monitoring programs for those species and species of concern on Travis AFB and its GSUs. Travis AFB completed a programmatic biological assessment in 2018 and received concurrence in a PBO from the USFWS on types of actions planned within the next five years. Prior to this PBO, Travis AFB received individual biological opinions for formal consultations and Not Likely to Adversely Affect concurrences for informal consultations. Only the active biological opinions are detailed in this section with their terms and conditions. We define active to mean those projects that are not completed or have terms and conditions with mitigation that are still ongoing. The completed projects with biological opinions are included in Appendix L, and a more concise list of prior biological consultations can be found in the current base-wide PBO (see Travis AFB 2018a,

Table 4). Some biological opinions resulted in the creation of conservation areas (formerly designated as preserves), and the terms mandate maintaining these areas as perpetual conservation easements. Finally, this section includes details on the ongoing programs and conservation tools Travis AFB plans to use to manage the special-status species and their habitats.

7.4.1 Threatened and Endangered Species Inventories and Monitoring

All species listed as threatened or endangered by USFWS or the State of California, as well as proposed/candidates for listing by the USFWS or the CDFW, are considered on all Travis AFB properties. For the purposes of this INRMP, special-status species includes (1) those species protected by federal laws including the MBTA and the BGEPA, (2) species considered to be a BCC by USFWS and/or a DoD mission-sensitive bird priority species, (3) those defined as species of special concern by the State of California, (4) plants ranked using CRPR by CNPS. Hereafter, special-status species collectively denotes all of these listing categories. This designation, however, does not infer equivalent legal protection for all species-status species. Table 2-6 in Section 2.3.4 lists 105 special-status species known to occur or having the potential to occur on Travis AFB. Those that do occur or need additional surveys are also discussed in more detail in the species accounts in Section 2.3.4.

Numerous biological resources surveys have been conducted at Travis AFB and its GSUs (Appendix G). These surveys have documented the occurrence of four federally listed and two state listed threatened or endangered species, as well as several species belonging to CNPS and other state and federal listing categories including MBTA and BCC (Table 7-1). These surveys provide baseline ecological data to guide natural resource management, as well as to meet the requirements of the environmental documentation in the NEPA/EIAP, to support the ERP, and for resource planning. A list of surveys conducted for listed species is provided in Appendix G. Travis AFB conducts surveys of the Main Base and GSUs on a regular five-year cycle, with the next round of surveys funded for 2022. The target taxa groups for those surveys include bats, terrestrial mammals, and fish, but plant surveys are not needed.

Table 7-1. Federally and State Listed Special-status Species documented to occur on Travis AFB or requiring additional surveys.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Federally Listed Species- Seven Species				
California tiger salamander	*Ambystoma californiense*	FT, ST	Present.	Suitable habitat exists on the Railroad ROW, Potrero Hills Annex and potentially the Cypress Lakes Golf Course.
Central Valley Chinook salmon	*Oncorhynchus tshawytsha*	FT (Central Valley spring-run), FE (Sacramento River winter-run) ST (spring-run),SE (winter-run)	Potentially found spring-run on base in high flood event in 2017. Identification not confirmed.	Absent. GSUs lack suitable habitat.

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Contra Costa goldfields	*Lasthenia conjugens*	FE, CRPR 1B.1	Present	Presumed absent. Species not detected during appropriately timed floristic surveys.
Monarch butterfly	*Danaus plexippus plexippus*	FC, ICP	Present	Habitat (milkweed) identified on Railroad ROW and Point Ozol GSUs
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT, ICP	Present	Found on Railroad ROW GSU, Outer Runway Marker GSU, Middle Runway Marker GSU and potential habitat exists on Point Ozol GSU
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE, ICP	Present	Found on Railroad ROW GSU
Western pond turtle	*Actinemys marmorata*	UR, SSC	Present	Has been found on Cypress Lakes Golf Course and the Railroad ROW GSUs.
MBTA, BCC, CDFW, CNPS Listed Species 21 Species				
Alkali milk vetch	*Astragalus tener* var. *tener*	CRPR 1B.2	Present	Suitable habitat on Railroad ROW GSU, Outer Runway Marker GSU, Middle Runway Marker GSU and Point Ozol GSUs
Brittlescale	*Atriplex depressa*	CRPR 1B.2	Present.	Present on Railroad ROW GSU
California newt or Coast range newt	*Taricha torosa*	SSC (Monterey County only)	Presumed absent. Species not detected during surveys., Not SSC in Solano County	Has been found on Point Ozol GSU. Not SSC in Contra Costa County
Congdon's tarplant	*Centromadia parryi ssp. congdonii*	CRPR 1B.1	Possibly occurs on base (needs verification)	Suitable habitat on Railroad ROW GSU
Crotch's bumble bee	*Bombus crotchii*	ICP	Possibly occurs on base (needs verification).	Presumed absent. Species not detected during GSU surveys.
Hairy water flea	*Dumontia oregonensis*	ICP	Present	Presumed absent. Species not detected during GSU surveys.
Loggerhead Shrike	*Lanius ludovicianus*	BCC[2], MBTA, SSC	Present- nests on base	Found on Potrero Hills Annex and Railroad ROW GSU

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs
Pallid bat	*Antrozous pallidus*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Pappose tarplant	*Centromadia parryi* ssp. *parryi*	CRPR 1B.2	Possibly occurs on base (needs verification)	Suitable habitat on Railroad ROW GSU
Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	ICP	Presumed absent. Species not detected during surveys	Present on Railroad ROW
San Joaquin spearscale	*Extriplex joaquinana*	CRPR 1B.2	Present	Present on Railroad ROW GSU. Suitable habitat on Outer Runway Marker and Middle Runway Marker GSUs.
Swainson's Hawk	*Buteo swainsonii*	MBTA, ST	Present- nests on base	Observed flying over Potrero Hills GSU and Cypress Lakes Golf Course
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Tricolored Blackbird	*Agelaius tricolor*	BCC[2], ST	Present- nests on base	Found on Railroad ROW GSU
Western bumble bee	*Bombus occidentalis occidentalis*	ICP	Possibly occurs on base (needs verification).	Presumed absent. Species not detected during GSU surveys.
Western Burrowing Owl	*Athene cunicularia hypogea*	BCC[2], MBTA, SSC	Present- nests on base	Found on Potrero Hills Annex and Railroad ROW GSU
Western mastiff bat	*Eumops perotis*	SSC	Present (acoustic survey)	Presumed absent. Species not detected during GSU surveys.
Western pond turtle	*Actinemys marmorata*	UR, SSC	Present	Has been found on Cypress Lakes Golf Course and the Railroad ROW GSUs.
Western red bat	*Lasiurus blossevillii*	SSC	Present	Presumed absent. Species not detected during GSU surveys.
White-tailed Kite	*Elanus leucurus*	MBTA, CFP	Present- nests on base	Presumed absent. Species not detected during GSU surveys.
Yellow-billed Magpie	*Pica nuttalli*	BCC	Present- nests on base	Found on Cypress Lakes Golf Course

Common Name	Scientific Name	Listing Status[1]	Presence on Main Base	Presence on GSUs

[1] FE=Federally Endangered, FT=Federally Threatened, FC=Federal Candidate for Listing, SOC=Federal Species of Concern, SE=State Endangered, ST= State Threatened, CNPPA= CA Native Plant Protection Act, CRPR=CA Rare Plant Rank, CFP= CA Fully Protected, BCC=Birds of Conservation Concern (USFWS), BGEPA=Bald and Golden Eagle Protection Act ICP=Invertebrate of Conservation Priority, SSC=Species of Special Concern WL=Watch list (CDFW)
[2] Species is also a Department of Defense Partners in Flight mission sensitive priority bird species (DoD 2016).
[3] Only species with other federal or state status were included, not all species protected under the MBTA.
Sources: USFWS 2008 Birds of Conservation Concern, ManTech 2016, USFWS 2018a, USFWS 2018b, USDA list of birds observed on Travis AFB from July 2014 to June 2019.

Four federally-listed species occur on Travis AFB: CTS (FE), CCG (FE), VPFS (FT), VPTS (FE), along with two species that have critical habitat on base for DGGB (FT) and CFS (FE), though the species has never been documented on base. These four species and critical habitat are protected by Travis AFB and receive additional management actions such as surveys, relocation, and restoration when needed. An additional 21 species with protection from CDFW or CNPS occur or have sufficiently suitable habitat that surveys are warranted to determine presence. These 21 species receive protection from Travis AFB when such protection does not interfere with the military mission and include the Central Valley Chinook salmon (FT), monarch butterfly (FC), and western pond turtle (UR), which could become federally listed. For Example, Travis AFB provides protection to the Western pond turtle through Best Management Practices when applicable.

Although it is unlikely that a new federally listed species will be found, there is a need to continue to monitor the status of all of the special-status species and sensitive habitats that are known to occur, and to continue to survey for additional special-status species, especially as new species are occasionally added to the various lists. It is critical that biologists conducting the monitoring provide listed species occurrence data to CDFW for inclusion into the CNDDB using the California Native Species Field Survey Form if warranted. The most recent base-wide survey for listed aquatic vernal pool species was conducted in 2016, and species-specific and taxa group surveys have been done annually (Marty 2016, 2020; CIRE 2017; Schwab 2018; CEMML 2018). Since the surveys for some species require two seasons to complete, outdated data can lead to project delays. Project proponents must advise the NRM of proposed plans as far in advance as possible.

7.4.2 Consultations for Threatened and Endangered Species and their Terms and Conditions

In June 2018, Travis AFB received the PBO on formal and informal consultation for activities conducted on Travis AFB that may affect four federally T&E species (Travis AFB 2018a). The PBO streamlines the consultation process for projects that require formal or informal consultation with the USFWS. Projects that have been completed and whose terms and conditions in the Biological Opinion have been satisfied are summarized in Appendix K. All projects completed under the PBO (including mitigation) within the calendar year are reported in the annual report to the USFWS.

Air Force Initiatives—In October 2018, the AFCEC completed a programmatic biological assessment (PBA) analyzing the effects of airfield flight operations on T&E species at 32 installations across the U.S. (AFCEC 2018a). Travis AFB was one of the 32 bases the PBA included. The study focused specifically on the effects of airfield flight operations on the installation and surrounding training areas, including BASH

activities required to maintain human safety on federally listed bird and bat species (AFCEC 2018a). A robust BASH modeling approach was used to assess the effects at the national and local installation level (AFCEC 2018b). The model specifically calculates the BASH risk and expected strikes that may occur from flight operations within the action area over the next five years (AFCEC 2018a, 2018b). The action area for each of the 32 installations was defined as the closed traffic pattern for the airfield in order to analyze effects both on and beyond the base boundary, such as noise from aircraft on approach.

Six federally listed species are documented to occur in the action area for the PBA based on reviews of existing literature (no new surveys were completed for the AFCEC PBA). Some of the analyzed species are special-status species for Travis AFB, and some are state-listed as well. The action area listed species for the Travis action area are Ridgway's Rail (FE, SE, CFP), California Least Tern (FE, SE, CFP), Western Snowy Plover (FT, SSC), Northern Spotted Owl (FT, ST), Least Bell's Vireo (FE, SE) and Tricolored Blackbird (BCC, ST). Only the Tricolored Blackbird has been documented as present within the Travis AFB boundary, and the remaining species were included because of documented occurrences within the closed traffic pattern of the base, which extends beyond the boundary.

The results of this analysis indicated that the BASH risk from flight operations within the action area may affect, but is not likely to adversely affect, the Ridgway's Rail, California Least Tern, Western Snowy Plover, Northern Spotted Owl, and Least Bell's Vireo (AFCEC 2018b). The results from the BASH model determined that the BASH risk from flight operations may affect and is likely to adversely affect the Tricolored Blackbird (AFCEC 2018b). However, BASH reports indicate that TRBB are not typically involved in BASH incidents, with zero recorded TRBB hits between 2017 and 2021 (USDA/BASH. Wildlife Strike Record 2021).

7.4.3 Conservation Areas

To compensate for impacts to legally protected species, Travis AFB established conservation areas (Figure 7-2). These conservation areas were formerly designated as "special management areas" or "special ecological preserves," and were created, restored or protected as mitigation for construction projects throughout Travis AFB. There are four conservation areas on Travis AFB. These conservation areas must be protected in perpetuity even in the event of Travis AFB realignment or closure. The conservation easement must be granted in favor of an organization approved by the USFWS, and the USAF shall be responsible for ensuring that the cost (if any) of granting the easement is met.

The four conservation areas include Castle Terrace, Hangar Goldfields, Perimeter Goldfields and Aero Club Conservation Areas (Figure 7-2). Appendix M provides details on the four conservation area project impacts and mitigation requirements.

7.4.4 Ongoing Programs to Manage Special-status Species

7.4.4.1 Special-Status Species Habitat Management

Most of Travis AFB's federally listed special-status species are associated with vernal pools or other seasonal wetlands embedded within grasslands. Since the wetlands cannot be managed individually, management is considered at the landscape scale. Studies conducted in these habitats in California and specifically on Travis AFB indicate that prescribed grazing, mowing, and prescribed burning are all compatible management tools that can be used in vernal pools and grasslands to benefit special-status species (Collinge 1999; Marty 2015a, 2015b). All of these tools are being employed in the vernal pools and grasslands on Travis AFB and are covered in other sections of this document.

Travis AFB has initiated prescribed burns as outlined in the Wildland Fire Management Plan (Section 15.0, Tab 1) in 2019 (Section 7.9 of this INRMP). These prescribed burns will help achieve conservation goals for reducing and controlling the spread of invasive plant species on Travis AFB. The prescribed fire program will complement the grazing program to reduce invasive species and improve the grassland and vernal pool ecosystems that federally listed special-status species rely on.

The presence of CTS, a federal and state threatened species, and its occurrence on the base and on adjacent lands adds a layer of complexity to planning because its upland habitat covers approximately 3,000 acres of the base. Known habitat includes breeding ponds and upland/dispersal habitat. Since the salamanders remain underground using ground squirrel and gopher burrows much of the year (approximately 90% of the time), ground-disturbing activity has the potential for adverse impact. The current grassland management on Travis AFB (e.g., mowing, grazing) is believed to be compatible with CTS upland habitat since they prefer grasslands with less cover and shorter vegetation (Johnson and Shaffer 2010) and such management may benefit ground squirrel populations, which will cascade to benefit to CTS (Ford et al. 2013).

Several factors determine whether or not areas within the migration range of a breeding pond may actually be upland habitat for salamanders. These factors include, but are not limited to, barriers to dispersal, presence of burrows, and other suitable cover. A long-term draft CTS Management Plan is currently being prepared for USFWS; once complete Travis will share with CDFW. With a better sense of where suitable habitat exists on Travis AFB and what activities have the potential to impact that habitat, the base has worked with the USFWS to develop a programmatic agreement that protects the species and also integrates the other agency mission essential activities. Travis AFB received a PBO on 01 June 2018.

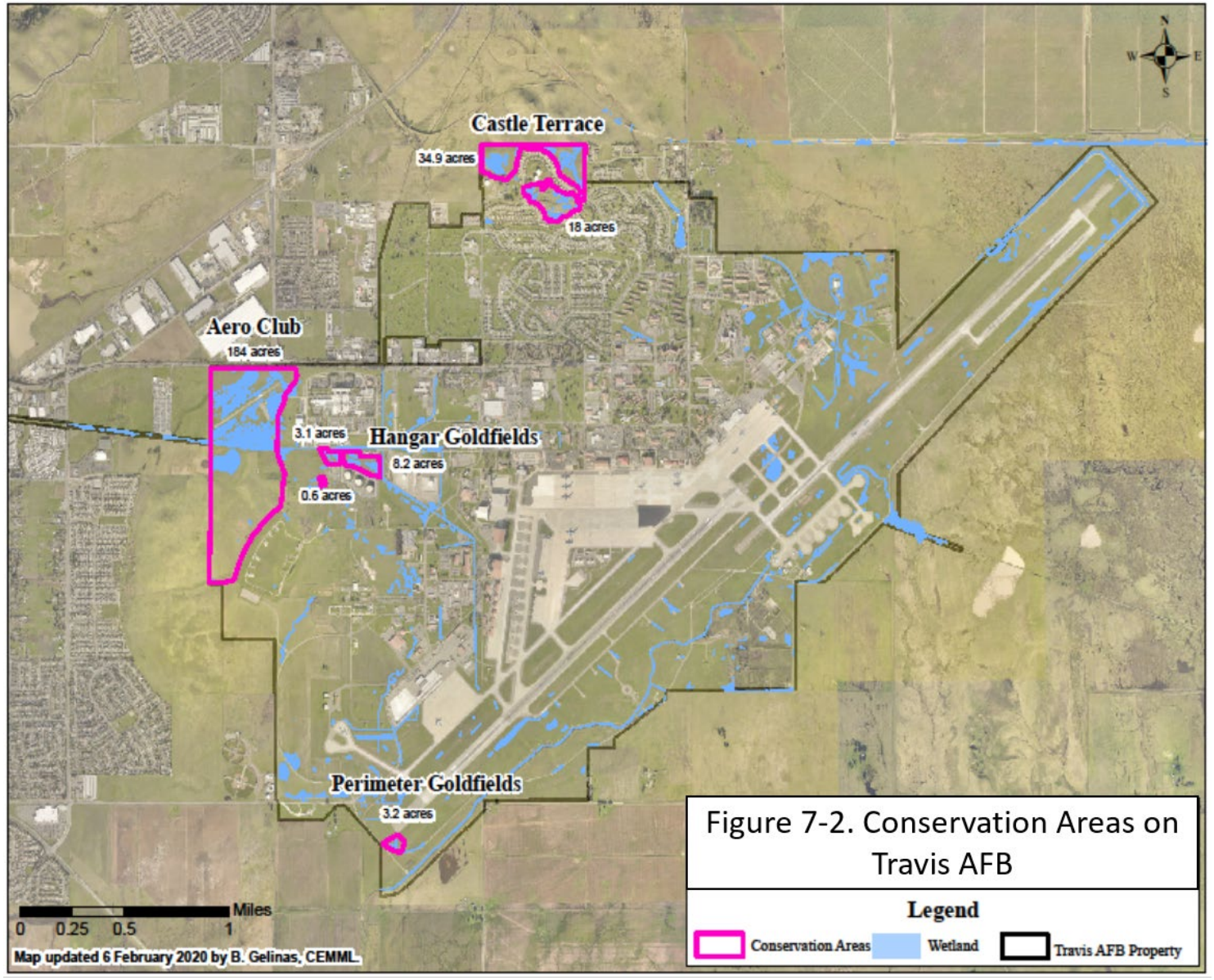

Figure 7-2. Conservation Areas on Travis AFB.

Travis AFB objectives for CTS management include mapping, monitoring, and management of the CTS habitat base-wide, as well as better understanding of where off-base populations exist within proximity to Travis AFB. It has been confirmed that the base is surrounded by at least 14 off-base CTS breeding ponds and contains three on-base breeding ponds. Long-term planning efforts will focus on how to improve regional population connectivity that is consistent with the base mission. To facilitate detection of CTS in aquatic habitat, Travis AFB is investigating the use of environmental DNA (eDNA) sampling. CTS spend much of the year buried underground, only emerging and congregating during the wet season to breed. This means that breeding adults, larvae, and pre-dispersal juveniles are highly detectible during a very short period in their aquatic habitat, and the remainder of the year they are not or only incidentally detectable in their upland subterranean habitat. In addition, the standard survey method for breeding CTS consists of dip-netting, which can be invasive and disruptive to the animals and the vernal pool habitat upon which they and many other species depend, and brings with it the risk of disease transmission. eDNA sampling is a relatively new low-impact survey technique that can be used to make initial assessments of sites over a broader sampling timeframe. Field-collected water samples are analyzed for genetic traces of the target species using specially-designed quantitative polymerase chain reaction assays, and samples can be collected for as long as water is present in a pool, extending the potential monitoring timeframe (Kieran et al. 2020).

A comparative survey of dip-net and eDNA results conducted on the Jepson Prairie Preserve and Dutchman Creek Conservation Bank in Merced County found 100% agreement between positive eDNA and dip-net detections, and recorded positive eDNA results in additional pools in which dip-netting did not detect CTS. There were no cases where dip nets detected CTS but the eDNA assay failed to. Furthermore, the study was able to detect CTS up to a month before dip-net surveys did, indicating that there may be a broader sampling period for this technique (Kieran et al. 2020).

Although eDNA sampling shows promise for CTS detection, it is an emerging technology and as such, USFWS does not currently accept eDNA data as an indicator of presence/absence. It is also not capable of measuring anything other than presence, and cannot be used to ascertain CTS abundance, health, or life stage, and dip-netting would be required to measure these factors.

7.4.4.2 7(a)(1) and 7(a)(2) Endangered Species Act Consultations

Federal agencies have two types of responsibilities under Section 7 of the Endangered Species Act. Section 7(a)(2) focuses on ensuring actions carried out by a federal agency are not likely to jeopardize the continued existence of any listed species. This results in project-specific consultations in support of mission activities. Section 7(a)(1) directs all federal agencies to carry out programs for the conservation of T&E species in consultation with the Service. Section 7(a)(1) integrates the action agency's conservation programs with its mission-driven programs and thereby contributes to recovery of listed species, and increases the efficiency and effectiveness of action specific Section 7(a)(2) consultation.

7.4.5 Climate Impacts on Threatened and Endangered Species Management

Management actions taken to protect special-status species will be influenced by the speed at which the climate changes, the nature of the climatic changes and the ability of the species to respond to those changes. Our understanding of species' response to changing climate is not yet sufficient to be able to predict how an individual species will respond. In addition, the response of sub-populations of a single species may vary. Genetic variation within a species can help populations adapt to environmental conditions, however, populations may not be able to undergo selection for preferred traits if environmental conditions change

rapidly (Hoffmann and Sgrò 2011). Behavioral changes, such as host-plant or food source switching have already been observed (Iwamura et al. 2013, Ozgul et al. 2010).

Many current special-status species management activities are appropriate for increasing resilience or facilitating adaptation to climate change. An ecosystem approach that prioritizes functional diversity, maintenance of habitat, habitat variability, and connectivity can help support genetic diversity that may be important for adaptation and can help species migrate to more favorable habitats. However, when approaching the uncertainty that is inherent with managing species under changing environmental conditions, additional analysis and planning is required.

Research into actionable science used for biodiversity conservation in changing conditions has developed several key principles. Historic patterns used for management decisions are likely to be insufficient for future management challenges (Bierbaum et al. 2013). Proactive approaches that anticipate change can help extend the period over which species can adapt to changing climate and avoid catastrophic declines associated with stochastic events that act on an already stressed ecosystem.

7.5 Water Resource Protection

Applicability Statement

This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

There are no significant non-point source issues at Travis AFB. There are several common non-point source issues including residential and commercial pollutants. Regional watershed issues are tracked on the California 303(d) list. Travis AFB does not directly discharge to any water bodies of concern on the list; however, many are downstream of Travis AFB.

7.5.1 Wastewater

Industrial and domestic wastewater is collected and discharged to the Fairfield-Suisun Sewer District's (FSSD) publicly owned treatment works (POTW) for treatment (Travis AFB 2017a). Discharges to the POTW are in strict compliance with the local sewer use ordinance and Travis AFB's wastewater discharge permit, which is written, issued, and enforced by FSSD. These discharges to the POTW average approximately one million gallons per day, are generated from domestic and industrial sources, and are regulated by Travis' wastewater discharge permit. Monthly collection and sampling assure contaminant levels comply with permit limits.

The wastewater system consists of pipes, oil water separators, pump stations, and lift stations. Connections include lavatories, shower rooms, janitorial sinks, floor drains, and wash racks from industrial facilities as well as all family housing units. Travis AFB monitors the waste stream at the South Gate manhole on the frequency set forth in the discharge permit and submits monthly monitoring reports to the FSSD.

7.5.2 Storm Water

Six storm water outfall locations drain the stormwater from Travis AFB and discharged primarily into Union Creek watershed. The storm water drains then enter Suisun Bay, south of Travis AFB and ultimately into the San Francisco Bay. Travis AFB maintains a State Water Resources Control Board's Storm Water General Permit for discharges of storm water associated with industrial activities. Fueling, maintenance, cleaning, and parking areas for aircraft, vehicles, and equipment; hazardous waste and hazardous material

storage areas; and aboveground storage tanks all have the potential to contaminate storm water runoff. Operations at these locations are subject to the base's best management practices (BMP's) along with the Storm Water Pollution Prevention Plan (Travis AFB 2017a).

Monitoring requirements in the Storm Water Pollution Prevention Plan vary by outfall location as well as with secondary containment areas. The three storm water outfall locations (I, VI, and B2) on the base perimeter are visually monitored monthly in the wet season and sampled during four storm events per year. The Industrial Storm Water Permit requires that these three be monitored because they discharge off base and have potential to impact water quality off site.

7.6 Wetland Protection

Applicability Statement

This section applies to USAF installations that have existing wetlands on USAF property. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

Wetlands on Travis AFB are primarily vernal pools and vernal swales associated with the bed and banks of surface water drainage features, and isolated depressions in low-lying areas. Wetlands occur across the base but are generally absent from the highly developed central and northern portions (Figure 2-15)**.**

Most of the original vernal pools in California have been eliminated or degraded by human disturbances, such as conversion to agriculture, urbanization, inappropriate grazing practices, and alteration of hydrology.

Current wetlands management focuses primarily on physical protection (i.e., preventing vehicle damage) and minimizing the impact of invasive weed species through the use of livestock grazing, prescribed fire, and mowing. To understand the impacts of construction activities on the vernal pool resources and potential strategies that may be implemented to mitigate inadvertent loss of vernal pools Travis AFB began a long-term study in December 1998 (Collinge 1999, 2005). As part of this study, 256 vernal pools were created adjacent to the former Aero Club runway and seeded with various combinations of native vernal pool plants. These pools are counted in the total of 600 vernal pools on the base. These constructed vernal pools are prospering adjacent to many natural vernal pools. The created pools continue to exhibit similar hydrologic properties as the natural pools on the site, and many of the native vernal pool plant species seeded have continued to grow in the pool basins.

All 256 pools are present and Travis AFB has established grazing protocols to maintain them. As part of a study to determine the composition of the seed bank in the restored pools, researchers determined that although the above-ground community had a significant portion of invasive species (specifically Italian rye grass [*Lolium perennis*]), the soil seed bank remained relatively native-dominated (Faish et al. 2013). Targeted grazing treatments are used to maintain the vernal pools and curtail spread of invasive grasses that can contribute dense thatch layers, interfere with hydrologic processes, and compete with native species.

The USAF is obligated to permanently protect land on base that has been designated as mitigation for previous construction activities. These areas include the 53-acre Castle Terrace Conservation Area (USFWS 1999) (of which approximately 40 acres are protected as a wetland preserve), and an approximate 184-acre area along the western edge of the base at the Aero Club Conservation Area, which includes both natural pools and the 256 restored vernal pools (Figure 7-2).

While Travis AFB has covered some mitigation needs by creating wetlands on the base, this practice is no longer advisable for several reasons. Land on Travis AFB for mission projects is very limited and therefore creating any additional wetlands is not feasible. Additionally, monitoring is time and cost intensive. Finally, the upland area used for creating vernal pools could be habitat for California tiger salamanders, and creating wetlands could negatively impact the hydrology of the vernal pool watershed. Since on-site mitigation is not practical, mitigation through an approved regional wetland mitigation bank is typically sought.

For wetland monitoring, restoration design and avoidance of impacts to wetlands from military activities, Travis AFB uses a combination of water and soil data sensors as well as other physical, chemical and biological monitoring technologies. These advanced methods can assess the impact of a project on an existing natural vernal pool or to predict the hydrology of created vernal pools prior to their construction. These established technologies can be used individually and collectively to gather data that will significantly improve land management actions and monitor the function of created compensatory mitigation pools.

Wetland Habitat Quality

In the 2018 base-wide PBO, a habitat quality model for wetlands was created based on a similar evaluation of wetlands in the draft Solano Habitat Conservation Plan (Solano County Water Agency 2012; Travis AFB 2018a). For the PBO Travis designated quality based on disturbance level, distribution of species covered by the plan and special management species, unique or uncommon habitat features, proximity to existing and proposed preserves/reserves, barriers, core recovery areas and critical habitat, and corridors and linkage areas. Based on these criteria, Travis AFB devised three categories of wetland habitat quality: High, Medium, and Low (Figure 7-3). These habitat categories are used as an assessment tool for land management, evaluating potential impacts and coordinating consultations with the USFWS The parameters for each of the three possible values are listed below.

7.6.1 Active Clean Water Act 401 and 404 Permits

Table 7-2 lists the current projects being completed or permits in the process of being written. More detailed information can be found in Appendix N along with recently completed 401/404 permits.

7.6.2 Climate Impacts on Wetland Protection

Wetlands on Travis AFB are primarily vernal pools and vernal swales associated with bed and banks of surface water drainage features, and isolated depressions in low-lying areas. Wetlands cover approximately 154.53 acres across the installation (total area representing the habitat classifications of vernal pool, riparian, wetlands and lacustrine marsh). Travis AFB currently attempts to either avoid or minimize impacts to wetlands. When impacts to wetlands are unavoidable, the wetland habitat loss is mitigated through on-site restoration or purchase of off-base wetland mitigation credits.

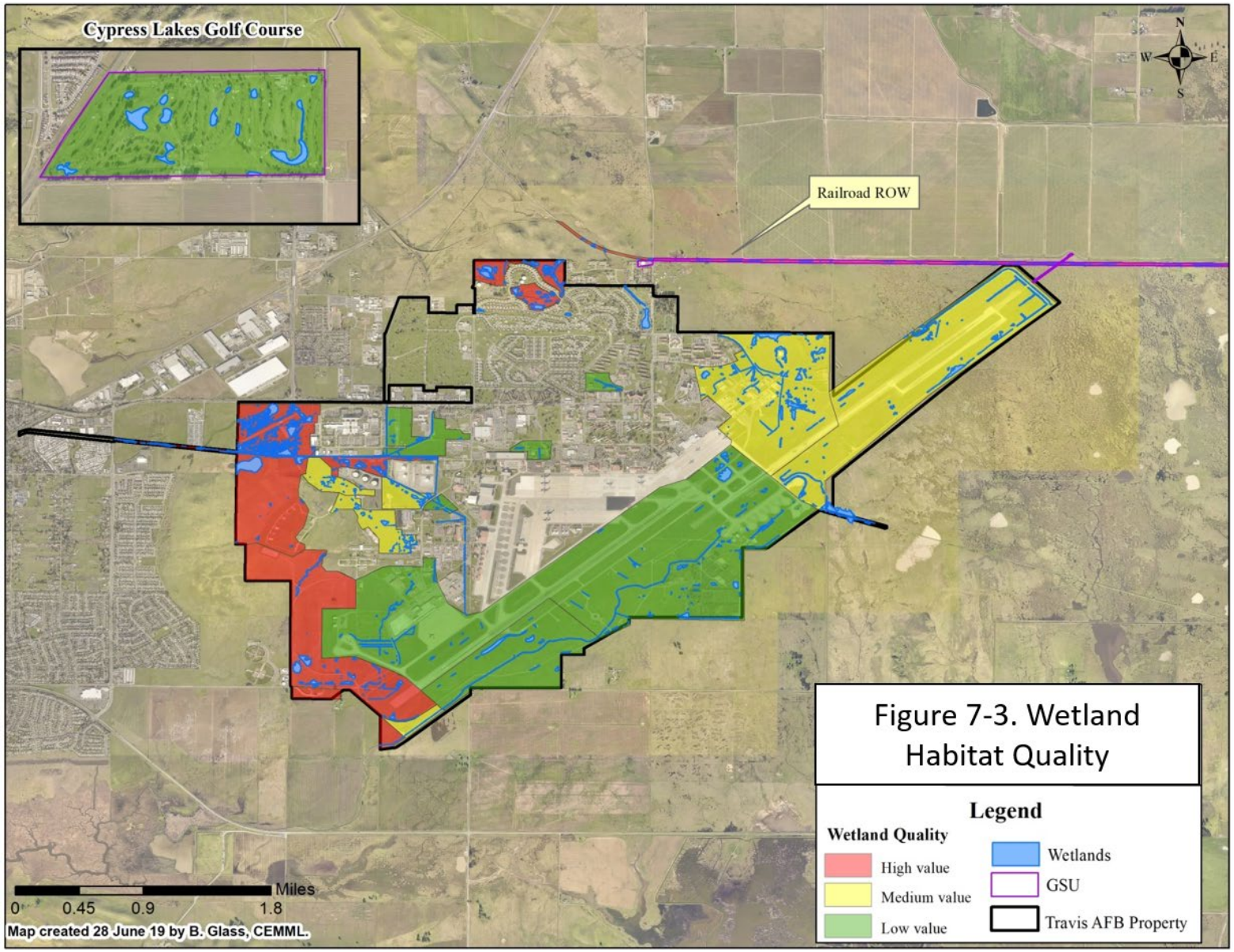

Figure 7-3. Wetland habitat quality on Travis AFB.

Table 7-2. Existing CWA 404/401 permits.

Title	Description	401/404 Required?
Perimeter Fence Upgrade Project	Upgrade perimeter fence	Yes, permits received 2019
TACAMO Maintenance Project	Upgrade culvert, security grate, and gas mains and laterals	Yes, permits received 2019
P205 Alert Force Complex	Construct facilities for secure Alert Force Complex	Yes, permits received
Walters Creek Culvert Repair	Replace Culvert	Yes, not received or application submitted
NE Perimeter Access Road	Upgrade perimeter access road	No 401/404 permit for this action required base on the scope of work
Level Loggers	Install level loggers for monitoring wetlands	Yes, permits received

Wetlands and marshes are naturally resilient, provide linear habitat connectivity, link aquatic and terrestrial ecosystems, and create thermal refugia for wildlife: all characteristics that can contribute to ecological adaptation to climate change. Wetland ecosystems will face increases in air and surface water temperatures, alterations in the magnitude and seasonality of precipitation and run-off, and potential shifts in reproductive phenology and distribution of plants and animals (Parmesan and Yohe 2003). The projected climate change could have a pronounced effect on wetlands through alterations in hydrological regimes (Erwin 2009). If storm energy intensifies and flood risk increases, wetlands become increasingly important for flood water attenuation, and may become vulnerable to hydrologic changes if flood waters cause excessive erosion.

As vital habitat for several vernal-pool obligate special-status species, the wetlands on Travis AFB are heavily monitored and managed. Potential climate change effects such as increasing frequency and severity of droughts, occasional extreme precipitation events, and invasive species establishment will all require continuing and adapting monitoring and management.

7.7 Grounds Maintenance

Applicability Statement

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

Typical grounds maintenance activities on improved and semi-improved areas consist of lawn mowing, mulching, tree planting and pruning, airfield management, and pest management. Typical grounds maintenance activities on unimproved grounds include only mowing.

Mowing is the most widespread grounds maintenance activity on the base and occurs on improved, semi-improved and unimproved grounds (Figure 7-4). In areas managed under the BASH program, the vegetation height requirement is coordinated with the BASH program manager and based on established airfield BMPs (Section 15.0, Tab 2). Additionally, timing, frequency and methodology of mowing is a valuable management strategy to benefit pollinators as well as other wildlife species.

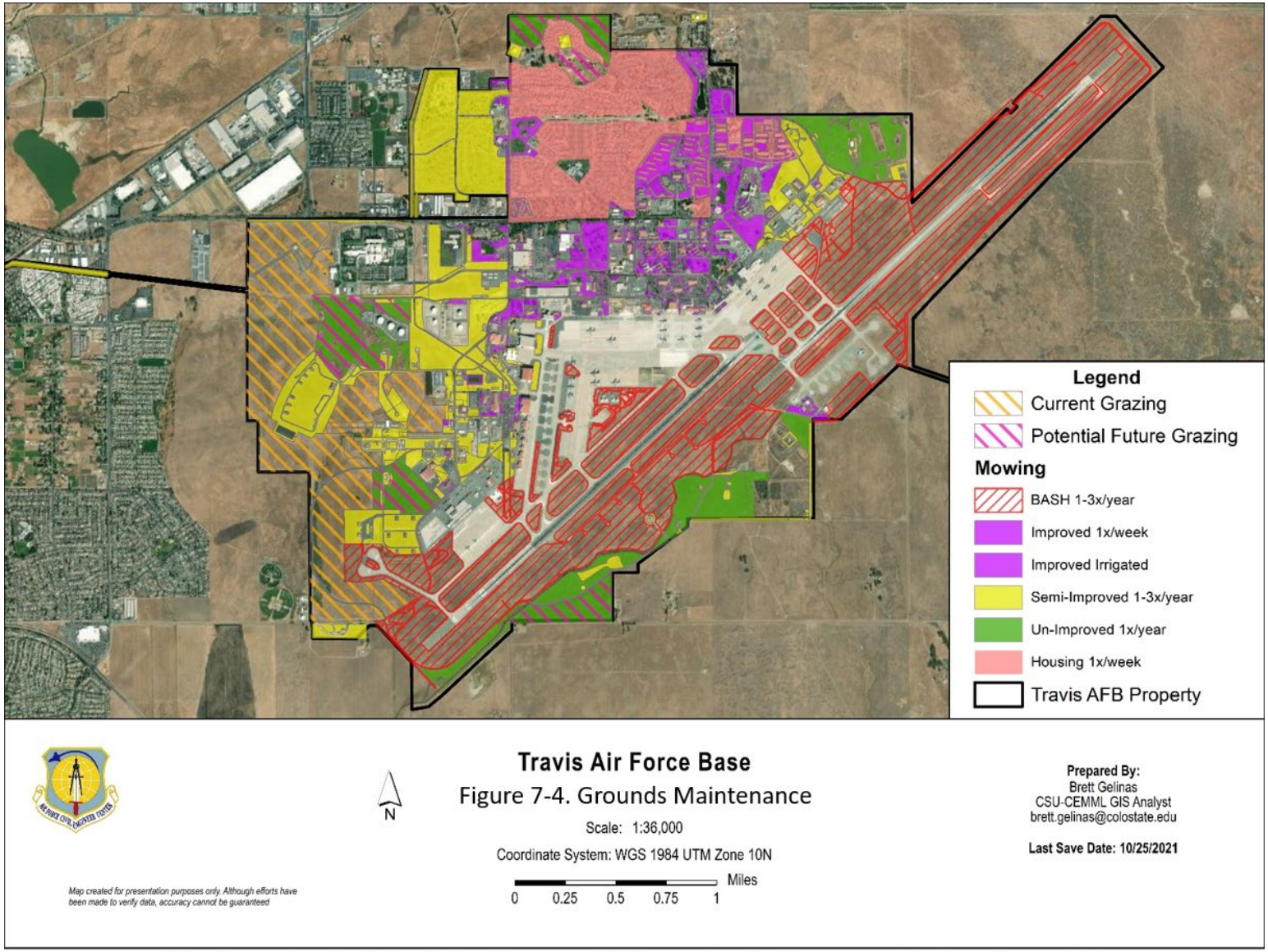

Figure 7-4. Grounds Maintenance Activities on Travis AFB.

In areas where vernal pools are present, decades of mowing have produced positive effects for the vernal pool plant community due to the reduction of cover of non-native grasses and thatch. Grounds maintenance personnel confirm mowing timing and restrictions with the NRM prior to implementation of mowing each year.

Fertilizers are applied to improved areas with lawns once in April and once in October in dry weather. Fertilizer application is restricted to only highly visible grounds in the improved areas. Other than fertilizer, amendments are not used except at time of planting.

Trees are pruned to maintain plant health by cutting diseased or injured wood or to control growth when an unshapely tree or shrub might result. An Urban Forest Management Plan has not been developed but is currently programmed (see Section 8, Project 6.4.2.).

In 2014, the President released a memorandum addressing federal efforts to enhance the health of pollinators, including honey bees, native bees, birds, bats, and butterflies (The President 2014). Agencies will incorporate pollinator health as a component of all future restoration and reclamation projects. DoD will support habitat restoration projects for pollinators and when possible have installations use pollinator-friendly native landscaping, and minimize use of pesticides harmful to pollinators. The focus of pollinator restoration at Travis AFB would be in the conservation areas (with the exception of Perimeter Goldfields Conservation Area) to reduce any possible BASH risks.

7.8 Forest Management

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section **IS NOT** applicable to Travis AFB.

Program Overview/Current Management Practices

In accordance with AFMAN 32-7003, the AFCEC Forester has determined that there is no commercial saw timber market for trees at Travis AFB. Although trees have been planted and are in good health on the base, the typical native landscape is not forested. No forest habitat types are found on the installation. Therefore, no forest management plans, commercial forestry operations, or timber harvesting operations are taking place on-base.

All wood and forest products generated in the process of tree maintenance or removal on Travis AFB are removed by the contractor or properly disposed of or recycled in a local municipal landfill. Forest products are not currently made available to the general public, other contractors or businesses for reuse or resale.

Travis AFB is within the Sudden Oak Death quarantine area, so no wood is transported out of the quarantined area. The quarantine applies to several species of wood including but not limited to oak.

Travis AFB has a tree replacement policy such that any tree that is removed shall be replaced in kind with a native drought tolerant species. Trees that are removed should be replaced when possible and if budget allows for replacement. The NRM will decide on a case-by-case basis if replacing the tree is necessary. No trees will be planted in the Wildlife Exclusion Zone (WEZ). If the tree cannot be planted at the site or near the site it was removed, it will be planted outside of the WEZ and within a Conservation Area or other suitable habitat.

7.9 Wildland Fire Management

Applicability Statement

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

Travis AFB has unimproved lands that are a wildland fire hazard. Wildfires occur on an annual basis during the summer and fall when grassland vegetation is dry and hot, with windy conditions. 50 wildfires totaling 180 acres occurred from 2008 through January 2015 (Travis AFB 2019). Limited geographic information system (GIS) data for these and prior wildfires are available; however, data in recent years is more complete. Two fires occurred in 2017, one on 06 July that burned 249 acres, including 154 on TAFB and a second on 06 September that covered five acres. Another fire on 9 March 2016 burned approximately 249.5 acres (150.8 on Travis AFB). Several other fires in 2016 without dates burned a total of 11.1 acres. The largest fire in Travis AFB's history happened in 2018. The 4000-plus acre wildfire started on the installation and moved off destroying homes and infrastructure. In 2020, Travis AFB was in immediate threat from the LNU Complex Fire, which was a mile from the base and at the time the second largest wildlife fire in the state of California.

Prescribed fire was first implemented on Travis AFB in 2019 within areas established in the WFMP (Figure 7-5). Fire breaks are cut or maintained to prevent wildfires from spreading (Figure 7-5). The Installation Commander, or appropriate designee, approves the installation WFMP. The WFMP defines the roles and responsibilities for wildland fire management at Travis AFB and designates the Travis AFB Wildland Fire Program Coordinator/Manager (AFMAN 32-7003). At Travis AFB, the Wildland Fire Program Coordinator is the NRM who reviews and approves plans for prescribed burns. The CES Fire Chief is responsible for all aspects of wildland fire suppression activities except for the wildland fire management planning, which is jointly shared with the Wildland Fire Program Coordinator. All personnel involved in wildland fire management activities are required to be certified in accordance with AFMAN 32-7003.

The Travis AFB WFMP was completed in 2019. The purpose of the plan is to reduce the potential for wildfire, to protect and enhance valuable natural resources, and to implement ecosystem management goals and objectives. The WFMP directly supports the USAF mission and is consistent with installation emergency operations plans. The main objectives include those listed below.

- Prevent unwanted human-caused ignitions.
- Take all appropriate actions to reduce or eliminate wildfire risk
- Ensure readiness for wildfire initial attack.
- Utilize all available tools to manage wildland fuels to support the mission.
- Implement prescribed fire and mechanical fuels treatments to meet specific natural resource land management objectives outline in the INRMP.

Partial post fire analysis (from a natural resources perspective) would be done for prescribed fires if needed. A Burned Area Emergency Response would be conducted only for fires that are so severe that habitat could not be restored without human intervention.

Travis AFB has a mutual aid agreement (MAA) with Solano County for both on and off-base fire support and another MAA with CAL FIRE.

Prescribed burns can be used as a management tool to enhance habitat for state and federally listed species and species of concern. Fire can also be used to control non-native grass species, weed management, discourage shrub encroachment, help reduce reestablishment of invasive species, and recycle nutrients back to the soil (Travis AFB 2018a). Specifically, burning of vernal pool habitat is expected to have a beneficial effect for CCG, VPFS and VPTS by removing thatch, changing vegetation composition over the following one to three growing seasons, and benefiting native forbs within vernal pools (Marty 2015b; USFWS 2018b). The WFMP has determined that a four-year fire interval would support vegetation composition targets and invasive species reduction goals. Travis AFB prescribed burning is usually timed to occur during the dry season when CTS are deep in their summertime underground habitat. CTS skin must remain moist, so burrowing individuals locate areas where the soil atmosphere's humidity is close to water saturation point (USFWS 2005b). In addition, the types of fuels available are generally grass and forb-derived, which result in fast but low-temperature burns that sweep quickly through an area. Because of these factors, Travis AFB believes that its prescribed burning poses little risk to fossorial CTS; however, as little research or literature is available documenting the effects of prescribed burning on CTS, the base will continue to monitor CTS for prescribed burning. For each burn, surveys are conducted before, during and after ignition, and no CTS have been detected yet.

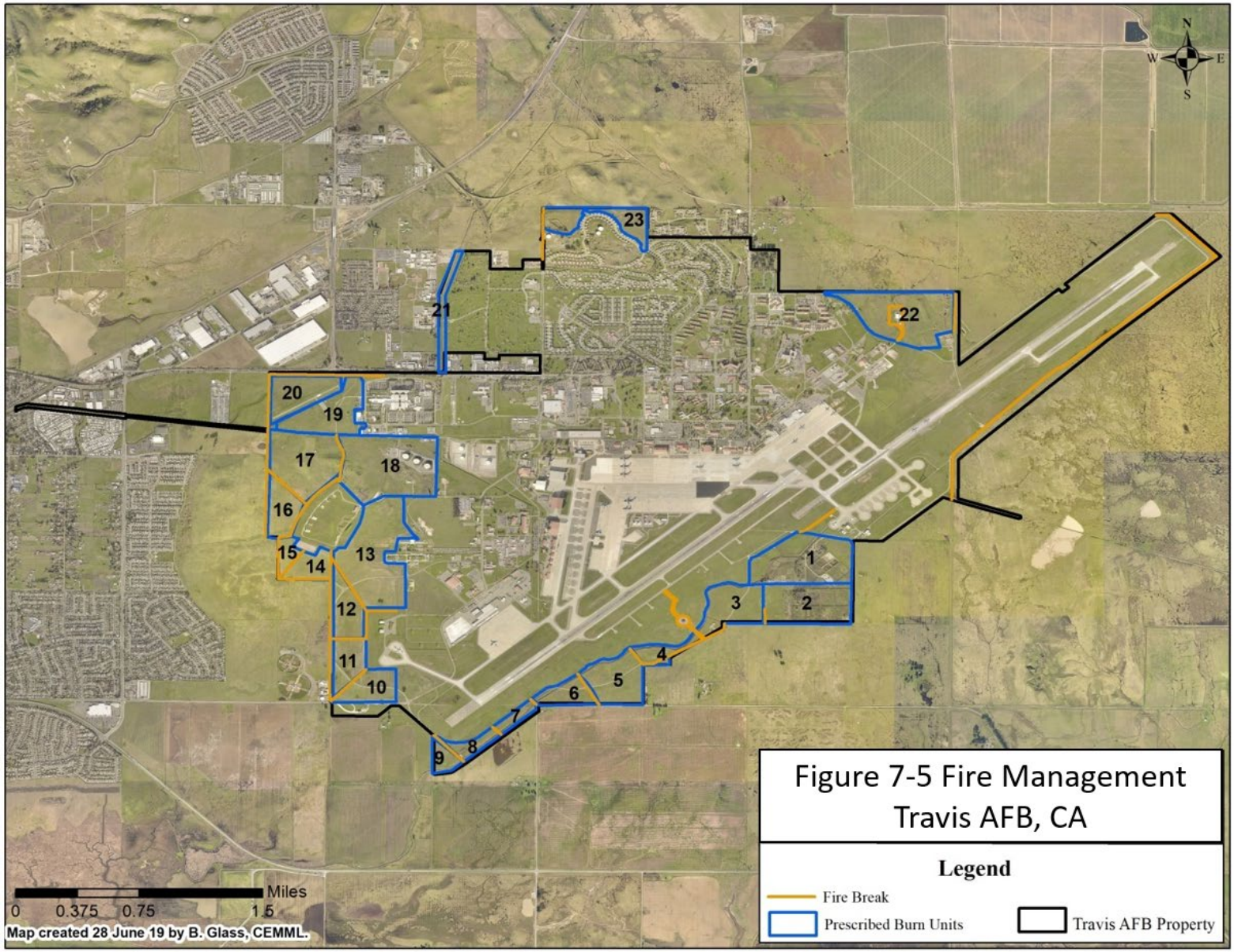

Figure 7-5. Fire management on Travis AFB.

7.9.1 Climate Impacts on Wildland Fire Management

All four projected climate change scenarios project increased annual precipitation at Travis AFB, with increases ranging from as little as 0.29 inches in the RCP 8.5 2030 scenario to as much as 3.92 inches in the RCP 4.5 2030 scenario (CEMML 2019a). However, monthly decreases in precipitation are frequent, with 35% of all projected months expected to receive less rain. In addition, in 23% of projected months, precipitation is expected to increase by less than 0.1 inches. Combined with the higher temperatures that are projected in all months in all climate scenarios, these months of lower, or effectively static, precipitation are likely to be drier than current day due to increased evaporation and evapotranspiration.

June through September is likely to remain very dry under all scenarios, with almost no rainfall at all in July and August. The timing of the wet/dry season breakpoints remains similar across scenarios and does not deviate from historical trends indicating the fire season is unlikely to expand or contract.

Vegetation models strongly suggest a shift toward a warmer and wetter vegetation ecosystem, shifting from temperate mixed forest to sub-tropical mixed forest. The projected shift can be interpreted as a change in species types toward warmer climate species that are capable of producing more biomass. The wetter climate overall, and possibly the much wetter February in the low-emissions scenario, would potentially lead to the production of more biomass. This may lead to increased fuel loads which could produce more intense wildfires whenever they occur.

Based on the above considerations particularly the effect on vegetation and biomass production, we expect an overall increase in the number, size, and intensity of wildfires at Travis AFB. Continuity of fuel and fuel load is likely to increase due to increased rainfall during the wet season under the low-emission scenario. A hotter dry season, during which rainfall is expected to remain essentially constant relative to historic norms, is likely to result in lower relative humidity leading to more wildfire ignitions and fires that are more intense and larger. The mission of Travis AFB does not produce a large number of ignitions, and historically there have been few wildfire incidents of any magnitude. The increase in fire potential is likely to alter the installation's exposure to wildfire hazards, despite the low probability of mission-caused ignitions. This effect is already being observed, as Travis AFB has seen a dramatic increase in fires starting on and off-base recently. If fire danger does increase over time, prescribed fire implementation may become more challenging as the window available for the ideal conditions may be shortened.

7.10 Agricultural Outleasing

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

7.10.1 Background

Grazing is considered a compatible management tool for the annual grasslands and vernal pools that comprise much of the undeveloped areas on Travis AFB. The most notable benefit of grazing is the reduction of ground cover of non-native annual grasses, particularly when the grazing livestock is cattle/sheep, while goats tend to be highly effective browsers of woodier material. Reducing non-native grass cover improves the diversity of native plants both in the vernal pool and upland habitats in grazed areas (Marty 2005). Timed and monitored grazing can have conservation benefits for special-status species.

These benefits include increased inundation periods for vernal pools, which benefits the native animal and plant species using that habitat for breeding and completing their life cycles (Marty 2005, 2015a, 2016). Additionally, grazing can improve grassland habitat for birds nesting and foraging. Targeted grazing, particularly by goats and sheep, can also be used to remove large infestations of woody or thorny material such as yellow starthistle (*Centaurea solstitialis*), and this is usually accomplished by short-term, large-number herds.

Grazing for resource benefit (rather than for agricultural production) can entail significantly more effort to ensure monitoring metrics are met and prevent resource damage instead of benefit. Appropriate timing, stocking rate, and species of animal are all dictated by the desired end state and susceptibility of the target species. Travis AFB has acquired considerable experience with implementing timed and data-driven grazing with cattle as a result of ongoing outleasing since 1977, and is currently investigating incorporating goats and sheep into management as well (CEMML 2016).

7.10.2 Grazing Management

Before Travis AFB was established, the land was used for sheep and cattle grazing (Dingler 2002; Goerke-Shrode 2007). Travis AFB's livestock grazing program began in 1977 with 145 acres being leased for cattle (Holmes 1996). By 1996, 604 acres were being grazed by cattle and horses (Holmes 1996). The acreage for cattle and horse grazing varied across the years, depending on the amount of rain and therefore forage available. The surrounding land use includes agriculture and open space as part of the requirements for the AICUZ (Travis AFB 2016a).

Travis AFB implements a Grazing Management Plan (GMP; see Section 15.0, Tab 6) to manage approximately 467 acres of grazed area that currently exists on the west side of the base (Travis AFB 2017b). This acreage is divided into subunits called pastures. Most of the acreage is outleased for cattle grazing, with a new lease beginning every five years according to AFI 32-9003, *Real Property*. There are five pastures for cattle amounting to 383 acres. Eight pastures and/or turnouts, amounting to 73 acres, are leased to the Base Equestrian Club for horses. One additional 11-acre pasture can be used by either horses or cattle. There are currently 14 pastures on Travis AFB, but there are plans to increase that acreage (Figure 7-6).

Cattle and horse grazing are managed differently. The pastures with cattle are grazed from October to June with no supplemental feeding allowed (Figure 7-6). Mineral supplements are provided to the cattle to meet their nutrient requirements. The placement of these mineral supplements will avoid sensitive natural resources. Horses are fed primarily in their stalls or turnout pastures entirely with supplemental feeding; incidental grazing occurs in the horse pastures year-round when they are used daily for exercise areas.

Cattle Grazing Fees—Grazing fees are currently set at $23 per animal unit month (AUM). This rate was determined by the Travis AFB Real Property Office in 2017 to be the fair market value as the Request for Interest in the new lease resulted in only one interested party, the current lessee. This rate is based on the average 2016 animal unit rates in California, as calculated by California U.S. Department of Agriculture National Agricultural Statistics Service Pacific Region (Grazing Fee Rates for Cattle Publication, 1 February 2017, available at www.nass.usda.gov/ca). Cattle grazing fees total less than $8,000 per year and are used for lease administration and natural resource projects on the base. The base's NR program (through contracted support) will be responsible for monitoring the health of the grazing allotments, monitoring agricultural lease payments in conjunction with the Travis AFB Real Property Office ensuring proper deposit, using agricultural reimbursable funds, and monitoring compliance with the land use regulations

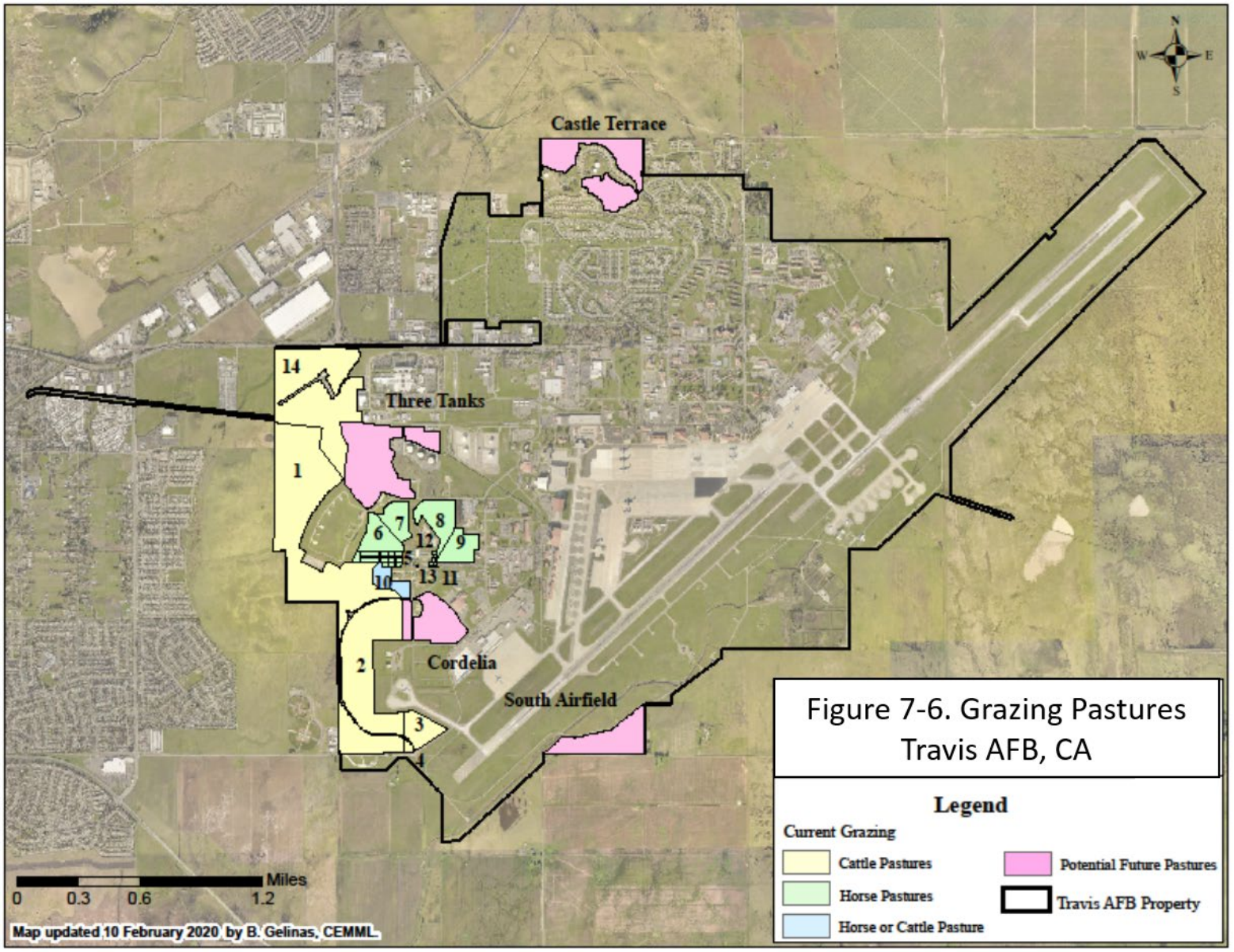

Figure 7-6. Grazing pastures on Travis AFB.

Grazing Models—Several different models for grazing are used at Travis AFB. The traditional model is to lease land at a fair and reasonable price to a rancher who uses the available forage to feed his cattle over a 6-12 month grazing season in a rotational or continuous manner at low levels. A second newer model is to pay a sheep or goat grazing service to bring animals to remove forage quickly for 1-4 weeks using a high intensity, short duration grazing prescription. A third option has been proposed that would establish a permanent herd of either goats or sheep on the base. The herd would be used primarily for fuel reduction and grounds maintenance purposes, but could also be tasked with targeted grazing for resource improvement such as invasive species control in noxious weed infestations. Management and maintenance of the herd would be the responsibility of a full-time shepherd. As with all potential projects on Travis AFB, the use of a dedicated, permanent grazing herd will be evaluated for its potential benefits and detrimental effects to all special-status species prior to implementation. There are pros and cons to these models, and selection of models at Travis AFB depends on the specific management goal and physical, financial, and logistical constraints. Ecological effects differ between the options because of the kind and class of animal as well as the duration, frequency, and timing of grazing.

A set of land use regulations has been established to ensure all grazing activities are conducted in a manner consistent with national policy (Appendix M). They are intended to:

- provide for the multiple use of the premises for military purposes, domestic livestock grazing, public recreation, water conservation, and wildlife habitat; and
- preserve and enhance natural resources.

Special-status Species—The GMP includes specific objectives for grazing operations that will improve habitat for listed species, including maintaining vegetation height at 8 inches in ground squirrel habitat to encourage squirrel usage and development of CTS burrow sites, residual dry matter targets that maintaining and facilitate CTS migration, and vernal pool maintenance to increase hydroperiods and maintain native species richness.

7.10.3 Grazing Capacity

Grazing capacity is the maximum number of animals in a defined area that will produce a target level of production without ecosystem deterioration over a defined period (Heady and Child 1994). The grazing capacity determines the stocking rates, which are the actual number of animals in a defined area during a specific period, typically a grazing season (Heady and Child 1994). Based on an analysis in the GMP (Travis AFB 2017b) and recent grazing studies, the grazing capacity was determined to be 1.4 AUMs per acre, resulting in 650 AUMs (Table 7-3). Allowable AUMs should be adjusted annually (or set to allow for heterogeneity of pasture conditions across all years) based on yearly rainfall and residual dry matter results as prescribed in the GMP. The duration, intensity, and frequency of seasonal grazing are designed to promote native species, maintain habitat for desirable species, sustain vegetative cover, minimize soil erosion, reduce fuel loads, and prevent the spread of undesirable plant species.

Table 7-3. Travis AFB pasture livestock type and size (acres).

Pasture	Acreage	Grazing Capacity (AUM)[1]	Livestock Use
1	178	254.6	Cattle
2	81	111.8	Cattle
3	15	20.7	Cattle
4	2	2.8	Cattle
5	9	11.3 (turnout)	Horse
6	16	22.1	Horse
7	13	17.9	Horse
8	19	26.2	Horse
9	15	20.7	Horse
10	11	15.2	Horse or Cattle
11	0.8	turnout	Horse
12	0.4	turnout	Horse
13	0.05	turnout	Horse
14	107	146.3	Cattle
TOTAL	**467**		

Note: The grazing capacity is based on recent use of 1.4 AUM per acre but should be adjusted up or down on a yearly basis, depending on the amount of winter rain and the forage growth for that year.
[1] AUM=Animal Unit Month.
Source: Grazing Management Plan (Travis AFB 2017) (Section 15.0, Tab 6).

7.10.4 Condition of Rangeland Resources

Vegetation—The grasslands in northern California are composed of cool-season annual plants, both grasses and broadleaf. Most plants in the pasture grow from seeds each spring, and the percent cover of each species changes every year. Common forage species include filaree, brome grass, wild oats, and annual ryegrass.

Federally Protected Species, Species of Special Concern and Their Habitat—Vernal pools occur in all pastures and contain historic or current records of CCG, CTS, VPFS, burrowing owl, tricolored blackbird, Swainson's hawk, and western pond turtle. Effects of grazing are primarily positive as long as it is managed well (see Section 2.3.4). Grazing is being used at Travis AFB to provide a conservation benefit to federally listed species and species of special concern.

Invasive species— Invasive species occur in pastures and are monitored in annual surveys. Specific invasive species of interest include medusahead (*Taeniatherum caput-medusae*), barbed goatgrass (*Aegilops triuncialis*), and purple and yellow starthistle (*Centaurea calcitrapa* and *C. solstitialis,* respectively). Currently barbed goatgrass and starthistles are being controlled via mechanical or chemical methods. Grazing practices may be adapted per protocols outlined in the GMP to prevent spread of species between pastures though are not currently in effect.

7.10.5 Monitoring

A new grazing monitoring protocol was developed (H. T. Harvey & Associates 2019) to measure success of specific goals and objectives outlined in this INRMP (Section 8 and 10) and the GMP. Annual monitoring results should be reviewed, and grazing practices adjusted in an adaptive management framework in order to achieve conservation benefits across the landscape (Project 6.3.12). The monitoring protocol should be

re-evaluated every five years to target goals and objectives (Project 6.3.13). Additionally, a vernal pool grassland study (Marty 2017e) is now in its fourth of five to seven years of data collection (Project 6.3.2). The first objective of this study is to quantify the impacts of horse and cattle grazing on vernal pools and the surrounding grassland by measuring plant species diversity, soil organic matter content and residual dry matter levels. The second objective is to compare the effects of grazing and mowing on vernal pool vegetation at the Aero Club with an emphasis on the population of CCG (Marty 2017e). The overall goal is to determine optimal grazing management recommendations to improve the habitat and perhaps populations of listed species known to occur on Travis AFB.

7.10.6 Future Grazing Goals

Continue with five-year, long-term leases and work toward establishing more grazing pastures.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to USAF installations that perform pest management activities in support of natural resources management (e.g., invasive species, forest pests). This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

7.11.1 Pest Management

The Foreman/NCOIC (non-commissioned officer in charge) of the Pest Management Section also serves as the Installation Pest Management Coordinator and is responsible for ensuring that pesticides do not negatively affect legally protected species. The PMP details the types of pesticides (which include insecticides, herbicides, and fungicides, etc.) used throughout the base to control animal and plant pest populations. The PMP is updated annually and revised every five years and is managed by the CES, Pest Management Section. The PMP is reviewed by the NRM as well as other departments to assure technical accuracy, environmental compliance, and relevance. DoDI 4150.07, *Pest Management Program,* and AFI 32-1053 provide the legal authority for the implementation of policies, standards, and requirements for base personnel to carry out all operations connected to the PMP. Control measures for pests that could be detrimental to the health and welfare of base personnel and property are described in the plan. The CES Pest Management Section is responsible for overseeing and managing all pesticide application on the Installation.

An important aspect of the pest management effort that requires cooperation between the NRM and the Pest Management shop is the control of ground squirrels. Because the native fossorial mammals are integral parts of the ecosystem and support special-status species, such as the Western Burrowing Owl and CTS, controlling them must be done judiciously. Travis AFB conducted squirrel activity surveys in 2020 in the cantonment and produced a memo outlining squirrel-resistant construction strategies. The base also ensures protection of Burrowing Owl by using ground squirrel baits only after the NRM has surveyed and cleared the area for their use.

7.11.2 Invasive Species Management

Travis AFB has experienced a proliferation of noxious weeds and has conducted major efforts to control these weeds starting around 2015. EO 13112, *Invasive Species*, requires noxious weed control to reduce economic loss as well as ecological impact. Weed species may or may not be a problem, depending on location, density and land use. A noxious weed is an invasive exotic plant that is able to proliferate and

aggressively alter or displace indigenous biological communities. In natural areas, noxious weeds can exclude native plants and alter or displace natural plant communities, reduce biological diversity, threaten sensitive (T&E) species, increase soil erosion and groundwater loss, disrupt ecosystem functions, and fundamentally alter the features of California (CNPS 1996).

Two particularly widespread noxious weeds on Travis AFB are medusahead and yellow starthistle. Medusahead contains high levels of silica and does not break down readily in the environment, reducing cover of competing species and impacting overall habitat quality, biodiversity, and native species. Large amounts of medusahead also reduce forage quality for grazing animals. There is potential for medusahead to be reduced temporarily with prescribed burning or use of herbicides. Travis AFB may experiment with such prescriptions as time allows and results become available. The WFMP (Travis AFB 2019) includes details of prescribed burning for fuels reduction and resource improvement. Yellow starthistle is toxic to horses, resulting in chewing disease, and can cause paralysis of lips, face, and legs, ultimately leading to starvation and death (Chang et al. 2012), so control in areas where horses are pastured is especially important. It can also present a barrier to CTS dispersal where if forms dense enough stands.

Travis AFB has an Invasive Species Management Plan that defines priorities and methods for invasive species control of known invasive plants and animals. A supplement to this plan was completed in 2017 to update methods for invasive plant species control. Implementation measures are ongoing. The plan outlines specific, measurable objectives and methods for each management area targeted for invasive species reductions based on INRMP goals and objectives (Section 8).

Invasive species control is necessary to improve pollinator habitat on Travis AFB (USFWS 2017). This can be challenging if native pollinators are using invasive plant species for nectar or nesting and will require additional planning to ensure native nectar or nesting substrate is available prior to invasive species removal. Mechanical control is the least impactful on pollinators of the control methods for invasive plant species. Herbicides are used alone or in combination with other techniques to control invasive species. Herbicides have the potential to affect pollinators if used improperly, such that native plants are killed. If insecticides need to be used, limited use is recommended to prevent resistance and potential harm to pollinators (USFWS 2017).

The U.S. Environmental Protection Agency has recently promulgated a Pesticide General Permit for discharges from the application of pesticides to waters of the United States. The installation has developed an Aquatic Pesticide Application Plan in order to obtain a General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States.

Nonpoint source pollution occurs when runoff from rain and snowmelt carries a pollutant into waterways, and this could be a concern with pesticide application on Travis AFB because of the prevalence of wetlands. However, the only personnel who can spray pesticide near aquatic sources on base is the entomology team which is only able to do so at one location. Grounds maintenance is prohibited from spraying near water/vernal pools/wetlands and usage of pesticide is strictly reviewed by the Installation Pest Management Coordinator. The base has set an annual threshold for specific active ingredients (AI), and after the threshold has been reached, no additional applications can be made with that AI, which prevents the over-use of pesticide.

7.12 Bird/Wildlife Aircraft Strike Hazard

Applicability Statement

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

Travis AFB Instruction 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program*, implements the BASH program on Travis AFB inside the WEZ, designated in February 2019 (Figure 7-7; Section 15.0, Tab 2).

Travis AFB is located within the Pacific Flyway, which is a major migration corridor for birds. Depending on the season, the base provides habitat for a variety of migrating birds including small passerines, raptors, shorebirds, wading birds, and waterfowl. The Suisun Marsh, one of the largest estuarine marshes in the western United States, is just a few miles south of Travis AFB. The marsh supports numerous waterfowl hunting clubs as well as conservation areas managed for the protection of waterfowl. Two landfills are located 1.5 miles north and 4 miles south of the Travis AFB runways. These landfills produce large amounts of gull activity that increase the risk to aircraft. Seasonal wetland, annual grassland, riparian, and marsh in and around Union Creek provide habitat close to the airfield on Travis AFB and must be actively managed to reduce its attractiveness to wildlife. Additionally, there are several stands of trees that provide habitat and require management.

The BASH program's principal focus is to mitigate wildlife hazards through preventative measures that include (1) identification and monitoring of threats, (2) habitat modification, and (3) harassment and relocation to discourage and non-lethally remove wildlife. When preventative methods have failed, depredation will occur as a last resort. The Travis AFB BASH program is implemented in two operational phases. Phase I concentrates on wildlife control and dispersal and is in effect year-round. Phase II is used in conjunction with Phase I procedures and concentrates on wildlife avoidance, using scheduling and airfield operating restrictions. Phase II is implemented during the September through April migration period.

Phase I operational activities occur year-round and include bird dispersal operations, grounds maintenance activities, trap and relocation program for raptors, habitat modification, removal of carcasses from the airfield, pest control, maintenance of drainage ditches, elimination of roosting sites, discouraging wildlife feeding, implementation of a bird watch conditions system and depredation as a last resort.

Bird Dispersal Operations—Dispersal activities are conducted by USDA Wildlife Services, Airfield Management Operations and Flight Safety personnel. These personnel respond when birds or other wildlife on the airfield create a potentially hazardous condition to aircraft. Hazardous conditions exist when birds are concentrated in the airfield or are moving near the runway or on the approach and departure corridors. Non-lethal dispersal operations include, but are not limited to, the use of working dogs, falcons, pyrotechnics, and paint ball guns.

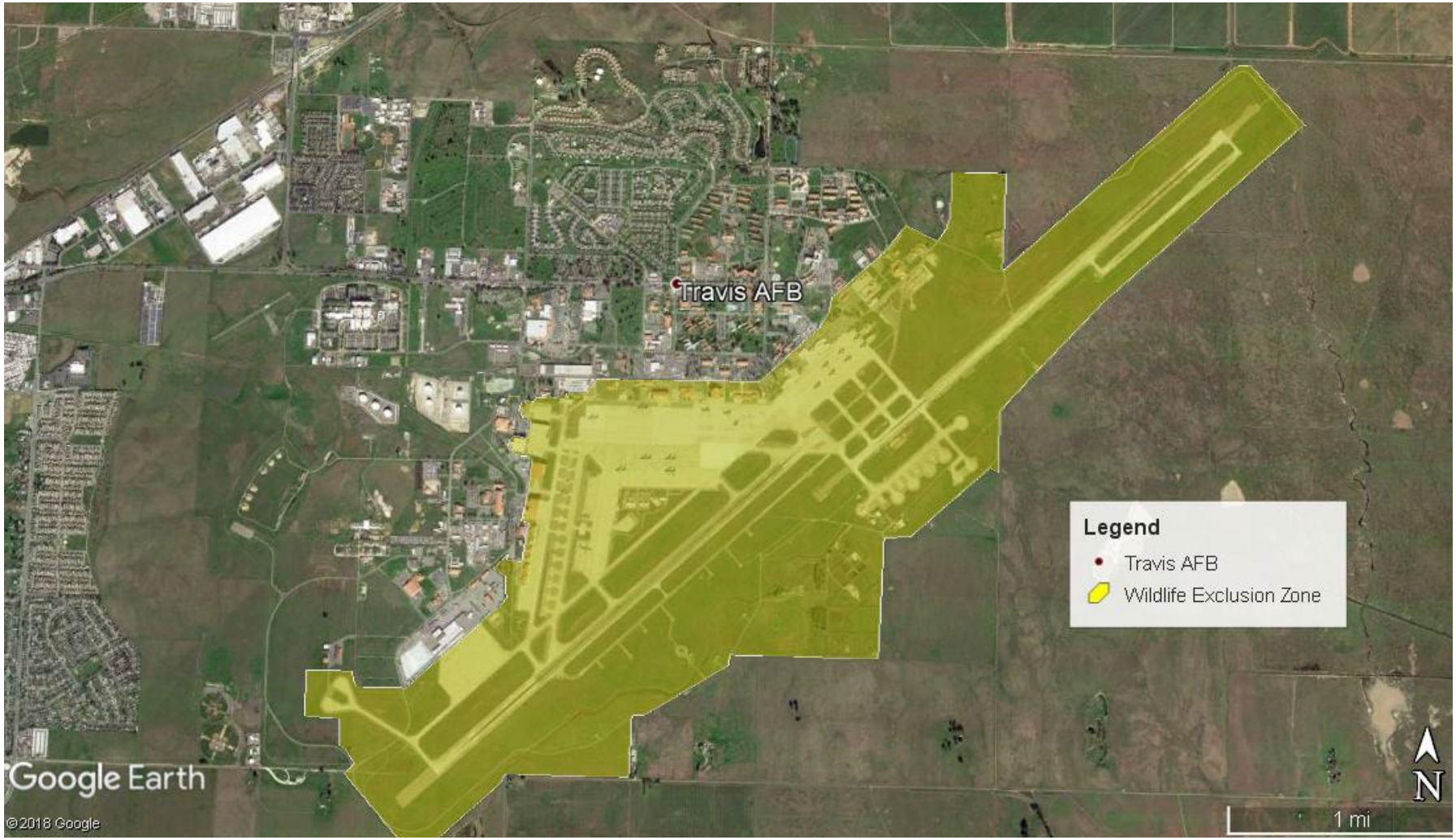

Figure 7-7. Wildlife Exclusion Zone at Travis AFB.

Grounds Maintenance—Vegetation along runways and taxiways, up to a distance of 800 feet from their edges, is maintained at a height of 7 to 14 inches. All shrubs and brush within this zone are removed (Figure 7-4). Mowing reduces the attractiveness to ground-nesting birds. Raptor perching sites are removed whenever possible. It is USAF policy to control vertebrates and invertebrates that would attract birds and the BASH Plan identifies the procedures used to control them (Section 15.0, Tab 2). Removal of all dead animals from the airfield areas further reduces the attraction of birds to the flightline areas. This is accomplished by Civil Engineering personnel.

Habitat Modifications—Many wildlife hazards occur near the airfield and off installation property. Although management of the lands off-base are not under the USAF's control, Travis AFB monitors and engages in planning meetings on proposed projects that could increase the risk of BASH incidents.

Maintaining Drainages—Union Creek runs under and along the east side of the airfield and requires regular maintenance in order to reduce its attractiveness to birds. Vegetation clearing is the preferred method for maintaining the creek since mowing/cutting is difficult to accomplish given the steepness of slopes along much of the drainage. Cattails and tules are attractants to blackbird species, which pose a very high risk to airfield operations. Vegetation clearing using an excavator that just removes vegetation does not require issuance of a 404/401 permit under the CWA and is coordinated through the NRM to ensure it occurs outside the nesting season for sensitive species such as the Tricolored Blackbird, which was recently determined to require legal protection under the CESA. The other option which does require issuance of 401/404 CWA certification/permit, is dredging. This involves removing soil below the ordinary high water mark that is deeper than just accumulated sediments. Dredging may be used in the long-term management of the creek. Travis AFB also maintains a 70-foot-wide easement for vegetation clearing along the length of Union Creek on private property southwest of the base. There are also easements for access to what used to be a marker off the end of the runway in the middle of the property.

Depredation—Depredation of wildlife posing a hazard to aircraft operations is used as a last resort on Travis AFB and is conducted by USDA Wildlife Services, Airfield Management Operations and Flight Safety personnel or contractors who are trained to harass birds and other wildlife on the airfield. Lethal take may only be conducted by persons given written authorization by the POC listed on the USFWS Depredation Permit, currently AMW Flight Safety. This permit allows for take, temporary possession and transport of certain species of migratory birds, their nests and eggs, under very specific circumstances and only when the birds pose a threat to human safety. The permit does not authorize take of migratory birds that merely present a nuisance. It excludes bald eagles, golden eagles and T&E species. The Depredation Permit contains specific requirements for agency coordination of lethal take activities and annual reporting of all take activities.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section **IS NOT** applicable to Travis AFB.

Program Overview/Current Management Practices

Not applicable to Travis AFB.

7.14 Cultural Resources Protection

Applicability Statement

This section applies to USAF installations that have cultural resources that may be impacted by natural resource management activities. This section **IS** applicable to Travis AFB.

Program Overview/Current Management Practices

Management of cultural resources is described in detail in the Travis AFB Integrated Cultural Resources Management Plan (Travis AFB 2016b; see Section 15.0, Tab 4). Travis AFB complies with federal laws and regulations concerning cultural resources to lessen or avoid adverse effects to significant cultural resources while accomplishing the military mission. The entirety of the installation and GSUs have been surveyed. Travis AFB does not have known existing archaeological resources that are eligible under the National Historic Preservation Act. Ten archeological resources were found. Of those, three were considered prehistoric, but those were destroyed at an unknown time. The other seven sites were considered historic but were determined to be ineligible for listing under the National Historic Preservation Act. A number of potential historic buildings and structures (approximately 30) have been identified. Only one building, Hangar 810, was determined to be eligible as a standalone structure under the National Register of Historic Places (NRHP). No known Native American sites or issues are associated with the installation, although two tribes have expressed interest in cultural resources at the base.

The NRM at Travis AFB also manages the cultural resources program and ensures management of the two programs are fully integrated. Activities with the potential to affect either resource are coordinated with natural resources staff and, as appropriate, measures are developed to minimize impacts.

7.15 Public Outreach

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. Travis AFB **IS** required to implement this element.

Program Overview/Current Management Practices

The public has a vested interest in installation natural resources management. Members of the public may serve as volunteers to support natural resources programs where they have a personal interest, and they review environmental documents and management plans affecting these programs when appropriate.

The NRM works with the Public Affairs Office (PAO) to establish an ongoing natural resources public relations program. The Installation Management Flight coordinates with the PAO to use existing programs such as Tree City USA, public events such as Earth Day and National Arbor Day, and other outreach programs to publicize efforts in natural resources activities at Travis AFB.

The NRM, working through the PAO, regularly issues news releases announcing upcoming events and accomplishments in installation natural resources management and develops environmental education programs in cooperation with local educational institutions, conservation organizations, and public service agencies.

Access may be granted to federal and state officials who furnish professional advice and technical assistance, and individuals who conduct academic research on natural resources. Researchers may collect plants, animals, mineral, or fossils on installation lands for valid scientific purposes when compatible with

the mission, approved by the installation or Wing Commander or designated representative, and the required federal or state permits have been obtained.

7.16 Climate Change Vulnerabilities

Applicability Statement

This section applies to USAF installations that have identified climate change risks, vulnerabilities, and adaptation strategies using authoritative region-specific climate science, climate projections, and existing tools. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

To address the mandate in DoDI 4715.03 to plan for climate change impacts to natural resources, this section discusses preliminary initiatives, goals, and measures designed to reduce vulnerability against expected climate changes. Because the science and practice of adaptation is still in early stages of development, Travis AFB will continue to research planning for climate change.

7.16.1 Management Responses to Climate Change

There are two primary categories of management strategies for addressing climate change: 1) increasing the resiliency of ecological systems and 2) providing areas for migration of habitat and species (also known as a mitigation strategy) (Joyce 2008, Peterson 2008). The uncertainties surrounding actions related to climate change require an adaptive management approach to the evaluation and implementation of management responses (Kareiva 2008). Where applicable, management responses to climate change are in the INRMP (Section 7.0, Natural Resources Program Management). Some of the areas of uncertainty include how climate change will affect the following environmental elements.

- Hydrologic regime, water temperature, water chemistry, sediment, aquatic and riparian habitat quality, and rare aquatic species.
- Hydrology, vegetation, and fire susceptibility of vernal pools and adjacent grasslands.
- Habitat and food sources for sensitive animal species.
- Behavior and rate of wildfires.
- Spread of invasive non-native plant and animal species.

Below is a list of general adaptation approaches for natural resource management at Travis AFB in response to climate change.

- Encourage land management of natural vegetation by the use of prescribed fire, grazing, and invasive species control.
- Reduce the impacts of current stressors to enhance ecosystem resilience to climate change in the near term. Current stressors include invasive species, habitat loss, hybridization, and others.
- Maximize unfragmented patches of ecological systems, including within ecosystem topographic and hydrologic variability, functional ecological processes, and landscape patterns of ecological systems.
- Monitor trends in ecological systems to assess changes in reference conditions, especially vernal pool hydroperiods and water quality and invasive plant and animal species infestation levels. Use the dynamic reference condition approach to assess changes over time.

Addressing impacts to protected species and species of concern and addressing them with modifications to natural resources management strategies will require an adaptive process of developing, validating, and improving models in the creation of forecasts needed for management. Identifying and adapting to the likely effects of climate change calls for a proactive rather than reactive approach to maintain cost effective programs and meet legal requirements to manage natural resources.

7.17 Geographic Information Systems

Applicability Statement

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. The installation is required to implement this element.

Program Overview/Current Management Practices

A GIS (called GeoBase in the USAF) is used to manage and catalogue information acquired in natural resources management. The GeoBase team assists in planning by mapping areas of environmental concern and providing a baseline for analyzing the potential impacts of any proposed natural resources management action. The GeoBase Program is implemented through the Geo Integration Office (GIO) and is the responsibility of the CES GIO. The GIO uploads geospatial data provided by the NRM after it has been approved by the Installation Management Flight Chief. The Installation Management Flight Chief is responsible for consulting with the GIO regarding GeoBase requirements prior to contracting for or accomplishing work that produces geospatial data, and for ensuring that collected data are provided to the GIO in a timely manner.

8.0 MANAGEMENT GOALS AND OBJECTIVES

This section of the INRMP provides a detailed description of Natural Resources (NR) Management goals, objectives, and projects for the next five years. Due to the base's adaptive NR Management approach, however, each proceeding year the list of projects may be updated and changed to ensure that we are accomplishing our current objectives and meeting our management goals. Goals are the desired conditions that if obtained represent a successful NR Management program. Objectives are the strategies that are designed to accomplish our goals through the implementation of specific projects. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable with input from the NR Manager, in-house key personnel, the AFCEC Installation Support Section, USFWS, and the CDFW. Priority is given based on ranking as H (high), M (medium), or L (low). For the next five years NR Management will pursue the following goals, objectives, and projects.

GOAL 1 POPULATIONS OF NATIVE FISH, PLANT AND WILDLIFE SPECIES PERSIST AND THRIVE AT TRAVIS AFB WHILE MAINTAINING OR IMPROVING CAPABILITY TO CONDUCT MILITARY ACTIVITIES.

OBJECTIVE 1.1 Integrate management with cooperating agencies and organizations, and in accordance with federal and state mandates.

PROJECT 1.1.1 Ensure that all BASH/USDA activities conducted near the Airfield are in accordance with the USFWS Depredation Permit, and in coordination with CDFW and Flight Safety (AFI 91-212).

PROJECT 1.1.2 Study and implement management and restoration activities to reduce conflicts between wildlife species of concern and runway flight operations in coordination with the BASH plan (e.g., Tricolored Blackbirds, new grazing pastures with bird attractants near airfield).

PROJECT 1.1.3 Implement the Avian Protection Plan to monitor risks to birds on all power lines, transmitter towers, and associated electrical configurations on Travis AFB (in coordination with CE, PG&E, and City Light & Power and other providers) for needed retrofits and new construction with databases and/or GIS to track changes.

PROJECT 1.1.4 Manage for raptors and owls through habitat surveys, educational outreach, and pre-construction training.

OBJECTIVE 1.2 Preserve and enhance native habitat for fish, plant and wildlife species.

PROJECT 1.2.1 Develop prescribed burn wildlife habitat priorities and coordinate with the Wildland Fire Management Program.

PROJECT 1.2.2 Identify and prioritize projects according to the Invasive Species Management Plan in conjunction with Agricultural Outleasing and the Wildland Fire Management Program.

PROJECT 1.2.3 Maintain and enhance pollinator habitat, focusing in conservation areas, with plantings of native wildflowers, native milkweed, and other pollinator friendly plant species.

PROJECT 1.2.4 Plan and implement habitat improvements for raptors, owls and bats in conservation areas and other suitable areas on the base.

PROJECT 1.2.5 Safeguard the Western Pond Turtle through the development of

Best Management Practices currently established on Travis and look to developing new BMP's through the DoD Natural Resources Legacy Program in "Recommended Best Management Practices for the Western Pond Turtle on Department of Defense Installations."

OBJECTIVE 1.3 Conduct surveys, monitoring and studies on native fish, plant and wildlife and implement current research to enhance natural resource management integral for successful base missions.

PROJECT 1.3.1 Conduct periodic wildlife surveys to update the comprehensive base species list, including GSUs, according to vegetation types and update GIS accordingly with results.

PROJECT 1.3.2 Conduct neotropical migratory bird monitoring as part of the PIF monitoring program to determine species status in various ecosystems on the base.

PROJECT 1.3.3 Conduct surveys for owls and raptors.

PROJECT 1.3.4 Conduct fish surveys of Union Creek, North Gate Pond, Valley View Pond and other perennial ponds on Travis AFB.

PROJECT 1.3.5 Monitor populations and habitat quality for bats by conducting surveys in the conservation areas, around the airfield, commissary and B-139.

PROJECT 1.3.6 Continually, or at minimum annually, update and maintain GIS database with survey results on native fish and wildlife.

PROJECT 1.3.7 Contribute species survey and occurrence data to federal, and other installation-approved scientific databases, such as the Avian Knowledge Network (AKN), North American Bat Monitoring Program (NABat), and/or California Natural Diversity Database (CNDDB).

GOAL 2 POPULATIONS OF FEDERAL AND STATE THREATED AND ENDANGERED SPECIES AND SPECIES OF CONSERVATION CONCERN PERSIST AND THRIVE AT TRAVIS AFB WHILE ENSURING MISSION SUSTAINABILITY

OBJECTIVE 2.1 Conduct inventories, studies, and surveys for federal and state T&E species and special-status species to determine presence and habitat usage.

PROJECT 2.1.1 Conduct habitat/ species surveys and/or habitat suitability modeling (e.g., CTS high-risk maps) to include federal and state protected plant and other wildlife species on the base, all GSUs, and proposed DoD REPI parcels.

PROJECT 2.1.2 Conduct surveys for CTS (eggs, larvae and adults).

PROJECT 2.1.3 Investigate the use of e-DNA as a survey and monitoring technique to determine presence/absence of CTS.

PROJECT 2.1.4 Investigate the use of surrounding conservation easement lands to relocate CTS.

PROJECT 2.1.5 Conduct surveys for BCC (USFWS 2021b), and federal and state T&E bird species, specifically including Golden Eagles, Tricolored Blackbirds, Swainson's Hawks, Western Burrowing Owls, and White-tailed Kites on the base to assess population trends, habitat use and quality, and potential measures to enhance their habitat and reduce species presence in areas where the species would constitute a BASH threat.

PROJECT 2.1.6 Implement the Burrowing Owl Management Plan and its

recommendations including to consider installation of artificial burrows in conservation areas..

PROJECT 2.1.7 Investigate the Potrero Hills Annex as a site for CTS mitigation (contractor cleanup required first).

PROJECT 2.1.8 Develop, continually or at minimum annually update and maintain a GIS database map for state and federal listed species, species of concern, their associated habitats and other vegetation maps.

PROJECT 2.1.9 Obtain and maintain a subscription to CNDDB (purchase subscription every two years).

OBJECTIVE 2.2 Maintain compliance with federal and state mandates for T&E species through funding, consultation and monitoring.

PROJECT 2.2.1 Maintain technical support from the USFWS Sacramento Fish & Wildlife Office through the USAF-USFWS Interagency Agreement.

PROJECT 2.2.2 Update and resubmit the PBA, as needed, but at least once every five years, to maintain the most current PBO from the USFWS.

PROJECT 2.2.3 Review federal and California state species, and the California State Wildlife Action Plan for newly listed or proposed species. Produce Travis AFB management goals for protection and recovery.

PROJECT 2.2.4 Implement the Basewide PBO to include consultation, reporting, tracking (database) and monitoring.

PROJECT 2.2.5 Continue updating and preparing long term CTS Management Plan (per 2017 Emergency Biological Opinion).

OBJECTIVE 2.3 Protect and enhance existing populations and habitats of T&E species through assessing their status, developing long-term plans, and conducting actions required for species recovery.

PROJECT 2.3.1 Manage vegetation using mowing, grazing, and/or prescribed burning in the conservation areas to enhance T&E species habitat by coordinating with the Fire Department and Grounds Maintenance.

PROJECT 2.3.2 Investigate the feasibility of making the airfield Low Risk CTS area by installing one way CTS wall as needed and relocating all caught CTS to an off-Base site.

PROJECT 2.3.3 Study solitary and social bees in conservation areas to determine presence and abundance of these important pollinators that enable Contra Costa goldfields populations to survive. Requirement: Biological Opinion (BO) 1-1-99-F-84.

PROJECT 2.3.4 Engage in ESA Section 7(a)(1) consultations with the Service for recovery of T&E species on Travis AFB.

PROJECT 2.3.5 Implement the feasibility of on-site mitigation options to offset mission impacts on CTS through (1) barriers and tunnels to allow the species' migration, while directing them away from mission activities (e.g., runway, taxiways, tarmac), (2) re-establishing migration away from the known breeding pond in the military family housing area, (3) studying/implementing new equipment/procedures for installation of storm drains, irrigation boxes, electrical boxes, and other equipment that may trap CTS, and (4) installation of artificial burrows around breeding ponds.

GOAL 3 WETLAND QUALITY MAINTAINED OR IMPROVED AT TRAVIS AFB THROUGH MANAGEMENT IN ACCORDANCE WITH CURRENT LAWS, REGULATIONS, AND COMPENSATION OBLIGATIONS TO SUPPORT MISSION SUSTAINABILITY

OBJECTIVE 3.1 Preserve the function of wetlands and a no net loss of waters of the U.S. by discouraging the introduction and spread of nonnative species, and maintaining inventories of all wetlands.

PROJECT 3.1.1 Continue updating Preliminary Jurisdictional Delineation of wetlands on Travis AFB and update GIS data accordingly and conduct a cumulative analysis to quantify disturbance, degradation, or modification of wetlands and vernal pool species habitat.

PROJECT 3.1.2 Study the hydrological functioning of wetlands using new technologies (e.g., real-time kinematic (RTK) global positioning system (GPS) watershed mapping and water level loggers) in order to inform consultations, permits and post-construction monitoring in support of mission activities.

PROJECT 3.1.3 Complete consultations with the Regional Water Quality Control Board and the U.S. Army Corps of Engineers on the base actions impacting wetlands (e.g., lead contamination of vernal pools at the Skeet Range).

PROJECT 3.1.4 Control exotic plant species that threaten wetland resources.

PROJECT 3.1.5 Update the wetlands GIS layer, resolve conflicting data between former mapping studies, and include information regarding wetland type, hydrology, weed infestation, and special-status species association.

PROJECT 3.1.6 Conduct a USFWS 2-Years protocol survey of vernal pool listed species. (H)

PROJECT 3.1.7 Generate Map identifying existing vernal pools where listed species have been documented with zoom enhanced.

OBJECTIVE 3.2 Prevent and minimize nonpoint source pollution with support from Grounds Maintenance.

PROJECT 3.2.1 Develop a greenscaping (xeriscaping) and education program to minimize the use of herbicides, pesticides, and fertilizers.

OBJECTIVE 3.3 Enhance and maintain wetlands and other Waters of the U.S. within Travis AFB to ensure military readiness.

PROJECT 3.3.1 Implement the North Gate Pond/Valley View ponds Management Plan, with support from Pest Management Shop, for North Gate Pond/Valley View Ponds, to include management, monitoring, and control of native and invasive plant and fish species, pond water levels, and pond water quality.

PROJECT 3.3.2 Implement management plan for controlling vegetation in Union Creek to reduce BASH hazards.

PROJECT 3.3.3 Encourage and support Engineering initiatives to map Travis AFB floodplains.

GOAL 4 POPULATIONS OF PEST AND INVASIVE SPECIES REDUCED OR CONTROLLED ON TRAVIS AFB TO FURTHER MISSION SUSTAINABILITY

OBJECTIVE 4.1 Manage known pest species by working with the Pest Management Shop.

PROJECT 4.1.1 Control pest species found on the Cypress Lakes Golf Course.

PROJECT 4.1.2 Continue to manage and control pest wildlife species through close coordination and regular discussion between the Pest Management Section and the Natural Resources Manager, and implementation of the Travis AFB Pest Management Plan.

PROJECT 4.1.3 Continue to kill & control invasive plant species by utilizing the cooperative agreement with Solano Resource Conservation District.

PROJECT 4.1.4 Continue to implement the ground squirrel management plan in partnership with the Pest Shop.

OBJECTIVE 4.2 Maintain and enhance the ecological integrity of sensitive habitat and species affected by invasive species through restoring ecosystem function and biodiversity and increasing control of target invasive species.

PROJECT 4.2.1 Monitor and control the spread of invasive species with Travis GIS survey data and work to reduce populations of treasure flower, barbed goatgrass, medusahead, black mustard, perennial pepperweed, bamboo, fennel, purple starthistle, yellow starthistle and Italian thistle to prevent habitat type conversion of wetland and grassland habitat.

PROJECT 4.2.2 Evaluate various methods of control including mowing activities, pesticide application, and controlled burns to control non-native, invasive species.

PROJECT 4.2.3 Develop a Predator Reduction Plan to reduce CTS and Western Pond Turtle predators (e.g., bullfrogs, fish, red-eared sliders) from the ponds in Castle Terrace Conservation Area to include a monitoring plan that details monitoring activities and thresholds for additional treatment.

PROJECT 4.2.4 Implement a Predator Reduction Plan to reduce CTS and Western Pond Turtle predators (e.g., bullfrogs, fish, red-eared sliders) from the ponds in Castle Terrace Conservation Area. Monitor activities and thresholds for additional treatments.

PROJECT 4.2.5 Ensure all invasive species treatment projects include plans to remove residual invasive plant material and restore area with native plants and weed free certified soil.

PROJECT 4.2.6 Develop strategy to set priority areas for habitat restoration in improved, semi-improved and unimproved landscapes and then conduct restoration and reduction of weed infestation according to priority level.

PROJECT 4.2.7 Conduct restoration in areas already treated with herbicide to allow for faster habitat recovery.

PROJECT 4.2.8 Evaluate measurable objectives for each area on Travis AFB in the Invasive Species Management Plan in reducing, controlling and eliminating invasive species and revise when necessary to maintain relevancy and incorporate new science.

OBJECTIVE 4.3 The movement of invasive and exotic species through the worldwide transportation network directly threatens military readiness and operations. The Pest Management Shop identifies biosecurity risks by developing inventory, monitoring and reporting processes at critical control points for inbound and outbound cargo. All personnel involved in the movement of cargo shall receive recurring Biosecurity Training. In addition establish partnership with Solano County Department of Agriculture for threats of invasive.

PROJECT 4.3.1 Develop a Travis AFB Biosecurity Plan with the Pest Management Shop that addresses potential biosecurity risks identified in inventory, monitoring and reporting processes for critical control points of inbound and outbound cargo and associated training materials.

PROJECT 4.3.2 Implement the Travis AFB Biosecurity Plan through recurring training for all personnel involved in the movement of cargo.

GOAL 5 NATURAL RESOURCES PRESERVED OR ENHANCED ON TRAVIS AFB THROUGH TRAINING, EDUCATION, OUTREACH, AND LAW ENFORCEMENT TO ENSURE MILITARY READINESS

OBJECTIVE 5.1 Protect natural resources through training and education of NRM staff and other base personnel, and NRM staffing support.

PROJECT 5.1.1 Ensure specialized training for NRM staff in the ESA, MBTA, Sikes Act, CWA, and other similarly applicable federal and state laws and USAF regulations responsible for maintaining and protecting natural resources.

PROJECT 5.1.2 Train NRM staff in the use of ArcGIS software and GIS data collection.

PROJECT 5.1.3 Train NRM in-house staff and contractors to get appropriate qualifications to conduct federally protected species surveys on Travis AFB.

PROJECT 5.1.4 Provide an updated training to the Base Electric Shop, Electrical Engineers, and Electrical System Lessee at least once every two years in accordance with the Avian Protection Plan.

PROJECT 5.1.5 Provide annually and as needed NCR Awareness training to all Base's key personnel such as Airfield Management, Flight Safety, PRIDE (landscaping contractor), Pest Shop, Golf Course, and on site construction work crew.

OBJECTIVE 5.2 Provide education and awareness to the public on Travis AFB's Natural Resources.

PROJECT 5.2.1 Publish articles in the Travis AFB newspaper, post on the base website (e-DASH) and produce fliers for outreach events to educate the public on how to respond to wildlife encounters or conflicts with pests or potentially dangerous wildlife species (e.g., rattlesnakes, skunks, coyotes).

PROJECT 5.2.2 Provide educational material to base residents, employees, and recreational users about the effects of releasing nonnative plants and animals (e.g., turtles, frogs, salamanders, and fish) on native aquatic and terrestrial ecosystems with support from the PAO.

PROJECT 5.2.3 Increase awareness of base residents, personnel and retirees regarding proper management of native vegetation and the need to avoid the introduction and spread of non-native plant species.

PROJECT 5.2.4 Develop and implement a water conservation education program to

minimize the use of water in land management activities, especially irrigation of landscaped areas.

PROJECT 5.2.5 Conduct Earth Day/Week celebration.

OBJECTIVE 5.3 Standardize conservation law enforcement program effectively in accordance with environmental laws, USFWS requirements and DoD and USAF requirements.

PROJECT 5.3.1 Coordinate with local agencies (CDFW or USFWS) to develop a memorandum of agreement for conservation law enforcement.

OBJECTIVE 5.4 Incorporate natural resources information into all management decisions which will allow effective completion of base missions with implementation and organization of this INRMP.

PROJECT 5.4.1 Produce and publicize the INRMP by providing both hard copy versions and electronic access.

PROJECT 5.4.2 Produce electronic and hard copy document for base procedures regarding nesting birds to comply with the MBTA.

PROJECT 5.4.3 Streamline and standardize environmental review process for mission projects.

PROJECT 5.4.4 Maintain hard copy and electronic records as specified in Section 6.1.

PROJECT 5.4.5 Identify and implement development of interpretive projects to educate base personnel and the public on native ecosystems, wildlife and fish habitat, and wetland laws and requirements for protecting sensitive natural resources. This would include CTS/Wetlands workshop if time allows.

PROJECT 5.4.6 Develop and implement a process to ensure all contracts producing geospatial information include a requirement to provide properly formatted data and are incorporated into Travis GIS data.

GOAL 6 RANGELAND, RECREATIONAL AREAS, AND OTHER MAN-MADE OR NATURAL LANDSCAPES ENHANCED OR EXPANDED TO CONSERVE NATURAL RESOURCES AND SUSTAIN MISSION INTEGRITY

OBJECTIVE 6.1 Minimize or eliminate potential negative impacts of golf course management to achieve the highest standards of environmental excellence.

PROJECT 6.1.1 Incorporate the Cypress Lakes GEM Plan with priority levels and recommendations into the INRMP.

OBJECTIVE 6.2 Support the use of recreation areas and outreach events on Travis AFB that are consistent with natural resource management and wildlife habitat protections while sustaining ecosystem and mission integrity.

PROJECT 6.2.1 Ensure public access to Castle Terrace Conservation Area and monitor use with support from the Public Affairs Office.

PROJECT 6.2.2 Ensure that maintenance methods used at developed campgrounds, picnic areas, sports fields, and hiking areas meet pest management BMPs and local industry landscaping standards in partnership with the Recreation Manager. (M)

PROJECT 6.2.3 PROJECT 6.2.3. Maintain compatible land use practices, fencing,

and educational signs in and around conservation areas in accordance with previous regulatory consultations and permits.

PROJECT 6.2.4 Develop educational materials (pamphlets, presentations) on T&E species and their habitats, and distribute to on and off base personnel at meetings, open houses, and other appropriate venues. Support from Public Affairs Office & Travis AFB School POC). (M)

PROJECT 6.2.5 If time allows Schedule, advertise and conduct guided tours of natural areas for the general base populace, local schools and interested public and local agencies. Trail upgrade has been funded for 2020. (H)

PROJECT 6.2.6 Maintain the Castle Terrace Conservation Area trails and signs to enhance the educational potential of this asset. Requirement: BO 1-1-99-F-84.

PROJECT 6.2.7 Develop natural resource education partnerships with external community groups that have expertise in natural resource conservation, to assist with the education program in natural resource areas, with support of the Public Affairs Office.

PROJECT 6.2.8 Increase awareness and encourage the use and support of the Community Urban Garden by all members of Travis AFB.

PROJECT 6.2.9 Promote educational opportunities and events to learn about conservation and wildlife on Travis AFB (e.g., Christmas Bird Count, DoD Legacy Project).

OBJECTIVE 6.3 Adaptively manage all resources in the rangeland ecosystem to be consistent with the military mission and all environmental regulations.

PROJECT 6.3.1 Implement a grazing monitoring program that evaluates and measures grazing impacts on the vernal pools and associated grasslands within grazed areas. Requirement: BO 1-1-99-F-84.

PROJECT 6.3.2 Establish grazing exclosures and monitor vegetation changes as a result of adding grazing management in the Aero Club Conservation Area. Requirement: 08ESMF00-2018-I-2320-1.

PROJECT 6.3.3 Describe current conditions of plant composition in grazing units and monitor landscape vegetation trends using photographic analysis and provide any GIS data collected to be incorporated into Travis GIS database.

PROJECT 6.3.4 Monitor the CCG sites on Base during the March through May period utilizing photos and other mechanical means to document current population status.

PROJECT 6.3.5 Prioritize invasive plant infestations and apply appropriate management techniques in coordination with the Invasive Species Management Plan.

PROJECT 6.3.6 Develop prescribed burn projects with wildland fire management to control invasive plants and manage native plant communities.

PROJECT 6.3.7 Evaluate monitoring protocol to target updated goals and objectives in the Grazing Management Plan.

PROJECT 6.3.8 Perform post fire analysis for natural resources prescribed fires if needed. A Burned Area Emergency Response would be conducted only for fires that are so serve that the habitat could not be restored without human intervention.

OBJECTIVE 6.4 Protect and enhance the desirable natural and man-made features in the landscape while supporting the military mission.

PROJECT 6.4.1 Develop, update, and maintain base-wide lands and grounds maintenance areas including improved, semi-improved, and unimproved landscapes according to local landscape industry standards (support from PRIDE) (M).

PROJECT 6.4.2 Conduct an urban forest survey on Travis AFB identifying native/nonnative, type of tree, health of tree etc. and develop a database as part of development of an Urban Forest Management Plan.

PROJECT 6.4.3 Evaluate and minimize grounds maintenance activities on special-status species in the cantonment area (with support from PRIDE).

PROJECT 6.4.4 Investigate options and benefits of establishing permanent goat/sheep herd on the installation for continuous fuel reduction in wildfire vulnerable areas; includes establishing a full time shepherd and goat/sheep herds in a self-sustainable effort. Research and conduct a feasibility study (includes analysis of effects) that includes an assessment of potential impacts to special-status species from grazing practices and associated facilities in year 1 and/or 2. Year 2 and/or 3, establish design. Year 3 and/or up to 6 years to implement the project.

PROJECT 6.4.5 Discuss potential future climate project/studies with USFWS. Year 1 and/or 2 feasibility study; Year 2 and/or 3 design/develop plan; Year 3 and/or 4 implement plan

PROJECT 6.4.6 Establish pollinator gardens to support native species and encourage milk weed for Monarch butterflies.

PROJECT 6.4.7 Establish seedbank for Contra Contra goldfield using the USACE Cold Region Research and Engineering laboratory or a facility with existing Contra Costa goldfield seeds; Develop a plan to establish plants in high wetland habitat. Research and conduct a feasibility study year 1 and/or 2. Year 2 and/or 3 establish design. Year 3 and/or up to 6 years to implement the projectCreate wetlands in high wetland habitat on Travis AFB; to allow for wetland growth and ensure no net loss for future projects areas. Research and conduct a feasibility study year 1 and/or 2. Year 2 and/or 3, establish design. Year 3 and/or up to 6 years to implement the project.. Implement state of the art projects to relocate or restrict CTS from airfield operations and maintenance.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

9.1.1 NR Management Staffing

The 60th AMW Commander, Base Civil Engineer and NRM, will implement the INRMP upon review and approval. The INRMP, when approved by the Commander, will serve as the overall guide to management of natural resources at Travis AFB. The INRMP is considered in compliance when it has been approved by the Commander, the USFWS Field Supervisor, and the CDFW Regional Manager.

The Travis AFB NR Management team consist of two full time civilian staff members, three full-time contractors, this constitute the on the ground NR Management team. In addition, there are two part-time AFCEC Installation Support Section staff members, and additional support through cooperative agreements. Management of the ecosystems at Travis AFB presents a challenge because of the diversity of species and abundance of unique habitats on Travis AFB including 122 acres of wetlands/vernal pools which provide breeding habitat for three T&E species. And there are 38 confirmed off-Base CTS breeding ponds and 5 on Base confirmed CTS breeding ponds, all in close proximity to the airfield.

9.1.1.1 Funding

Implementation of this INRMP is subject to the availability of annual funding. The AFCEC is the primary source of funding to support the management of natural resources at Travis AFB. This budget is managed by the NRM. The AFCEC provides funding for natural resource surveys, environmental monitoring projects and compliance-related projects. Supplemental funding may come from project related activities that require compliance with the ESA and/or CWA. Additional funds may come from grants including the DoD Legacy fund that provides financial assistance to conserve natural and cultural resources on Federal Lands.

9.1.1.2 Implementation

Implementation of the INRMP is the responsibility of all base organizations, contractors and tenant organizations. Specific projects to be implemented have been identified by priority and presented in Chapter 8. These priorities are based on the necessity to fulfill a regulatory requirement or to ensure the safety of personnel or resources. High-priority projects are those that should be implemented immediately. Medium-priority projects should be implemented within 3 to 5 years. Low-priority projects should be implemented as resources become available.

To ensure a well-integrated natural resources program, the INRMP and its operational component plans will be coordinated with all affected agencies and units on base, the Environmental Safety and Occupational Health Committee, and other involved parties.

9.2 Monitoring INRMP Implementation

Monitoring of the INRMP Implementation will be done through the annual review as described in Section 9.3. The effectiveness of the INRMP at Travis AFB can be measured by whether it helps prevent net loss in the capability of military lands to support the military mission. Long-term management effectiveness is evaluated through regular inventories of species populations, habitat quality and quantity, and habitat values through recurring surveys. It should be noted: **This INRMP remains in full force until replaced by a revised INRMP.**

9.3 Annual INRMP Review and Update Requirements

The INRMP requires annual review, in accordance with DoDI 4715.03, *Natural Resources Conservation Program,* and AFMAN 32-7003, to ensure the achievement of mission goals, verify the implementation of projects, and establish any necessary new management requirements. Each INRMP annual review will include a review of the efficacy of current management practices with the Travis AFB Sikes Act partners and status revisions to the projects listed in Section 8. Any projects not accomplished will be appropriately placed within the timeline and any necessary further modifications made to scheduling. Additional actions necessary to complete objectives and to achieve associated goals will be identified, and projects included in the revision and programmed for funding as necessary to ensure their completion.

NRM/POC documents the findings of the annual review in an Annual INRMP Review Summary and obtains signatures from the coordinating agencies on review findings. By signing the Annual INRMP Review Summary, the collaborating agency representatives assert concurrence with the findings. If any agency declines to participate in an on-site annual review, the NRM submits the INRMP for review along with the Annual INRMP Review Summary document to the agency via official correspondence and request return correspondence with comments/concurrence.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source, and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows.

High—The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the Air Force is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.

Medium—Project supports a specific INRMP goal and objective, and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within programmed year due to other priorities.

Low—Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

The work plans below cover fiscal years 2022–2026. The Office of Primary Responsibility for the projects below is the Travis AFB Natural Resources Management Office (60 AMW CES/CEIE).

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 1.1.1. Ensure all Bird/Wildlife Aircraft Strike Hazard (BASH) U.S. Department of Agriculture (USDA) activities conducted near the Airfield are in accordance with the U.S. Fish and Wildlife Service (USFWS) Depredation Permit, and in coordination with California Department of Fish and Wildlife (CDFW) and Flight Safety (AFI 91-212).	TAFB	High	Annual
2022–2026	PROJECT 1.1.2. Study and implement management and restoration activities to reduce conflicts between wildlife species of concern and runway flight operations in coordination with the BASH plan (e.g., Tricolored Blackbirds, new grazing pastures with bird attractants near airfield).	EQ	Medium	Annual
2022–2026	PROJECT 1.1.3. Implement the Avian Protection Plan to monitor risks to birds on all power lines, transmitter towers, and associated electrical configurations on Travis AFB (in coordination with Civil Engineering, Pacific Gas & Electric, and City Light & Power and other providers) for needed retrofits and new construction with databases and/or a geographic information system (GIS) to track changes.	TAFB	Low	Annual
2022–2026	PROJECT 1.1.4. Manage for raptors and owls through habitat surveys, educational outreach, and pre-construction training.	EQ	Medium	Annual
2022–2026	PROJECT 1.2.1. Develop prescribed burn wildlife habitat priorities and coordinate with Wildland Fire Management Program.	TAFB	High	Annual
2022–2026	PROJECT 1.2.2. Identify and prioritize projects according to the Invasive Species Management Plan in conjunction with Agricultural Outleasing and Wildland Fire Management Program.	EQ	Medium	Annual
2022–2026	PROJECT 1.2.3. Maintain and enhance pollinator habitat, focusing in conservation areas, with plantings of native wildflowers and other pollinator friendly plant species.	EQ	Low	Annual
2022–2026	PROJECT 1.2.4. Plan and implement habitat improvements for raptors and owls in conservation areas and other suitable areas on the base.	EQ	Medium	Annual
2022-20026	Project 1.2.5 Safeguard the Western Pond Turtle through the development of Best Management Practices currently established on Travis and look to developing new BMP's through the DoD Natural Resources Legacy Program in "Recommended Best Management Practices for the Western Pond Turtle on Department of Defense Installations."	EQ	Low	As needed
2022–2026	PROJECT 1.3.1. Conduct periodic wildlife surveys to update the comprehensive base species list, including GSUs, according to vegetation types and update GIS accordingly with results.	EQ	LOW	Bi-annual
2022–2026	PROJECT 1.3.2. Conduct neotropical migratory bird monitoring as part of the Partners in Flight monitoring program to determine species status in various ecosystems on the base.	EQ	Medium	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 1.3.3. Conduct surveys for owls and raptors.	EQ	Medium	Annual
2022–2026	PROJECT 1.3.4. Conduct fish surveys of Union Creek, North Gate Pond, Valley View Pond and other perennial ponds on Travis AFB.	EQ	Low	Annual
2022–2026	PROJECT 1.3.5. Monitor populations and habitat quality for bats by conducting surveys in the conservation areas, around the airfield, commissary and B-139.	EQ	Medium	Annual
2022–2026	PROJECT 1.3.6. Continually, or at a minimum annually, update and maintain the GIS database with survey results on native fish and wildlife.	EQ	Medium	Annual
2022-22026	PROJECT 1.3.7 Contribute species survey and occurrence data to federal, and other installation approved scientific databases, such as the Avian Knowledge Network (AKN), North American Bat Monitoring Program (NABat), and/or California Natural Diversity Database (CNDDB).	EQ	Low	Annual
2022–2026	PROJECT 2.1.1. Conduct habitat/species surveys and/or habitat suitability modeling (e.g., CTS high-risk maps) to include federal and state protected plant and other wildlife species on the base, all GSUs, and proposed DoD REPI parcels.	EQ	Medium	Annual
2022–2026	PROJECT 2.1.2. Conduct surveys for California tiger salamanders (CTS) (eggs, larvae and adults).	EQ	High	Annual
2022–2026	PROJECT 2.1.3. Investigate the use of environmental DNA (e-DNA) as a survey and monitoring technique to determine presence/absence of CTS.	EQ or Other	Medium	Annual
2022–2026	PROJECT 2.1.4 Investigate the use of surrounding conservation easement lands to relocate CTS	EQ	High	TBD
2022–2026	PROJECT 2.1.5. Conduct surveys for Birds of Conservation Concern (BCC) (USFWS 2008), and federal and state threatened and endangered (T&E) bird species, specifically including Golden Eagles, Swainson's Hawks, Tricolored Blackbirds, Western Burrowing Owls and White-tailed Kites on the base to assess population trends, habitat use and quality, and potential measures to enhance their habitat and reduce species presence in areas where the species would constitute a BASH threat.	EQ	Medium	Every two years
2022–2026	PROJECT 2.1.6. Implement the Burrowing Owl Management Plan and its recommendations including to consider installation of artificial burrows in conservation areas.	EQ	Medium	Annual
2022–2026	PROJECT 2.1.7. Investigate the Potrero Hills Annex as a site for CTS mitigation (contractor cleanup required first).	TAFB	Low	TBA

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 2.1.8. Develop, continually or at minimum annually update and maintain a GIS database map for state and federal listed species, species of concern, their associated habitats and other vegetation maps.	TAFB, EQ, Other	Low	Annual
2022–2026	PROJECT 2.1.9. Obtain and maintain a subscription to California Natural Diversity Database (CNDDB). (Purchase subscription every 2 years).	EQ	Low	Every two years
2022–2026	PROJECT 2.2.1. Maintain technical support from the USFWS Sacramento Fish & Wildlife Office through the U.S. Ai Force-USFWS Interagency Agreement.	EQ	High	Annual
2022–2026	PROJECT 2.2.2. Update and resubmit the PBA, as needed, but at least once every five years, to maintain the most current programmatic biological opinion (PBO) from the USFWS.	EQ	Low	4 years
2022–2026	PROJECT 2.2.3. Review federal and California state species, and the California State Wildlife Action Plan for newly listed or proposed species. Produce Travis AFB management goals for protection and recovery.	EQ	Low	Annual
2022–2026	PROJECT 2.2.4. Implement the PBO to include consultation, reporting, tracking (database) and monitoring.	EQ, SRM, Military Construction (MILCON)	High	Annual
2022–2026	PROJECT 2.2.5. Continue updating and preparing long term CTS Management Plan (per 2017 Emergency Biological Opinion)	EQ	High	Annual
2022–2026	PROJECT 2.3.1. Manage vegetation using mowing, grazing, and/or prescribed burning in the conservation areas, to enhance T&E species habitat by coordinating with the Fire Department and Grounds Maintenance contract.	EQ	High	Annual
2022–2026	PROJECT 2.3.2. Investigate the feasibility of making the airfield Low Risk CTS area by installing one way CTS wall as needed and relocating all caught CTS to an off-Base site.	EQ, SRM or MILCON	High	Annual
2022–2026	PROJECT 2.3.3. Study solitary and social bees in conservation areas to determine presence and abundance of these important pollinators that enable Contra Costa goldfields populations to survive. Requirement: BO 1-1-99-F-84.	EQ	High	Annual
2022–2026	PROJECT 2.3.4. Engage in ESA Section 7(a)(1) consultations with the Service for recovery of threatened and endangered species on Travis AFB.	EQ	Medium	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 2.3.5. Implement the feasibility of on-site mitigation options to offset mission impacts on CTS through (1) barriers and tunnels to allow the species' migration, while directing them away from mission activities (e.g., runway, taxiways, tarmac), (2) studying/implementing new equipment/procedures for installation of storm drains, irrigation boxes, electrical boxes, and other equipment that may trap CTS,	EQ	High	Annual
2022–2026	PROJECT 3.1.1. Continue updating Preliminary Jurisdictional Delineation of wetlands on Travis AFB and update GIS data accordingly and conduct a cumulative analysis to quantify disturbance, degradation, or modification of wetlands and vernal pool species habitat.	EQ	High	Annual
2022–2026	PROJECT 3.1.2. Study the hydrological functioning of wetlands using new technologies (e.g., real-time kinematic [RTK]\ global positioning system (GPS) watershed mapping and water level loggers) in order to inform consultations, permits and post-construction monitoring in support of mission activities.	EQ	High	Annual
2022–2026	PROJECT 3.1.3. Complete consultations with the Regional Water Quality Control Board and the U.S. Army Corps of Engineers on base actions impacting wetlands (e.g., lead contamination of vernal pools at the Skeet Range).	EQ	High	Annual
2022–2026	PROJECT 3.1.5. Control exotic plant species that threaten wetland resources.	EQ	Medium	Annual
2022–2026	PROJECT 3.1.6. Update the wetlands GIS layer, resolve conflicting data between former mapping studies, and include information regarding wetland type, hydrology, weed infestation, and special-status species association.	EQ	Medium	Annual
2022–2026	PROJECT 3.1.7. Conduct a USFWS 2-year protocol survey of vernal pool listed species.	EQ	Med	2-yrs
2022–2026	PROJECT 3.1.8. Generate map identifying existing vernal pools where listed species have been documented with zoom enhanced.	EQ	Med	Annual
2022–2026	PROJECT 3.2.2. Develop a greenscaping and education program to minimize the use of herbicides, pesticides, and fertilizers.	EQ	Low	Annual
2022–2026	PROJECT 3.3.1. Implement the North Gate Pond Management Plan, with support from Pest Management Shop, to include management, monitoring, and control of native and invasive plant and fish species, pond water levels, and pond water quality.	EQ/Base Pest Shop	Medium	Annual
2022–2026	PROJECT 3.3.2. Implement management plan for controlling vegetation in Union Creek to reduce BASH hazards.	EQ	High	Annual
2022–2026	PROJECT 3.3.3. Encourage and support Engineering initiatives to map Travis AFB floodplains.	EQ	Medium	One-time
2022–2026	PROJECT 4.1.1. Control pest species found on the Cypress Lakes Golf Course.	EQ	Low	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 4.1.2. Continue to manage and control pest wildlife species through close coordination between the Pest Management Section and the Natural Resources Manager and implementation of the Travis AFB Pest Management Plan.	EQ	Low	Annual
2022–2026	PROJECT 4.1.3. Continue to kill & control invasive plant species by utilizing the cooperative agreement with Solano Resource Conservation District.	EQ	Med	Annual
2022–2026	PROJECT 4.1.4. Continue to implement the ground squirrel management plan in partnership with the Pest Shop.	EQ	Med	Annual
2022–2026	PROJECT 4.2.1. Monitor and control the spread of invasive species with Travis GIS survey data and work to reduce populations of treasure flower, barbed goatgrass, medusahead, black mustard, perennial pepperweed, bamboo, fennel, purple starthistle, yellow starthistle and Italian thistle to prevent habitat type conversion of wetland and grassland habitat.	EQ	Low	Annual
2022–2026	PROJECT 4.2.2. Evaluate various methods of control including mowing activities, pesticide application, and controlled burns to control non-native, invasive species.	EQ	Low	One-time over three years
2022–2026	PROJECT 4.2.3. Develop a Predator Reduction Plan to reduce CTS predators (e.g., bullfrogs, fish) from the ponds in Castle Terrace Conservation Area to include a monitoring plan that details monitoring activities and thresholds for additional treatment.	EQ	Medium	One-time
2022–2026	PROJECT 4.2.4. Implement a Predator Reduction Plan to reduce CTS predators (e.g., bullfrogs, fish) from the ponds in Castle Terrace Conservation Area. Monitor activities and thresholds for additional treatments.	EQ	Med	Annual
2022–2026	PROJECT 4.2.5. Ensure all invasive species treatment projects include plans to remove residual invasive plant material and restore area with native plants and weed free certified soil.	EQ	Medium	Annual
2022–2026	PROJECT 4.2.6. Develop strategy to set priority areas for habitat restoration in improved, semi-improved and unimproved landscapes and then conduct restoration and reduction of weed infestation according to priority level.	EQ	High	Annual
2022–2026	PROJECT 4.2.7. Conduct restoration in areas already treated with herbicide to allow for faster habitat recovery.	EQ	High	Annual
2022–2026	PROJECT 4.2.8. Evaluate measurable objectives for each area on Travis AFB in the Invasive Species Management Plan in reducing, controlling and eliminating invasive species and revise when necessary to maintain relevancy and incorporate new science.	EQ	Med	Annual
2022–2026	PROJECT 4.3.1. Develop a Travis AFB Biosecurity Plan with the Pest Management Shop that addresses potential biosecurity risks identified in inventory, monitoring and reporting processes for critical control points of inbound and outbound cargo and associated training materials.	EQ	Low	TBA

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 4.3.2. Implement the Travis AFB Biosecurity Plan through recurring training for all personnel involved in the movement of cargo.	EQ	Low	TBA
2022–2026	PROJECT 5.1.1. Ensure specialized training for natural resources management (NRM) staff in Endangered Species Act, Migratory Bird Treaty Act, Sikes Act, the Clean Water Act and other similarly applicable federal and state laws and United States Air Force regulations responsible for maintaining and protecting natural resources.	EQ	High	Annual
2022–2026	PROJECT 5.1.2. Train NRM staff in the use of ArcGIS software and GIS data collection.	EQ	Medium	Annual
2022–2026	PROJECT 5.1.3. Train NRM in-house staff and contractors to get appropriate qualifications to conduct federally listed species surveys on Travis AFB.	EQ	Medium	Annual
2022–2026	PROJECT 5.1.4. Provide an updated training to the Base Electric Shop, Electrical Engineers, and Electrical System Lessee at least once every two years in accordance with the Avian Protection Plan.	EQ	Low	At least once every two years
2022–2026	PROJECT 5.1.5. Provide annually and as needed NCR Awareness training to all Base's key personnel such as Airfield Management, Flight Safety, PRIDE, Pest Shop, Golf Course, and on site construction work crew.	EQ	High	Annual
2022–2026	PROJECT 5.1.6. Provide annually and as needed NCR Awareness training to all Base's key personnel such as Airfield Management, Flight Safety, PRIDE, Pest Shop, Golf Course, and on site construction work crew.	EQ		Annual
2022–2026	PROJECT 5.2.1. Publish articles in the Travis AFB newspaper, post on the base website and produce fliers for outreach events to educate the public on how to respond to wildlife encounters or conflicts with pests or potentially dangerous wildlife species (e.g., rattlesnakes, skunks, coyotes).	EQ	Medium	Annual
2022–2026	PROJECT 5.2.2. Provide educational material to base residents, personnel, retirees, and recreational users about the effects of releasing nonnative plants and animals (e.g., turtles, frogs, salamanders, and fish) on native aquatic and terrestrial ecosystems with support from the Public Affairs Office.	EQ	Medium	Annual
2022–2026	PROJECT 5.2.3. Increase awareness of base residents, personnel, and retirees regarding proper management of native vegetation and the need to avoid the introduction and spread of non-native plant species.	EQ	Medium	Annual
2022–2026	PROJECT 5.2.4. Develop and implement a water conservation education program to minimize the use of water in land management activities, especially irrigation of landscaped areas.	EQ	Medium	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 5.2.5. Conduct Earth Day/Week celebration.	TAFB	Low	When funding is available
2022–2026	PROJECT 5.4.1. Produce and publicize the Integrated natural Resources Management Plan by providing both hard copy versions and electronic access.	EQ	Medium	Annual
2022–2026	PROJECT 5.4.2. Produce electronic and hard copy document for base procedures regarding nesting birds to comply with the Migratory Bird Treaty Act.	EQ	High	Annual
2022–2026	PROJECT 5.4.3. Streamline and standardize environmental review process for mission projects.	EQ	Medium	Annual
2022–2026	PROJECT 5.4.4. Maintain hard copy and electronic records as specified in Section 6.1.	EQ	High	Annual
2022–2026	PROJECT 5.4.5 Identify and implement development of interpretive projects to educate base personnel and the public on native ecosystems, wildlife and fish habitat, and wetland laws and requirements for protecting sensitive natural resources. This would include CTS/Wetlands workshop if time allows.	EQ	High	Annual
2022–2026	PROJECT 5.4.6. Develop and implement a process to ensure all contracts producing geospatial information include a requirement to provide properly formatted data and are incorporated into Travis GIS data.	EQ	Low	Annual
2022–2026	PROJECT 6.1.1. Incorporate the Cypress Lakes Golf Course Environmental Management (GEM) Plan with priority levels and recommendations into the INRMP.	EQ	Low	Annual
2022–2026	PROJECT 6.2.1. Ensure public access to Castle Terrace Conservation Area and monitor use with support from the Public Affairs Office.	EQ	Low	Annual
2022–2026	PROJECT 6.2.2. Ensure that maintenance methods used at developed campgrounds, picnic areas, sports fields, and hiking areas meet best management practices (BMPs) for managing pests and local industry landscaping standards in partnership with the Recreation Manager.	EQ	Low	Annual
2022–2026	PROJECT 6.2.3. Maintain compatible land use practices, fencing, and educational signs in and around conservation areas in accordance with previous regulatory consultations and permits.	EQ	Medium	Annual
2022–2026	PROJECT 6.2.4. Develop educational materials (pamphlets, presentations) on T&E species and their habitats, and distribute to on and off base personnel at meetings, open houses, and other appropriate venues. Support from Public Affairs Office & Travis AFB School point of contact).	EQ	Low	Annual
2022–2026	PROJECT 6.2.5. If time allows schedule, advertise and conduct guided tours of important natural resource management units/areas for the general base populace, local schools and interested public and local agencies. Trail upgrade has been funded for 2020.	EQ	Medium	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 6.2.6. Maintain the Castle Terrace Conservation Area trails and signs to enhance the educational potential of this asset. Requirement: BO 1-1-99-F-84.	EQ	Medium	Annual
2022–2026	PROJECT 6.2.7. Develop natural resource education partnerships with external community groups with expertise in natural resource conservation to assist with the education program in natural resource areas with support of the Public Affairs Office.	EQ	Medium	Annual
2022–2026	PROJECT 6.2.8. Increase awareness and encourage the use and support of the Community Urban Garden by all members of Travis AFB.	EQ	Low	Annual
2022–2026	PROJECT 6.2.9. Promote educational opportunities and events to learn about conservation and wildlife on Travis AFB (e.g., Christmas Bird Count and DoD Legacy Project).	EQ	Low	Annual
2022–2026	PROJECT 6.3.1. Implement a grazing monitoring program that evaluates and measures grazing impacts on the vernal pools and associated grasslands within grazed areas. Requirement: BO 1-1-99-F-84.	EQ	Medium	Annual
2022–2026	PROJECT 6.3.2. Establish grazing exclosures and monitor vegetation changes as a result of adding grazing management in the Aero Club Conservation Area. Requirement: 08ESMF00-2018-I-2320-1.	EQ	Medium	Annual
2022–2026	PROJECT 6.3.3. Describe current conditions of plant composition in grazing units and monitor landscape vegetation trends using photographic analysis and provide any GIS data collected to be incorporated into Travis GIS database.	EQ	Medium	Annual
2022–2026	PROJECT 6.3.4. Monitor the Contra Costa goldfield sites on Base during the March through May period utilizing photos and other mechanical means to document current population status.	EQ	Medium	Annual
2022–2026	PROJECT 6.3.5. Prioritize invasive plant infestations and apply appropriate management techniques in coordination with the Invasive Species Management Plan.	EQ	Low	Annual
2022–2026	PROJECT 6.3.6. Develop prescribed burn projects with wildland fire management to control invasive plants and manage native plant communities.	EQ	Medium	Annual
2022–2026	PROJECT 6.3.7. Evaluate monitoring protocol to target updated goals and objectives in the Grazing Management Plan.	EQ	Low	Annual
2022–2026	PROJECT 6.3.8. Perform post fire analysis for natural resources prescribed fires if needed. A Burned Area Emergency Response would only be done for fires that are so serve that the habitat could not be restored without human intervention.	EQ	Low	Annual
2022–2026	PROJECT 6.4.1. Develop, update, and maintain base-wide lands and grounds maintenance areas including improved, semi-improved, and unimproved landscapes according to local landscape industry standards.	EQ	Low	Annual

Table 10-1. Five-year work plan for Travis Air Force Base (AFB) (2022–2026).

Fiscal Year	Annual Work Plans	Funding Source	Priority Level	Frequency
2022–2026	PROJECT 6.4.2. Conduct an urban forest survey on Travis AFB identifying native/nonnative, type of tree, health of tree etc. and develop a database as part of development of an Urban Forest Management Plan.	EQ	Low	Once every five years to update plan
2022–2026	PROJECT 6.4.3. Evaluate and minimize grounds maintenance activities on special-status species in the cantonment area with support from PRIDE.	EQ	Medium	Annual
2022–2026	PROJECT 6.4.4. Investigate options and benefits of establishing permanent goat/sheep on the installation for continuous fuel reduction in wildfire vulnerable areas; includes establishing a full time shepherd, goat/sheep herds in a self-sustainable effort Research and conduct a feasibility study (includes analysis of effects) that includes an assessment of potential impacts to special-status species from grazing practices and associated facilities in year 1 and/or 2. Year 2 and/or 3, establish design. Year 3 and/or up to 6 years to implement the project.	EQ	High	Annual
2022–2026	PROJECT 6.4.5 Discuss potential future climate project/studies with USFWS. Year 1 and/or 2 feasibility study; Year 2 and/or 3 design/develop plan; Year 3 and/or 4 implement plan	USFWS/ EQ	Low	Annual
2022–2026	PROJECT 6.4.6. Establish pollinator gardens to support native species and encourage milk weed for Monarch butterflies	EQ	Medium	Every other year
2022–2026	PROJECT 6.4.7. Establish seedbank for Contra Contra goldfield using the USACE Cold Region Research and Engineering laboratory or a facility with existing Contra Costa goldfield seeds; Develop a plan to establish plants in high wetland habitat. Research and conduct a feasibility study year 1 and/or 2. Year 2 and/or 3 establish design. Year 3 and/or up to 6 years to implement the project	EQ	High	Annual
2022–2026	PROJECT 6.4.8. Create wetlands in high wetland habitat on Travis AFB; to allow for wetland growth and ensure no net loss for future projects areas. Research and conduct a feasibility study year 1 and/or 2. Year 2 and/or 3, establish design. Year 3 and/or up to 6 years to implement the project..	EQ	High	Annual
2022–2026	PROJECT 6.4.9. Implement state of the art projects to relocate or restrict CTS from airfield operations and maintenance	EQ	High	Annual

11.0 REFERENCES

11.1 Standard References *(Applicable to all USAF installations)*

AFMAN 32-7003, *Environmental Conservation*

Sikes Act

eDASH Natural Resources Program Page

Natural Resources Playbook

DoDI 4715.03, *Natural Resources Conservation Program*

AFI 32-1015, *Integrated Installation Planning*

AFI 32-10112, *Installation Geospatial Information and Services (IGI&S)*

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF installations)

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

- 60 AMW 60th Air Mobility Wing
- AFB Air Force Base
- AFCEC Air Force Civil Engineer Center
- AFI Air Force Instruction
- AFMAN Air Force Manual
- AFPD Air Force Policy Directive
- AICUZ Air Installation Compatible Use Zone
- AMC Air Mobility Command
- AMW Air Mobility Wing
- AUM animal unit month
- BASH Bird/Wildlife Aircraft Strike Hazard
- BCC Birds of Conservation Concern
- BGEPA Bald and Golden Eagle Protection Act
- BMP best management practice
- BO Biological Opinion
- CA California
- CAFS California fairy shrimp
- CCG Contra Costa Goldfield
- CDFW California Department of Fish and Wildlife
- CE Civil Engineering
- CES Civil Engineering Squadron
- CEMML Center for Environmental Management of Military Lands
- CES/ CEIE Civil Engineering Squadron, Natural Resources Management Office
- CESA California Endangered Species Act
- CFP California fully protected
- CFR Code of Federal Regulations
- CFT Cross-Functional Team
- CIRE Center for Integrated Research on the Environment
- CLEO Conservation Law Enforcement Officer
- CNDDB California Natural Diversity Database
- CNPS California Native Plant Society
- CRPR California rare plant rank
- CRW Contingency Response Wing
- CTS California Tiger Salamander
- CWA Clean Water Act
- dB decibels
- DGGB Delta Green Ground Beetle
- DGMC David Grant Medical Center

- DNL day-night average a-weighted sound level
- DoD Department of Defense
- DoDD Department of Defense Directive
- DoDI Department of Defense Instruction
- DVA Department of Veteran Affairs
- eDNA environmental DNA (deoxyribonucleic acid)
- EIAP Environmental Impact Analysis Process
- EMP Environmental Management Plan
- EMS Environmental Management System
- EO Executive Order
- ERP Environmental Restoration Program
- ESOHC Environmental Safety and Occupation Health Committee
- ESA Endangered Species Act
- °F degrees Fahrenheit
- FC candidate species (federal)
- FE endangered species (federal)
- FSS Force Support Squadron
- FSSD Fairfield-Suisun Sewer District
- FT threatened species (federal)
- GDD growing degree days
- GEM Golf Course Environmental Management
- GIO Geographic Information Officer
- GIS Geographic Information System
- GMP Grazing Management Plan
- GPS Global Positioning System
- GSU Geographically Separated Unit
- HOTDAYS average number of days per year that exceed 90 °F
- IAW in accordance with
- ICC invertebrates conservation concern (State of California)
- ICP invertebrates of conservation priority (State of California)
- IDP Installation Development Plan
- INRMP Integrated Natural Resources Management Plan
- IPMP Integrated Pest Management Plan
- MAA Mutual Aid Agreement
- MBTA Migratory Bird Treaty Act
- MSG Mission Support Group
- MVFS midvalley fairy shrimp
- NEPA National Environmental Policy Act
- NOAA Fisheries National Oceanic and Atmospheric Administration, national Marine Fisheries Service
- NR natural resources
- NRCS Natural Resources Conservation Service
- NRHP National Register of Historic Places
- NRM Natural Resources Manager
- OSD Office of the Secretary of Defense
- PAO Public Affairs Office
- PBA Programmatic Biological Assessment

- PBO Programmatic Biological Opinion
- PIF Partners in Flight
- P.L. Public Law
- PMP Pest Management Plan
- POC point of contact
- POTW publicly owned treatment works
- PRECIP annual average precipitation
- RCP Representative Concentration Pathway
- REPI Readiness and Environmental Protection Integration
- ROW right-of-way
- RTK real-time kinematic (GPS loggers for mapping watersheds and monitoring water levels)
- RV recreational vehicle
- SE endangered species (State of California)
- SOC species of concern (federal)
- SSC species of special concern (State of California)
- ST threatened species (State of California)
- T&E Threatened and Endangered
- TACAMO Tactical Airborne Communication and Maritime Operation
- TAVE annual average temperature
- TMAX annual average maximum temperature
- TMIN annual average minimum temperature
- UR under review (for possible ESA listing)
- U.S. United States
- USACE United States Army Corps of Engineers
- USAF United States Air Force
- U.S.C. United States Code
- USDA United States Department of Agriculture
- USFWS United States Fish and Wildlife Service
- VPFS vernal pool fairy shrimp
- VPTS vernal pool tadpole shrimp
- WETDAYS average number of days (per year) when precipitation exceeds 2 inches in a day
- WEZ wildlife exclusion zone
- WFMP Wildland Fire Management Plan
- WL watch list (State of California)
- WNS white-nose Syndrome
- WWTP Waste Water Treatment Plant

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all USAF installations)

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

Special-status species. Special-status species collectively denotes state and federal listed species and other species of concern. Species of concern include (1) species protected by federal laws, including the Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA); (2) avian species considered to be birds of conservation concern (BCC) by USFWS and/or a DoD mission-sensitive bird priority species; (3) species defined as species of special concern by the State of California; (4) plant species listed as rare pursuant to the Native Plant Protection Act; (5) plant species with a California Rare Plant Rank; and (6) California Fully Protected species.

14.0 APPENDICES

14.1 Standard Appendices

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, *Protection and Enhancement of Environmental Quality*	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, *Protection and Enhancement of the Cultural Environment*	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, *Exotic Organisms*	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, *Floodplain Management*	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, *Off-Road vehicles on Public Lands*	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, *Protection of Wetlands*	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

EO 12088, *Federal Compliance with Pollution Control Standards*	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, *Environmental Justice*	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, *Invasive Species*	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*	The USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401– 7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund) (26 U.S.C. § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 U.S.C. § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 U.S.C. § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act (16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.
Migratory Bird Treaty Act 16 U.S.C. § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.	Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality created Regulations for Implementing the National Environmental Policy Act [40 Code of Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 U.S.C. § 470 et seq.	Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.
Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, 4 August 1983 (Revised 29 May 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 *DoD Pest Management Program* dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, *Environmental Security*	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Office of the Secretary of Defense (OSD) Policy Memorandum, 17 May 2005— *Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands*	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.
OSD Policy Memorandum, 1 November 2004— *Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews*	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum, 10 October 2002— *Implementation of Sikes Act Improvement Act: Updated Guidance*	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process (EIAP)	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-1015, *Integrated Installation Planning*	This publication establishes a comprehensive and integrated planning framework for development/redevelopment of Air Force installations..
AFMAN 32-7003, *Environmental Conservation*	Implements AFPD 32-70, *Environmental Quality;* DoDI 4715.03, *Natural Resources Conservation Program*; and DoDI 7310.5, *Accounting for Sale of Forest Products*. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-7065, *Cultural Resources Management*	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

AFI 32-10112 *Installation Geospatial Information and Services (IGI&S)*	This instruction implements Department of Defense Instruction (DoDI) 8130.01, Installation Geospatial Information and Services (IGI&S) by identifying the requirements to implement and maintain an Air Force Installation Geospatial Information and Services program and Air Force Policy Directive (AFPD) 32-10 Installations and Facilities.
AFPD 32-70, *Environmental Quality*	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on 29 January 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.
Installation-Specific Policies (including State and/or Local Laws and Regulations)	
Travis AFB Instruction 91-212	Travis AFB Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program.
Travis AFB Instruction 31-102	Control of Feral Animals on Travis AFB
California Endangered Species Act (CESA)	This act was established in 1970 and is overseen by the CDFW. The act states that all native species of fish, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected and preserved. See the following website for a comparison with the federal ESA: https://www.wildlife.ca.gov/Conservation/CESA/FESA
California Department of Fish and Game Codes Considered by Travis AFB	
Native Plant Protection Act (Fish and Game Code 1900 et seq.)	
Fully Protected Species (Fish and Game Code §§ 3511, 4700, 5050, & 5515)	
State Protections for Nesting Birds (Fish and Game Code §§ 3503, 3503.5, & 3513)	

14.2 Installation Appendices

14.2.1 Appendix B. List of Tables and Figures

14.2.2 Appendix C. List of Flora and Fauna Species Known to Occur and Special-status Species with Potential to Occur on Travis Air Force Base

14.2.3 Appendix D. List of Recommended Native Plants to be used in Landscaping

14.2.4 Appendix E. Burrowing Owl Management Plan

14.2.5 Appendix F. Wetland Inventory Maps and Determinations

14.2.6 Appendix G. Natural Resources Surveys

14.2.7 Appendix H. Union Creek Vegetation Easement

14.2.8 Appendix I. North Gate Pond Management Plan

14.2.9 Appendix J. California White-Nose Syndrome Action Plan

14.2.10 Appendix K. Castle Terrace Recreational and Management Plan

14.2.11 Appendix L. Biological Opinions

- Reinitiation of Formal Consultation on the Communication Line Installation Project at Travis Air Force Base, Solano County, California
- Formal Consultation on the Gas Pipeline System Upgrade Project by Pacific Gas and Electric Company at Travis Air Force Base, Solano County, California
- Formal Consultation on the 2013 Performance-Based Contract for Soil and Groundwater Cleanup Activities at Travis Air Force Base, Solano County, California
- Consultation Under Section 7(a)(2) of the Endangered Species Act on the Travis Air Force Base Communications Line Installation Project
- Consultation Under Section 7(a)(2) of the Endangered Species Act on the Travis Air Force Base Water Main Leak Repair Project
- Consultation Under Section 7(a)(2) of the Endangered Species Act on the Travis Air Force Base Removal of Airfield Obstruction Project
- Biological Opinion for the Proposed Travis Air Force Base Taxiway M Bypass Road Project, Solano County, California
- Biological Opinion for the Proposed Travis Air Force Base Georgetown Perimeter Fence Project, Solano County, California
- Biological Opinion for the Proposed Travis Air Force Base 03R/2IL Runway Repair Project, Solano County, California
- Biological Opinion for the Proposed Travis Air Force Base JP-8 Pipeline and Terminal Project, Solano County, California
- Biological Opinion for the Proposed Travis Air Force Base South Gate Improvement Project, Solano County, California
- Reinitiation of the Biological Opinion for the Proposed Travis Air Force Base South Gate Improvement Project (Service File Number 81420-2008-F-0596-1), Solano County, California
- Biological Opinion for the Proposed Travis Air Force Base C-17 Assault Landing Strip Project, Solano County, California on the threatened California tiger salamander

- Reinitiation of the Biological Opinion for the Proposed Travis Air Force Base C-17 Assault Landing Strip Project (Service File Number 81420-2008-F-1142-1), Solano County, California
- Formal Endangered Species Consultation on the Proposed Burke Property Housing Project, Travis Air Force Base, Solano County, California
- Programmatic Formal and Informal Consultation on the Proposed Effects of Activities Conducted at Travis Air Force Base on Six Federally Threatened and Endangered Species, Solano County, California

14.2.12 Appendix M. Aero Club Mitigation Plan

14.2.13 Appendix N. Wetland Permits

14.2.14 Appendix O. Agricultural Outgrant Land Use Regulations

14.2.15 Appendix P. Contacts for Agencies

15.0 ASSOCIATED PLANS

15.1 Tab 1—Wildland Fire Management Plan

15.2 Tab 2—Bird/Wildlife Aircraft Strike Hazard Plan

15.3 Tab 3—Golf Environmental Management Plan

15.4 Tab 4—Integrated Cultural Resources Management Plan

15.5 Tab 5—Integrated Pest Management Plan

15.6 Tab 6—Grazing Management Plan