Department of the Air Force

Integrated Natural Resources Management Plan

Davis Monthan

Installation Supplement

Integrated Natural Resource Management Plan

Davis-Monthan Air Force Base
Tucson, Arizona

February 2019

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 has been developed in cooperation with applicable stakeholders, which includes Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs); USAF Playbooks; federal, state, and local requirements; Biological Opinions; and permits are referenced.

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language that address 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 maintained and updated by the approved plan owner.

NOTE: The terms "Natural Resources Manager," "NRM," and "NRM/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.

DOCUMENT CONTROL

Standardized INRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate (CZ) Business Rule (BR) 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 (SME).

This version of the template is current as of 06/26/2020 and supersedes the 2018 version.

NOTE: Installations are not required to update their INRMPs every time this template is updated. When it is time for installations to update their INRMPs, they should adopt the most recent version of this template available in the Plan Tool.

Installation INRMP

Record of Review - The INRMP is updated 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 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 (NOAA) Fisheries when applicable (AFMAN 32-7003).

Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), and/or a 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 Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of 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. By signing the 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

Installation Supplement

W 2020 INRMP Signature Page All.pdf

[SIGNATURE]

DEPARTMENT OF THE AIR FORCE
355TH CIVIL ENGINEER SQUADRON (ACC)
DAVIS-MONTHAN AIR FORCE BASE. ARIZONA

27 Oct 2021

MEMORANDUM FOR AFCEC/CZ
USFWS
AZGFD

FROM: 355 CES/CEIE

SUBJECT: Annual INRMP Review Meeting Minutes

Air Force Manual 32-7003. Environmental Conservation, paragraph 3.8. requires the installation natural resources manager to conduct an annual review of the INRMP in coordination with internal stakeholders and local representatives of the U.S. Fish and Wildlife Service (USFWS), state fish and wildlife agency, and NOAA Fisheries where applicable.

The results of the review will be documented in an Annual INRMP Review' Summary. The AFMAN also identifies the areas that must be included in the summary; they are listed in the following paragraphs. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings.

Due to the COVID-19 outbreak, an in-person meeting was not conducted. A teleconference was held 25 Oct 2021 with the following personnel present:

Michael Ingraldi - Arizona Game and Fish Department
Nora Clark - Arizona Game and Fish Department
John Windes - Arizona Game and Fish Department
Nate Cost - Chief, Installation Management Flight, Davis-Monthan AFB
Christopher Brewster - Chief, Environment Flight Davis-Monthan AFB
Kevin Wakefield - Natural Resources Manager Davis-Monthan AFB
Katherine Zander - Natural Resources Program Manager, Nellis 1SS

Due to technical difficulties a second call was held with US Fish and Wildlife Service on 27 Oct 2021 with the following personnel present:

Cal Crawford US Fish and Wildlife Senice - Arizona Ecological Services Office
Kevin Wakefield - Natural Resources Manager Davis-Monthan AFB

- Summary of area covered during the teleconference:
    - o Game and Fish Projects Completed FY2021
        - ■ Final report - Nichol's Turk's Head Cactus report - Titian Missile Site 12 - 16 Feb 2021

o Game and Fish Future Projects

- Task 1 - Rare Plants - Atterbury Wash Survey
- Task 2 - Vegetation Mgt - EOD Range
- Task 3 - Species at risk Burrowing owl project, gcotags, banding, sighting. Bend ire's Thrasher (BETH) Survey, BE DMAFB
- Task 4 - Migratory Birds - Continue to conduct surveys, and entering and summarizing raptor survey and bird point count data.
- Task 5 - Invasive Species Mgt - Monitor tree plots, plant several new plots, collect tree growth data, began to write report

o INRMP Goal Review and Status

- Goals listed in the INRMP were reviewed and status of each was reviewed.

o USFWS

- Consultations - Informal - Playas MOA EA New Mexico Ecological Services Field Office, EA completed 18 May 2021.

- Will continue to insure all future projects include considerations of the following species, as identified in past consultations:
  - Pima Pineapple Cactus
  - Lesser Long-nosed Bat
  - Ocelot
  - Jaguar

o INRMP Updates

- The following determinations were made during the last INRMP Review.
  - No updates to the plan are required at this time

o Current/Fulure NEP A Projects

- Regional Airspace E1S - Stabilized DOPAA received 8 Oct 2021
- Realignment EA - Kickoff meeting scheduled 25 Oct 2021
- FY22 - Base Planning/Mission Enabling Installation Development Plan/Comprchcnsivc Planning Platform EA (3rd QTR)
- FY23 - Personnel Recovery Program EA Update (2nd QTR)

o Open Discussion - The development of a BE for DMAFB was discussed, Cat Crawford USFWS, slated that the BE should be for a specific action. It could be associated with the Installation Development Plan (IDP) EA projected for FY23.

• Annual Work Plan: FY 22. FY 23, FY24, FY25

FY 22

- FBNV220850, Mgt. Species. Migratory Birds-- $50,000.
- FBNV22O845, Mgt, Species, Species at Risk/Candidate Species — $50,000.
- FBNV220890, Mgt, Habitat, Invasive Species. Multiple- $100,000. (Increase requested)

FY 23

- FBNV230850. Mgt. Species, Migratory Birds- $50,000.
- FBNV23O845. Mgt, Species, Species at Risk/Candidate Species - $50,000.
- FBNV230890, Mgt, Habitat. Invasive Species, Multiple- $60,000

FY 24

- FBNV240850, Mgt, Species. Migratory Birds— $50,000.
- FBNV240845, Mgt, Species. Species at Risk/Candidate Species — $50,000.
- FBNV240890. Mgt. Habitat, Invasive Species. Multiple— $60,000

FY 25

- FBNV240850, Mgt, Species. Migratory Birds— $50,000.
- FBNV240845, Mgt, Species. Species al Risk/Candidate Species — $50,000.
- FBNV240890, Mgt, Habitat. Invasive Species. Multiple- $60,000

- Qualified natural resource management personnel and resource statement. Current Natural Resource Manager. Kevin Wakefield, has a Bachelor of Science Degree in Environmental Science and graduated from Colorado State University with a master's degree in Military Rangelands Management. May 2016. He also completed the Naval Civil Engineer Corps Officers School's (NCECOS) Natural Resource Compliance Course on 29 June 2012; copy of certificate is attached as Attachment #1.

- Resource to facilitate the Natural Resource Management Program are available and projected based on the goals identified in the INRMP.

- This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a et ***seq.)*** as amended.

KEVIN L. WAKEFIELD, GS-12, DAFC
Natural Resource Program Manager

Attachment:
NCECOS Certification Kevin Wakefield 29 June 2012

Naval Civil Engineer Corps Officers School
Port Hueneme, California

Certificate of Graduation

This certifies that

KEVIN WAKEFIELD

Successfully Completed

NATURAL RESOURCES COMPLIANCE
COURSE #12020
CIN: A-4A-0087

(Recommended/Academic /Professional Development Hours: 32)

26-29 JUNE 2012
DATE

NATHAN R. PAUKOVITS
LIEUTENANT COMMANDER. CEC. USN
EXECUTIVE OFFICER

COE

EXECUTIVE SUMMARY
Installation Supplement

The purpose of the Integrated Natural Resources Management Plan (INRMP) for the Davis-Monthan Air Force Base (DMAFB) is to provide direction and guidelines for natural resources management on the installation through an interdisciplinary approach to ecosystem management. The DMAFB INRMP facilitates natural resource management with an emphasis on maintaining and supporting (1) the mission requirements at DMAFB, (2) the environmental compliance process and (3) the maintenance and improvement of ecosystem health. The intent of the INRMP is to provide a tool for managers and involved stakeholders to reference when executing pertinent management actions, while concurrently providing information regarding the interrelated variables involved in the administration of the installation's natural resources including flora and fauna, associated habitat, water, and other resources within the approximately 10,817.7 acres DMAFB encompasses.

The INRMP is developed to be integrated with the DMAFB mission and presents specific strategies and goals for the management of the natural resources on the installation. The current and future development of natural resources management must be coordinated with the development of the installation's military strategies and goals, and must be able to adjust to mission changes. It emphasizes the need to document and monitor natural resources and to adapt management strategies in response to new information and regulatory changes. Incorporation of adaptive management strategies may be made during the review and revision of the INRMP every five years.

The Sikes Act requires the Department of Defense (DoD) to prepare INRMPs for relevant installations in cooperation with the USFWS and the State's wildlife management agency. The Sikes Act states that INRMPs shall reflect the mutual agreement on the management of natural resources, by installation commanders, the USFWS, and the State's wildlife agency. INRMPs must be reviewed by the parties regularly, and no less than every 5 years. Furthermore, Section 101(a)(2) of the Sikes Act states that the INRMP shall reflect the "mutual agreement" of the FWS and State Wildlife Agency "concerning conservation, protection, and management of fish and wildlife resources."

The INRMP was developed in direct contact with the Natural/Cultural Resources Management (355th Civil Engineer Squadron (CES)/ Civil, Environmental and Infrastructure Engineering (CEIE)) office as well as through cooperation with various program offices and elements at DMAFB. In particular, interviews were held with the point of contact (POC) in each of the following elements/programs: Grounds Maintenance (355th CES/CEIE Operations Flight), Outdoor Recreation (355th Force Support Squadron), Integrated Pest Management (355 CES/CEIE Operations Flight), and Water Management (355 CES/CEIE Environmental Management) staff. In each case a questionnaire was developed based on the instruction manual for developing INRMPs, AFM 32-7003 (USAF 2020), and tailored to issues specific to the Sonoran Desert and DMAFB. The Florence Military Reservation and Luke Air Force Base, 2 other Sonoran Desert military installations in the region, were contacted to gain perspectives from their experiences with developing their respective INRMPs and management of natural resources.

Ecosystem management recognizes the need to manage for all ecosystem components (i.e., physical and biological inputs and outputs) which includes sustainable human activities as well as providing a means for DMAFB to support its mission and continue providing military readiness. Ecosystem management strives to maintain, rehabilitate, or improve natural local ecosystems and should provide for a diversity of goods and services to current and future generations. The DMAFB INRMP serves as a guiding document to accomplish DMAFB's mission while prioritizing natural resources.

Primary natural resources management goals include: 1) Managing and monitoring current populations of burrowing owls throughout DMAFB as this is the most robust population in the region and is therefore essential to the conservation of the species in this area, 2) Managing and monitoring current populations and habitats of other raptors on DMAFB including Swainson's hawks, Cooper's hawks, and great horned owls, 3) Identifying and eradicating invasive species that pose a fire hazard and a threat to native vegetation communities, (e.g., buffelgrass (Pennisetum ciliare) and fountain grass (Pennisetum sp.)), 4) Conducting inventory surveys for all sensitive wildlife and plant species of conservation concern potentially occurring on DMAFB, 5) Protecting all, or at a minimum portions, of the native Sonoran desertscrub habitat extant on Base (especially along Atterbury Wash including an adequate buffer zone) from disturbance or encroachment by mission-related activities unless required by the DMAFB mission. With much of DMAFB surrounded by urban population encroachment, the eastern portion of the Base, especially Atterbury Wash, may serve as an important corridor for many wildlife species to move between suitable habitats (e.g., between Santa Rita and Rincon mountains), 6) Initiating strict xeriscape landscaping techniques using exclusively native species and investigating and installing passive rainwater harvesting structures whenever feasible, and 7) Ensuring the DMAFB mission is not impacted by management of natural resources including maintenance of native vegetation in the vicinity (but outside of the managed control zone) of taxiways and the end of runways to reduce bird aircraft strike hazards (BASH). Section 101 (b)(1)(l) of the Sikes Act states that each INRMP shall, to the extent appropriate and applicable, and consistent with the use of the installation to ensure the preparedness of the Armed Forces, provide for "no net loss in the capability of military installation lands to support the military mission of the installation." In general, implementation of current INRMP objectives is in accordance with recent natural resources management practices. No significant negative environmental impacts are expected during implementation of this INRMP.

Objectives of the plan include: 1) Identify the natural resources on DMAFB determined to be sensitive to impacts from military training and/or public use, 2) Identify and resolve gaps in the current inventorying/monitoring efforts within the Sonoran Desert Ecoregion, 3) Prioritize the need to inventory and/or monitor these natural resources, and 4) Standardize the protocols to inventory and/or monitor the natural resources to further the data gathering efforts by all agencies in the area. To keep the implementation process manageable and to tie it to regular DoD funding cycles this INRMP identifies those projects to be implemented within the first five years of the plan. The INRMP will be reviewed annually to verify that progress is on track and to adjust it when necessary. Every five years, the INRMP will be reviewed in greater depth and revised as appropriate.

1 OVERVIEW AND SCOPE

This 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 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 for 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. The Sikes Act is the legal driver for the INRMP.

7.7 *Purpose and Scope*
Installation Supplement

The purpose of INRMP for the Davis-Monthan Air Force Base (DMAFB) is to provide direction and guidelines for natural resources management on the installation, through an interdisciplinary approach to ecosystem management. The DMAFB INRMP facilitates natural resource management with an emphasis on maintaining and supporting (1) the mission requirements at DMAFB, (2) the environmental compliance process, and (3) the maintenance and improvement of ecosystem health. The intent of the INRMP is to provide a tool for managers and stakeholders to reference when executing pertinent management actions, while concurrently providing information regarding the interrelated variables involved in the administration of the installation's natural resources including flora and fauna, associated habitat, water, and other resources within the 10,530 acres DMAFB encompasses.

7.2 *Management Philosophy*
Installation Supplement

1.2.1 The INRMP and the Military Mission

The INRMP is developed to be integrated with the DMAFB mission and presents specific strategies and goals for the management of the natural resources on the installation. The current and future development of natural resources management must be coordinated with the development of the installation's military strategies and goals, and must be able to adjust to mission changes. It emphasizes the need to document and monitor natural resources and to adapt management strategies in response to new information and regulatory changes. Incorporation of adaptive management strategies may be made during the review and revision of the INRMP every five years.

1.2.2 Interdisciplinary Development of the INRMP

The INRMP was developed in direct contact with the Natural/Cultural Resources Management (355 CES/CEIE) office as well as through cooperation with various program offices and elements at DMAFB. In particular, interviews were held with the point of contact (POC) in each of the following elements/programs: Grounds Maintenance (355 CES/CEIE Operations Flight), Outdoor Recreation (355th Force Support Squadron), Integrated Pest Management (355 CES/CEIE Operations Flight), and Water Management (355 CES/CEIE Environmental Management) staff. In each case a questionnaire was developed based on the instruction manual for developing INRMPs, AFM 32-7003 (USAF 2020) and Air Force Civil Engineering Command (AFCEC) template and tailored to issues specific to the Sonoran Desert and DMAFB. Attempts were made to establish contacts with other Sonoran Desert military installations throughout Arizona to gain perspectives from their experiences with developing their respective INRMPs and management of natural resources. Contact was made with Florence Military Reservation and Luke Air Force Base.

1.2.3 Air Force Principles for Ecosystem Management

Ecosystem management recognizes the need to manage for all ecosystem components (i.e., physical and biological inputs and outputs) which includes sustainable human activities as well as providing a means for DMAFB to support its mission and continue providing military readiness. Ecosystem management strives to maintain, rehabilitate, or improve natural local ecosystems and should provide for a diversity of goods and services to current and future generations. The DMAFB INRMP serves as a guiding document to accomplish ecosystem management and thus biodiversity protection and support DMAFB's mission.

Air Force Principles for Ecosystem Management:

1. Maintain or restore native ecosystem types across their natural range where practical and consistent with the military mission;
2. Maintain or restore ecological processes such as fire and other disturbance regimes where practical and consistent with the military mission;
3. Maintain or restore the hydrological processes in streams, floodplains, and wetlands when feasible;
4. Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components as well as other federal, state and local agencies, and adjoining property owners;

Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the AF mission.

Maintaining biodiversity through best practices of ecosystem management is closely tied to the philosophy of multiple-use management. Performing the military missions described in Chapter 3.3 while simultaneously managing DMAFB's natural resources can be accomplished most effectively by following this principle. Multiple-use management provides for the stewardship of natural resources in a manner which takes into account the nation's long-term needs for renewable and non-renewable resources. The multiple-use approach as it applies to the AF integrates management of all natural resources to achieve optimum use and enjoyment while maintaining environmental quality, ecological relationships, aesthetic values, and the military mission in proper balance.

During the development of this INRMP, data gaps pertaining to natural resources at DMAFB were identified and incorporated into the management goals and objectives discussed in Chapter 8. To gauge ecosystem health, it is important to establish procedures for monitoring the condition of natural resources at DMAFB. These include:

1. Evaluating the success of management activities;
2. Drawing attention to areas of immediate concern;
3. Identifying unforeseen problems in implementing the INRMP and applying adaptive management when applicable;
4. Assessing changing conditions on and off the installation that could affect DMAFB's natural resources.

Management of natural resources is integrated into the installation's mission by the use of AF Forms 332 (Base Civil Engineer Work Request), 103 (Base Civil Engineering Work Clearance Request), 813 (Request for Environmental Impact Analysis), and DD Form 1391 (Military Construction Project Data). A user submits AF Form 332 or AF Form 103 for any maintenance or construction activity to Civil Engineer Customer Service Call. The form will be reviewed by various offices, including the Environmental Management (CEIE) Element before it is routed to the Environmental Assessment/Environmental Impact Analysis Process (EA/EIAP) office within the Asset Optimization Element. If the EA/EIAP office determines an environmental assessment is required, the user will be instructed to submit AF Form 813. The EA/EIAP office will determine if a categorical exclusion (CATEX), EA, environmental impact statement (EIS), or other analysis is required. The proposed action cannot proceed until AF Form 332 or the AF Form 103 is reviewed and approved. The DD Form 1391 will be coordinated with the Natural Resources Project Administrator or Designee to determine if there is a natural resources concern.

1.2.4 The INRMP and DMAFB General Planning Process

By integrating natural resources with the base general planning process, improved coordination and a reduction in potential conflicts will result. It will lead to savings in time and effort and directly benefit natural resources and the military mission. To facilitate integration of the INRMP with the base general planning process, the INRMP follows the land classification system used at DMAFB. For planning purposes, the base is divided into 12 land use affinities (LUAs) (Figure 1). Each of the LUAs has a unique set of existing land use and facility characteristics. DMAFB has a matrix to identify and prioritize new projects within each LUA. The General Plan for DMAFB identifies current uses in each LUA, reviews planned improvements, recommends additional improvements, and provides the Demolition List and Facility Development Plan for the installation (DMAFB 1994, 1995, 1996). A summary of current land uses is presented below.

Administrative Area includes various headquarters facilities, base support and administrative staff, security operations, traffic check houses, telecom, audio/visual, data processing and television centers.

Airfield includes aircraft runways, overruns, taxiways, parking/maintenance aprons, and undeveloped lands surrounding the specified pavements.

Aircraft Operations and Maintenance includes aircraft hangars, aerospace ground equipment (AGE) maintenance shops, aircraft maintenance shops, aircrew training facilities, air passenger and freight terminals, avionics maintenance facilities, and flying squadron and base operations.

Industrial Area includes base supply facility, civil engineer facilities/fire stations, vehicle operations/maintenance facilities, aircraft storage areas Aerospace Maintenance and Regeneration Group (AMARG), flight simulator, field training detachment, field training areas, small arms training/ranges, and Defense Logistics Age (DLA).

Community Commercial Area includes the fast food restaurants on Base in addition to the Base Exchange, Commissary, Bank of America branch, and Vantage Credit Union.

Community Service Area includes educational dependent schools, post office, library, child development center (CDC), chapels/religious education center, and education center.

Medical/Dental Area includes ambulatory health care center (AHCC), dental clinic, veterinarian facility, bio-environmental engineering, medical storage, and satellite pharmacy.

Housing Area includes unaccompanied housing (airmen dormitories) and accompanied housing that only includes the general and squadron officers' quarters. Military family housing is now privatized and management decisions are no longer under the control of DMAFB although they can act as consultants in the decision making process (e.g., choosing native vegetation for landscaping purposes, guidelines on how to relocate nuisance animals, including native species).

Temporary Lodging Area includes temporary lodging facilities (TLF), visiting officers' quarters, and visiting airmen quarters.

Outdoor Recreation includes outdoor courts, athletic fields, swimming pool/bath house, riding stables, services equipment checkout/storage, outdoor ranges, parks, picnic areas/armadas, golf course area and paint ball range.

Open Space Area includes conservation areas, buffer space, safety clearance zones, security areas, and utility easements.

Water Area includes surface water gathered in two collection ponds from storm drainage. They do not retain sufficient water for fish or wildlife preservation. This area will be expanded to include the ephemeral stock pond situated along Atterbury Wash in the unimproved area of the base.

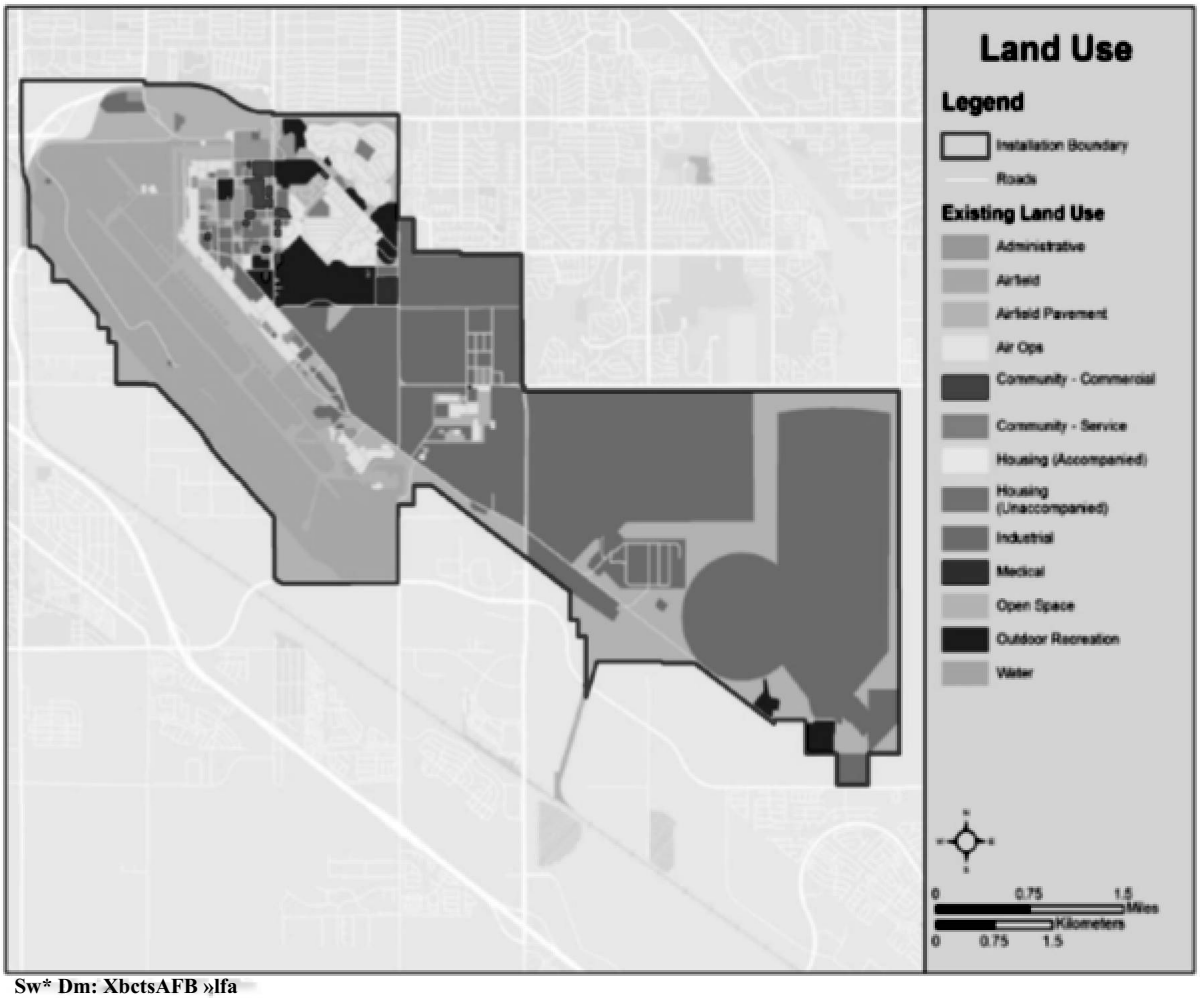

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Figure 1. Existing Land Use at Davis-Monthan Air Force Base

1.2.5 General Management and Conservation Approach

Conservation management is a dynamic process. A consistent conservation management approach includes those systematic procedures that should be used by each DoD installation or activity, as follows (adapted from Environmental Conservation Program, DoD Instruction 4715.3):

1. Assess military mission;
2. Prepare detailed inventory of resources;
3. Analyze and assess risk to the resources;
4. Prepare management plans;
5. Implement management plans;
6. Monitor and assess results;
7. Conduct needs assessment survey;
8. Reassess inventories;
9. Reanalyze and reassess risk to resources;
10. Adaptive management (i.e. adjust program, as necessary based on recent findings).

1.2.6 Environmental Documentation

The Integrated Natural Resource Management Plan Environmental Assessment (EA) was prepared in 1998 to evaluate the potential environmental effects associated with implementation of the management guidelines set forth in the INRMP (Appendix A, EA). The EA was prepared in accordance with the NEPA and Council on Environmental Quality (CEQ) regulations. This is not a programmatic EA. Component plans, as well as AF actions involving specific sites, training activities, or mission changes, may require additional environmental analysis and documentation, as required by NEPA.

The 1998 EA had a finding of "No Significant Impact" and concluded that the implementation of the integrated approach to resource management is expected to have an overall beneficial effect on the management of natural resources at DMAFB by:

1) Reviewing, updating, and developing specific resource management plans resulting in better overall management of DMAFB lands;

2) Identifying base natural resource management units (ecosystems) and their differing management needs;

3) Increasing coordination among resource management programs; and

4) Anticipating and reducing the potential for conflicts among the various programs.

No adverse impacts are anticipated from the implementation of the INRMP

1.2.7 Conditions for Implementation and Revision

Implementation

The DMAFB INRMP is a dynamic document integrating various aspects of the management of natural resources with the installation's overall mission. If successful implementation is to occur, the goals and objectives of the DMAFB INRMP must be considered early in the decision-making process for mission changes, community planning, and resources management activities. Responsibility for the management of different environmental issues at DMAFB is divided among several CE flights, elements, and offices. These are summarized below:

A. Installation Management Flight

1) Asset Optimization Element

a) Community Planning

b) Environmental Assessment (EA)/ Environmental Impact Analysis Process (EIAP)

c) NEPA

d) Real Property

2) Environmental Management Element

a) Wastewater Management

b) Hazardous Waste Management/Turn-in

c) Stormwater Management

d) Aboveground/Underground Storage Tanks

e) Air Quality, Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Management

f) Environmental Restoration

g) RCRA Corrective Actions

h) Natural/Cultural Resources Management

i) Pollution Prevention

j) Solid Waste

k) Emergency Planning andCommunity Right-to-Know Act (EPCRA)

3) Capital Asset Management Element

a) Housing Assistance Management

B. Operations Flight

1) Pest Management Element

1.2.8 Revisions

The DMAFB INRMP will be reviewed annually by the Natural Resources Program Administrator or Designee. Component plans will be revised every two years. The INRMP as a whole will be revised at least once every five years. This includes establishing and maintaining regular communications with the appropri2.5.2 ate federal (USFWS), state (AZGFD), and installation organizations to address issues concerning implementation of the INRMP. At a minimum, this will include an annual review of the INRMP by the installation in coordination with the USFWS and AZGFD. The annual review will be certified by the installation or wing commander, or designee.

The annual review will verify that:

1. All "must fund" projects and activities have been budgeted for and implementation is on schedule;
2. All required trained natural resources positions are filled or are in the process of being filled;
3. Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate revising the INRMP if the goals and objectives remain unchanged;
4. All required coordination with USFWS and AZGFD wildlife agencies have occurred;
5. Any significant changes to the installation's mission requirements or its natural resources have been identified.

To be finalized, this INRMP must be approved by the 355th Wing Commander, the installation's Natural/Cultural Resources Manager, the DMAFB Environmental, Safety, Occupational Health Leadership Committee (ESOHLC), and Headquarters Air Combat Command Natural Resources (HQ ACC/A7AN). Changes in this plan must be approved by HQ ACC/A7AN. Individual component plans are approved by HQ ACC/A7AN or HQ ACC/A7O (Operations), as appropriate.

The DMAFB ESOHLC consists of:

355th Wing Vice Commander - Chairman	355th W Commander - Alternate Chairman
355th Operations Group Commander	355th Medical Group Commander
355th Maintenance Group Commander	355th Mission Support Group Commander
355th Wing Safety	355th Civil Engineer Squadron
355th Wing Judge Advocate	563rd Rescue Group
943rd Rescue Group	309th AMARG

1.3 Authority

Installation Supplement

The development and implementation of the DMAFB INRMP is required and authorized by The Sikes Act, 16 U.S.C. 670 et. seq., Department of Defense (DoD) Instruction 4715.3, Environmental Conservation Program, May 3, 1996, Air Force Policy Directive (AFPD) 32-70, Environmental Considerations in Air Force Programs and Activities, and Air Force Manual (AFM) 32-7003 (USAF 2020), Environmental Conservation.

The Sikes Act of 1962 authorizes the Secretary of Defense to carry out a planning program for the development, maintenance and coordination of conservation and rehabilitation programs for wildlife and fish, including game species at military installations, under a cooperative plan mutually agreed upon by the Secretary of Defense, the Secretary of the Interior, and the appropriate state wildlife management agency. Each planning program provides for sustained multipurpose use of natural resources, wetlands protection, habitat improvements, control of Off-Road-Vehicle (ORV) traffic, specific habitat improvement projects and other concerns.

DoD Instruction 4715.3, Environmental Conservation Program (1) implements policy, assigns responsibility, and prescribes procedures under DoD Directive 4715.1 (Environmental Security, February 24, 1996) for the integrated management of natural and cultural resources under DoD control, (2) authorizes the publication of "A Resource Manager's Guide to Volunteer and Partnership Programs" and "A Guide to Integrated Natural Resources Management," (3) implements all items listed in Table 1, (4) Establishes the DoD Conservation committee that reports to the Environmental Safety and Occupational Health (ESOH) Policy Board, and (5) Designates "DoD Executive Agents" to lead DoD implementation of key conservation issues.

Table 1. Items Implemented by DoD Instruction 4715.3

Sections 1531, 1996 and 4341 of title 42, United States Code	Section 1251 et seq. of title 32, United States Code
DoD Executive Agents for Conservation Issues	Presidential Memorandum, "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds," April 26, 1994
Programming and Budgeting Priorities for Conservation Program	Federal Register, Volume 60, page 40837, August 10, 1995
Conservation Measures of Merit	Executive Order 11988, "Floodplain Management," May 24, 1977, as amended
Ecosystem Management Principles and Guidelines	Section 2701 et seq. of title 33, United States Code
Contents of INRMPs and ICRMPs	Section 3001 of title 25, United States Code
Principles for Consultations with Native American	Title 43, Code of Federal Regulations, Part 10, "Native American Graves Protection and Repatriation Act Regulation," December 4, 1995
Title 36, Code of Federal Regulations, Parts 60, 78, 79, 800 and 1228, "National Register of Historic Places," current edition	Title 32, Code of Federal Regulations, Parts 22 and 229, "Archeological Resources Protection Act of 1979; Uniform Regulations."
Sections 1588(a)(2), 2665, 2667(d) and 2825 of title 10, United States Code	DoD Directive 4165.61, "Intergovernmental Coordination of DoD Federal Development Programs and Activities," August 9, 1983
Sections 6301-6308 of title 31, United States Code	Presidential Memorandum, "Government-to-Government Relations with Native American Tribal Governments," April 29, 1994

Sections 431-433, 470 et seq., 670 et seq., 1361 -1407 1431 et seq., 1531 et seq. and 3501 et seq. of title 16, United States Code	DoD Directive 4100.15, "Commercial Activities Program," March 10, 1989
Section 328 of National Defense Authorization Report 103-701	Federal Register, Volume 53, page 4742, February 17, 1988
Section 2852 of National Defense Authorization Report 103-499	Federal Register, Volume 48, page 44716, September 29, 1983
Title 40, Code of Federal Regulations, Parts 1500-1508, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" current edition	Executive Order 12962, "Recreational Fisheries," June 7, 1995
Executive Order 11990, "Protection of Wetlands," May 24, 1977	Executive Order 11644, "Use of Off-Road Vehicles on the Public Lands," February 8, 1972
Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," February 11, 1994	Executive Order 11989, "Off-Road Vehicles on Public Lands," May 24, 1977
DoD 3210.6-R, "DoD Grant and Cooperative Agreement Regulations," March 1995, authorized by DoD Directive 3210.6, April 4, 1991	Executive Order 11593, "Protection and Enhancement of the Cultural Environment," May 13, 1971
DoD Instruction 7310.5, "Accounting for Production and Sale of Forest Products," January 25, 1988	DoD Instruction 4715.9, "Environmental Planning and Analysis," May 3, 1996

Air Force Policy Directive (AFPD) 32-70, *Environmental Considerations in Air Force Programs and Activities,* establishes policy to address the environmental considerations in all Air Force programs and activities using a management system framework. It also assigns duties and responsibilities, and establishes long-term goals and objectives, with specific programs in support of those objectives. It aims to create a culture where personnel incorporate environmental considerations into all we do, with environmental compliance, risk reduction, and continuous improvement serving as central tenets for sustainable Air Force operations.

AFM 32-7003, *Environmental Conservation,* implements AFPD 32-70, *Environmental Considerations in Air Force Programs and Activities,* and DoD Instruction 4715.3, *Environmental Conservation Program.* It provides guidance and procedures for cultural resource and natural resource programs at Air Force installations.

Installation-Specific Policies (including State and/or Local Laws and Regulations)

1.3.1 Responsibilities

DMAFB command elements responsible for the oversight and implementation of the INRMP include the Installation Commander, Base Civil Engineer, and Natural Resources Manager. The responsibilities specific to each command element are listed below.

Installation Commander (355 FW/CC) will:

a. Approve the INRMP every five years before submission to Headquarters Air Combat Command (ACC);

b. Certify the annual review of the INRMP as valid and current; or delegate the certification of the annual INRMP review to the appropriate designee;

c. Provide funding and staffing to ensure implementation of the INRMP;

d. Control access to and use of installation natural resources.

Base Civil Engineer (BCE) will:

a. Ensure properly qualified and trained personnel manage the natural resources program at DMAFB. When it is not practicable to use DoD personnel to perform natural resources management duties, priority will be given to obtaining these services from federal or state agencies with responsibilities for the conservation and management of natural resources. The BCE will verify that outside sources are trained in the Air Force modules for management of wildlife on a military installation;

b. Review the INRMP annually to ensure currency with any changes in environmental or natural resources laws and/or directives as they may pertain to the installation;

c. Forward natural resources funding requirements to higher headquarters through the Automated Civil Engineering System-Project Management (ACES-PM) module or the Legacy Resource Management Program;

d. Ensure conservation of natural resources is given proper consideration in base planning, programming, and construction activities, including those by associate units;

e. Ensure coordination and cooperation with other base agencies and associate units when executing any parts of component plans within the INRMP.

Natural Resources Program Administrator (or Qualified Designee) (355 CES/CEIE) will:

a. Serve as the single point of contact for the installation of natural resources program;

b. Work closely with installation, state and federal agencies to execute natural resources projects or requirements in component plans of the INRMP (e.g. BASH plan, Integrated Pest Management Plan);

c. Ensure, through active participation in project planning, that natural resources are identified and given proper consideration under the National Environmental Policy Act (NEPA) process;

d. Develop a natural resources public awareness program to educate installation personnel on their responsibilities under federal and/or state laws and directives;

e. Maintain, through training and professional development, a level of proficiency in natural resources management commensurate with the resources on DMAFB, with federal standards set by the Office of Personnel Management and the Secretary of the Interior, and with requirements identified by the AF and HQ Air Combat Command. If an outside source is designated to manage natural resources on DMAFB, they will be trained in the Air Force modules for management of wildlife on a military installation.

In addition to DMAFB command elements, the state and federal wildlife agencies also share responsibility for the oversight and implementation of the INRMP. Their responsibilities are listed below:

Arizona Game and Fish Department

The Arizona Game and Fish Commission (Commission) and Department (Department) serve the people of Arizona as stewards of the State's wildlife. These resources are a public trust, managed for the benefit of present and future generations. Under Arizona Revised Statutes Title 17, wildlife is State property and the Commission and Department are vested with the authority to manage the State's wildlife. Wildlife in Arizona is primarily managed by the Arizona Game and Fish Department (AZGFD), with the exception of federally listed species which are cooperatively managed with the U.S. Fish and Wildlife Service (USFWS). The State of Arizona has no threatened and endangered species laws; however, many species or geographical populations are managed by the Arizona Game and Fish Commission by establishing seasons and setting bag limits in applicable Commission Orders.

The AZGFD will participate in review and comment periods during the development of the INRMP. This responsibility will include thoroughly reviewing the INRMP document at various drafting stages and providing comments and suggestions for the improvement and/or accuracy of the document. The AZGFD will provide staff, as available, to participate in a workgroup at DMAFB to facilitate regular communication and coordination.

U.S. Fish and Wildlife Service

The USFWS Service is the federal government agency dedicated to the conservation, protection, and enhancement offish, wildlife and plants, and their habitats. It is the only agency in the federal government whose primary responsibility is management of fish and wildlife for the American public, and whose primary objectives include:

1. To assist in the development and application of an environmental stewardship ethic for society, based on ecological principles, scientific knowledge offish and wildlife and a sense of moral responsibility;
2. To guide the conversation, development and management of the Nation's fish and wildlife resources, and;
3. To administer a national program to provide the public opportunities to understand, appreciate and wisely use fish and wildlife resources (USFWS 2018).

The USFWS will participate in review and comment periods during the development of the INRMP. This responsibility will include thoroughly reviewing the INRMP document at various drafting stages and providing comments and suggestions for the improvement and/or accuracy of the document. The USFWS will provide staff, as available, to participate in a workgroup at DMAFB to facilitate regular communication and coordination.

7.4 *Integration with Other Plans*
Installation Supplement

GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT):

- *Discuss how the INRMP integrates with and supports the Installation Development Plan (see AFI32-1015, Integrated Installation Planning)*
- *Discuss how the INRMP integrates with and supports the installation Air Installation Compatible Use Zone (AICUZ) program*
- *Discuss how the INRMP and the Bird/Wildlife Aircraft Strike Hazard (BASH) Plan are mutually supportive*
- *Discuss how the INRMP and the Integrated Pest Management Plan (IPMP) are mutually supportive*
- *Discuss how the INRMP integrates with and supports other relevant plans, such as Range Management Plans, Landscape Plans, etc.*

Example/boilerplate language (to be updated/replaced with installation-specific content):

INRMP revisions and concurrence with the final plan must be coordinated through the installation chain of command and the *Identify internal stakeholders.* The NRM must ensure that the INRMP, *List applicable installation plans, i.e., ICRMP; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) / Resource Conservation and Recovery Act (RCRA) cleanup plans; BASH plan; IPMP; Grounds Maintenance contract; and AICUZ studies* and any other plans that may affect natural resources, are mutually supportive and not in conflict.

2 INSTALLATION PROFILE
Installation Supplement

Office of Primary Responsibility (OPR)	*Enter OPR* 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/Point of Contact (POC)	Name: Add. Phone: Add. Email: Add.
State and/or local regulatory POCs (Include agency name for Sikes Act cooperating agencies)	

Total acreage managed by installation	
Total acreage of wetlands	
Total acreage of forested land	
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	
Natural Resources Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	□ Fish and Wildlife Management □ Outdoor Recreation and Access to Natural Resources □ Conservation Law Enforcement □ 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)

2.7 Installation Overview

2.1.1 Location and Area
Installation Supplement

DMAFB is located within the City of Tucson, Pima County, Arizona. The City of Tucson annexed the base in 1995. It is less than 5 miles northeast of Interstate 10, about 6 miles east of the Santa Cruz River, and 6 miles northeast of Tucson International Airport. DMAFB occupies approximately 10,817.7 acres, of which approximately 2,200 acres are developed or otherwise improved, approximately 3,500 acres are semi-improved, and approximately 4,530 acres are unimproved, and 300 acres are under easement to and maintained by Pima County. Acreage is constantly subject to change due to development and mission changes.

An additional, DMAFB oversees lands in the surrounding area including approximately 330 acres to accommodate the interpretive Titan II Missile Site 12 located within the Ironwood Forest National Monument managed by Bureau of Land Management (BLM), approximately 10 acres associated with the Titan II Missile Museum managed by Pima County and the Pima Air and Space Foundation, and approximately 2 acres associated with the Gator Site on Mt. Lemmon within Forest Service easement. DMAFB also is responsible for two Forward Operating Locations (FOL) in Aruba and Curacao, 42 acres and less than 1 acre, respectively. The FOLs are not discussed further in this report, but activities within those areas are required to comply with AF Instruction 32-7091, Environmental Management Outside the United States and DoD Instruction 4715.05, Evironmental Compliance in Installations Outside of the United States (USAF 2016).

DMAFB is located in the Tucson Basin and surrounded by the Tucson (west), Santa Catalina (north), Rincon (east), and Santa Rita (south) mountains. These features are within a larger geological unit known as the Basin and Range Province characterized by northwest-southeast trending mountain ranges separated by wide, alluvial basins. The Basin and Range Province extends from west Texas through southern New Mexico, southeastern and northwestern Arizona, northwestern Mexico, Nevada, western Utah, and part of southern California. The Tucson Valley is a typical basin, with gently sloping terrain and elevations ranging from 2,550 to 2,950 feet above mean sea level. DMAFB falls within the Sonoran Desert biotic community that encompasses south-central Arizona and neighboring northwestern Mexico. Rainfall averages only 10 to 11 inches per year. Even so, it is sufficient to support a wide variety of hardy cacti, shrubs and trees. In fact the Sonoran desert is considered one of the world's most arboreal deserts, that is, it supports many perennial species that reach ≥10 feet, and resembles a depauperate version of the more tropical Sinaloan thornscrub of northwestern Mexico. A number of species, including the giant saguaro cactus (Carnegiea gigantea) and the desert ironwood (Olneya tesota) are endemic to the Sonoran Desert.

Installation/GSU Location and Area Descriptions

Installation/ Geographically Separated Unit (GSU)	Main Use/ Mission	Acreage	Addressed in INRMP?	Describe Natural Resource Implications
Main installation.			*Include where addressed, Cat II, etc. (e.g., INRMP coverage)*	
GSU 7.				
GSU 2.				

2.7.2 *Installation History*
Installation Supplement

In 1919, the City of Tucson established the country's first municipal airfield and, in 1925, moved it to a second site that is the current location of DMAFB. On September 27, 1927, Colonel Charles Lindbergh dedicated the Tucson Municipal Airport as the first municipal airport to be converted to use as a military base by the U.S. Army.

In 1928 the base was officially named Davis-Monthan in honor of Lieutenants Samuel Davis and Oscar Monthan, Tucson residents who died in early aviation accidents. In 1940, the name was changed to Tucson Air Base. Following the Japanese attack on Pearl Harbor, bombardment units from the base entered the war. For the remainder of World War II, the base was a center for training B-24 and B-29 flight crews. In 1942, the base was rededicated as Davis-Monthan Field. After the war, the base served as a personnel out-processing center and storage location for excess aircraft. This mission continues today under the management of AMARG.

The 355th Tactical Fighter Wing relocated to DMAFB in 1971. It was responsible for installation host activities for 10 years, until the 836th Air Division was activated and assumed those duties. In 1992, the 836th Air Division was inactivated, and the 355th Wing became the host unit

DMAFB is an ACC installation with a population of approximately 6,700 active duty military personnel, 8,159 family members, and 3,200 civilian employees. There are 110 officer family units, 822 enlisted family units, 744 unaccompanied spaces and 102 mobile home lots. Temporary lodging consists of 246 visitor units, 50 temporary units and 125 RV spaces. There are 2 elementary schools on base run by the Tucson Unified School District.

2.1.3 Military Missions

Installation Supplement

The 355th Wing is the host unit at DMAFB. It provides base operations, logistical, and administrative support to all personnel and units on the base. The 355th Wing's primary mission is:

- provide close air support and forward air liaison for Army forces;
- provide expeditionary combat support forces to other military operations;
- provide training for all A/OA-10 and EC-130 pilots and crews; and
- to aid Combat Search And Rescue (CSAR) forces, EC-130H Compass Call aircraft, and HH-60 Pavehawk helicopters

Major associate units at DMAFB include 12th Air Force Headquarters (HQ); 563rd Rescue Group; 55th Electronic Combat Group; 943rd Rescue Group (Air Force Reserve); 309th AMARG; U.S. Customs; and Border Patrol. AMARG provides a single location to process and maintain aircraft and components being stored by all services. 12th Air Force controls ACC forces based in the western U.S. and Panama and is the air component for the U.S. Southern Command and U.S. Strategic Command (Battle Management).

Performing the Military Mission

DMAFB is home of the 355th Wing, part of ACC and the host wing. Major associate units at DMAFB include 12th Air Force Headquarters (HQ); 563rd Rescue Group; 55th Electronic Combat Group; 943rd Rescue Group (Air Force Reserve); 309th AMARG, and; U.S. Customs and Border Patrol (Department of Homeland Security). These organizations and agencies have a variety of missions encompassing tactical flying training, forward air control, electronic countermeasures, combat search and rescue, aircraft storage and disposition, military communications, sale of excess, surplus, and scrap property, and drug interdiction. DMAFB's natural resources discipline is part of the Natural Resources Management Flight of the 355th CES/CEIE.

Listing of Tenants and Natural Resources Responsibility

Tenant Organization	Natural Resources Responsibility
List tenant organizations.	*Identify which host/tenant organization is responsible for managing tenant's impact to/by natural resources.*

2.1.4 Natural Resources Needed to Support the Military Mission

Installation Supplement

Due to the limited amount of on-the-ground training at DMAFB, there are no essential natural resources needed to support the mission. The combat (Security Forces) training area on the east side of the base near Atterbury Wash depends somewhat on cover from desert vegetation, therefore soil compaction and vegetation trampling will be minimal. Mitigation measures will be implemented to retain and promote dense cover.

Maintenance of unimproved and enhancement of improved and semi-improved lands for native desert vegetation (e.g., Section 6.3), coupled with development of interpretive materials describing the natural history and uniqueness of the Sonoran Desert (e.g., brochures, interpretive center, botanical plates identifying native vegetation) will benefit the military mission. This will provide base personnel with a sense of appreciation for the Sonoran Desert and therefore contribute to his/her well-being and sense of place.

2.7.5 *Surrounding Communities*

Installation Supplement

DMAFB occurs at the southeastern edge of Tucson, Arizona and as such is surrounded by heavily urbanized areas to the west, north and northeast. Continued population growth has led to more urban development to the east and south of DMAFB. The area directly east of the base boundary is State Trust Land managed by the Arizona State Land Department (Figure 2). Much of this is undeveloped Sonoran Desert that is leased to local ranchers for grazing livestock although mountain biking trails are maintained throughout the area immediately adjacent to DMAFB. The City of Tucson has a population of 520,116 according to the 2010 census. Unincorporated portions of Pima County border the southern part of the base.

Arizona's metropolitan areas are some of the fastest expanding cities in the county. The major cities (Phoenix, Tucson) as well as smaller cities in southern Arizona (e.g., Nogales, Sierra Vista) are continuously expanding with new urban and commercial developments. Eastern Pima County is composed primarily of state or federally owned lands but also includes some privately held lands. The primary consumptive land use in these exurban landscapes includes livestock grazing by private ranches with much of the grazing occurring on state and federally leased lands (Figure 3). Agriculture is practiced in some of the valleys of southern Arizona, including the Gila - Salt River Valley, the San Pedro River Valley, and the Sulphur Springs Valley. There is no large-scale agriculture in the Tucson Valley. There are several large copper mining operations in the vicinity of Tucson, including the Asarco mine and the inactive Freeport-McMoRan Sierrita Mine southwest of Tucson and the proposed Rosemont mine in the Santa Rita Mountains. Because much of the land is government owned and managed, much of the land surrounding Tucson and throughout southeastern Arizona is in a relatively natural condition, excluding impacts from livestock grazing, and as such is rich in natural resources.

2.*1.6 Local and Regional Natural Areas*

Installation Supplement

The Tucson Basin and all of the surrounding southeast Arizona is a region rich in natural resources and recreational opportunities (Figure 1; Figure 2). The region is dominated by a diversity of publicly accessible lands. Many natural areas occur in the immediate vicinity of DMAFB and provide multiple opportunities to explore the surrounding deserts, mountains, grasslands, and riparian areas. Southeastern Arizona has long been considered as one of the most biologically-rich regions in the country due to the convergence of 4 major biotic provinces including the Chihuahuan and Sonoran deserts, the Great Plains and the Sierra Madre Occidental of Mexico. This region is known in the local vernacular as the Sky Island Region due to the isolated, Sierra Madrean-influenced, more mesic, mountain ranges ("islands") and the intervening, drier grasslands and deserts ("oceans"). This provides for a diversity of flora and fauna all within 0.5 - 3 hours driving time from DMAFB. Additional information on local and regional natural ares is presented in Section 4.2.Saguaro National Park consists of two management units, Tucson Mountain District and Rincon Mountain District. The former consists of lower elevation mountains and deserts while the latter begins in Sonoran Desert and rises to an elevation of approximately 8,700 feet. Rincon Mountain District lies approximately 10 miles to the northeast, while Tucson Mountain District lies approximately 20 miles to the northwest of DMAFB. The southern portion of the Tucson Mountains is managed by the Pima County and offers many mountain biking and hiking trails through a natural desert environment.

Other natural areas in the vicinity of DMAFB include Cienega Creek Natural Preserve managed by Pima County (20 mile southeast of Tucson) and Las Cienegas National Conservation Area managed by the BLM and the Nature Conservancy. These areas represent an excellent example of natural riparian area in the Sonoran Desert. The nearest major river is the Santa Cruz River which occurs about 6 miles west of DMAFB. Historically parts of the Santa Cruz River were perennial through Tucson but now these sections only flow intermittently following storm events. Nearby intermittent tributaries of the Santa Cruz include Rincon Creek, Pantano Wash (into which Atterbury Wash flows), and the Rillito River. The San Pedro River is approximately 40 miles to the southeast of the base.

The City of Tucson has several public parks with playgrounds, picnic facilities, and athletic fields. Because DMAFB is located in close proximity to so many outdoor recreational opportunities, the majority of the base's outdoor recreation program consists of providing information to many destinations listed above and renting camping and outdoor equipment for use off-base.

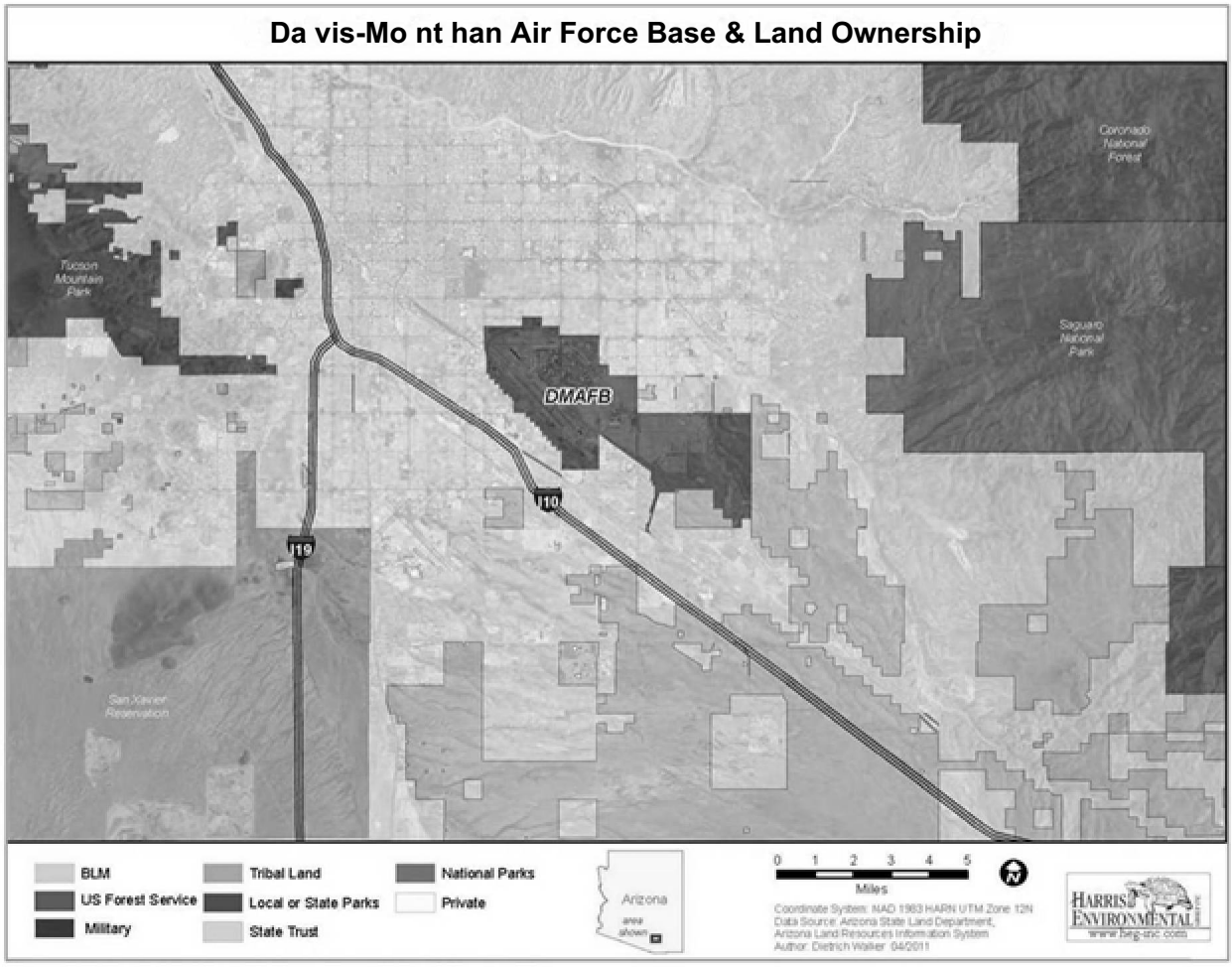


Figure 1. Land Ownership near Davis-Monthan Air Force Base.

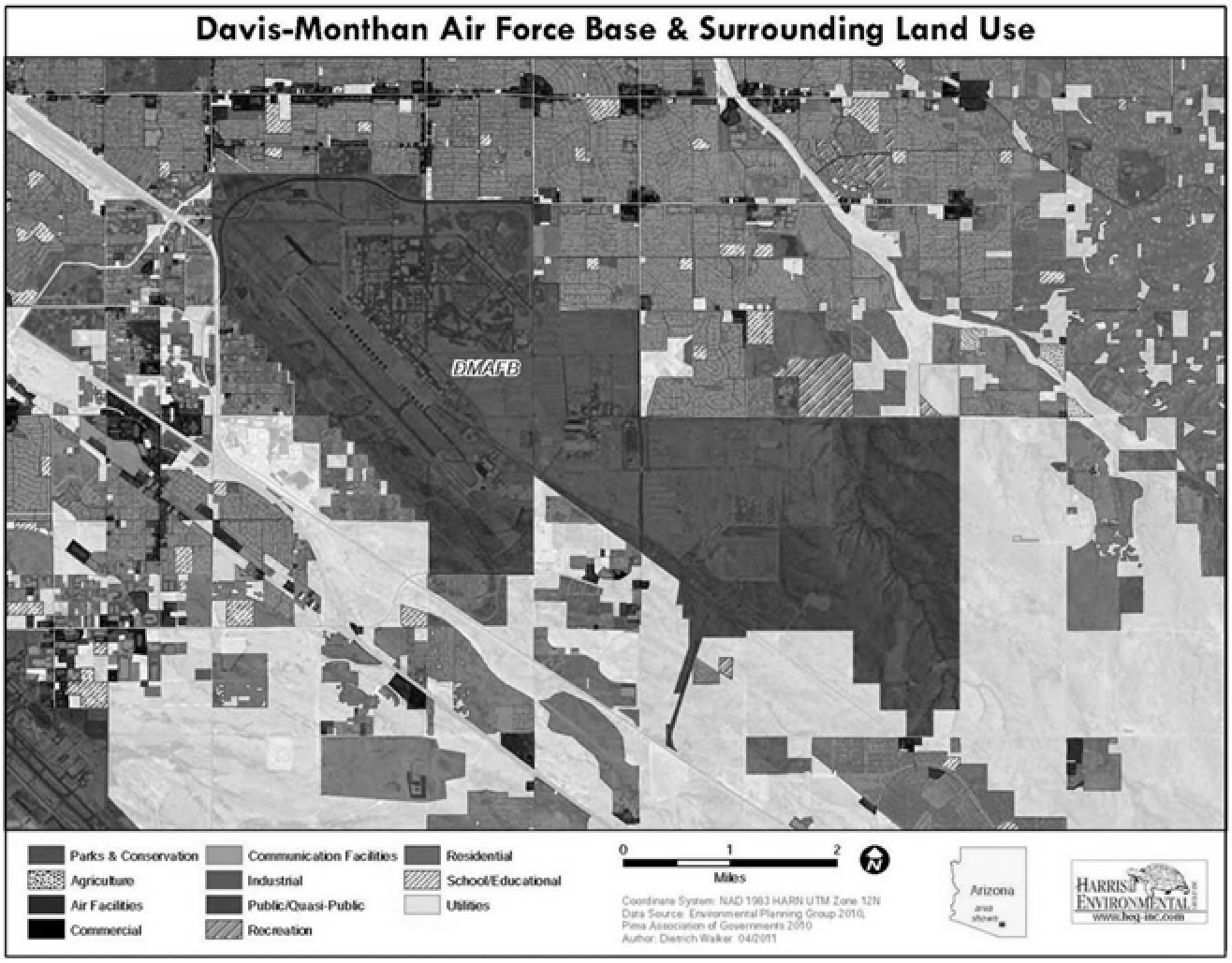


Figure 2. Surrounding Land Use near Davis-Monthan Air Force Base.

2.2 *Physical Environment*

2.2.1 Climate

Installation Supplement

The climate of DMAFB is warm, semi-arid, and characterized by a long, hot season beginning in April and ending in October. Prevailing winds follow a diurnal pattern, blowing from the southeast during the night and early morning hours and from the northwest during the day. The growing season lasts approximately 264 days.

Overall, the desert air and the altitude of 2,550 to 2,950 feet lead to a year-round mild climate. Average annual temperature ranges from a high of 82°F to a low of 53°F. Maximum temperatures above 90°F are the rule from May through September. The average annual rainfall is 10 to 11 inches, with the majority falling in July and August, usually in the form of afternoon thundershowers. Monthly rainfall averages from 0.2 inches in May to over 2.2 inches in July.

2.2.2 Landforms

Installation Supplement

DMAFB is located in the Tucson Basin and surrounded by the Tucson (west), Santa Catalina (north), Rincon (east), and Santa Rita (south) mountains. These features are within a larger geological unit known as the Basin and Range Province characterized by northwest-southeast trending mountain ranges separated by wide, alluvial basins. The Basin and Range Province extends from west Texas through southern New Mexico, southeastern and northwestern Arizona, northwestern Mexico, Nevada, western Utah, and part of southern California.

The terrain on DMAFB is generally flat, sloping downwards from southeast to northwest from an elevation of 2,950 feet to 2,550 feet. The base has two significant sloping areas: one is a highway cut for Kolb Road; the other is Atterbury Wash, located in the eastern part of the base. The slopes in these areas constitute constraints to development (DMAFB 1996). The major landforms in the Sonoran Desert are desert plains, conjoined alluvial fans (locally known as bajadas) and terraces.

2.2.3 *Geology and Soils*
Installation Supplement

DMAFB is located in the Tucson Basin, an intermontane trough formed between the Tucson Mountains and the Rincon, Santa Catalina and Santa Rita mountains, all within the Sonoran Desert. The Rincon and Santa Catalina mountain ranges are geologically a single metamorphic core complex, encompassing an area of approximately 4600 feet^2 and range in elevation from approximately 2,800 feet to 9,100 feet.

The Tucson Mountains are a rugged, strongly dissected mountain ridge carved from uplifted, tilted, and faulted intrusives, volcanics, and sediments. According to Kring, they are thought to have formed by several actions to include; detachment faulting that occurred near the present Santa Catalina Mountains, that separated materials in a northeast-southwest direction and volcanic activity to include the collapse of the Tucson Mountain Caldera (Kring 2002).

Regionally, the oldest rocks are isolated blocks of Paleozoic limestone. Other rock types include rhyolite tuff; early Cretaceous fine-grained siltstones, sandstones and mudstones; Cretaceous granites; and middle Tertiary volcanics and basalts. The mountains are skirted by younger sedimentary and alluvial deposits that range from late Miocene to Quaternary (Figure 3).

DMAFB is located in Seismic Zone II, characterized by moderate intensity earthquakes of intermediate frequency. There has been no significant earthquake activity in the area during the past century.

Most of the developed portion of DMAFB is on Mohave soils and soils disturbed or enhanced by urban development with 1 to 8 percent slopes (Figure 4). Mohave soils are loamy down to 60 inches or more. Permeability of Mohave soils is moderately slow and runoff is moderate. Susceptibility to water and wind erosion is moderate.

The majority of the undeveloped portion of DMAFB, including AMARG, is on Tubac gravelly loam with 1 to 8 percent slopes. Tubac soils have a surface covered with 25 percent gravel and 5 percent cobbles. The surface layer is gravelly loam or coarse sandy loam. The subsoil is gravelly sandy clay loam to a depth of 66 inches or more. Permeability is slow and runoff is moderate. Susceptibility to water and wind erosion is slight.

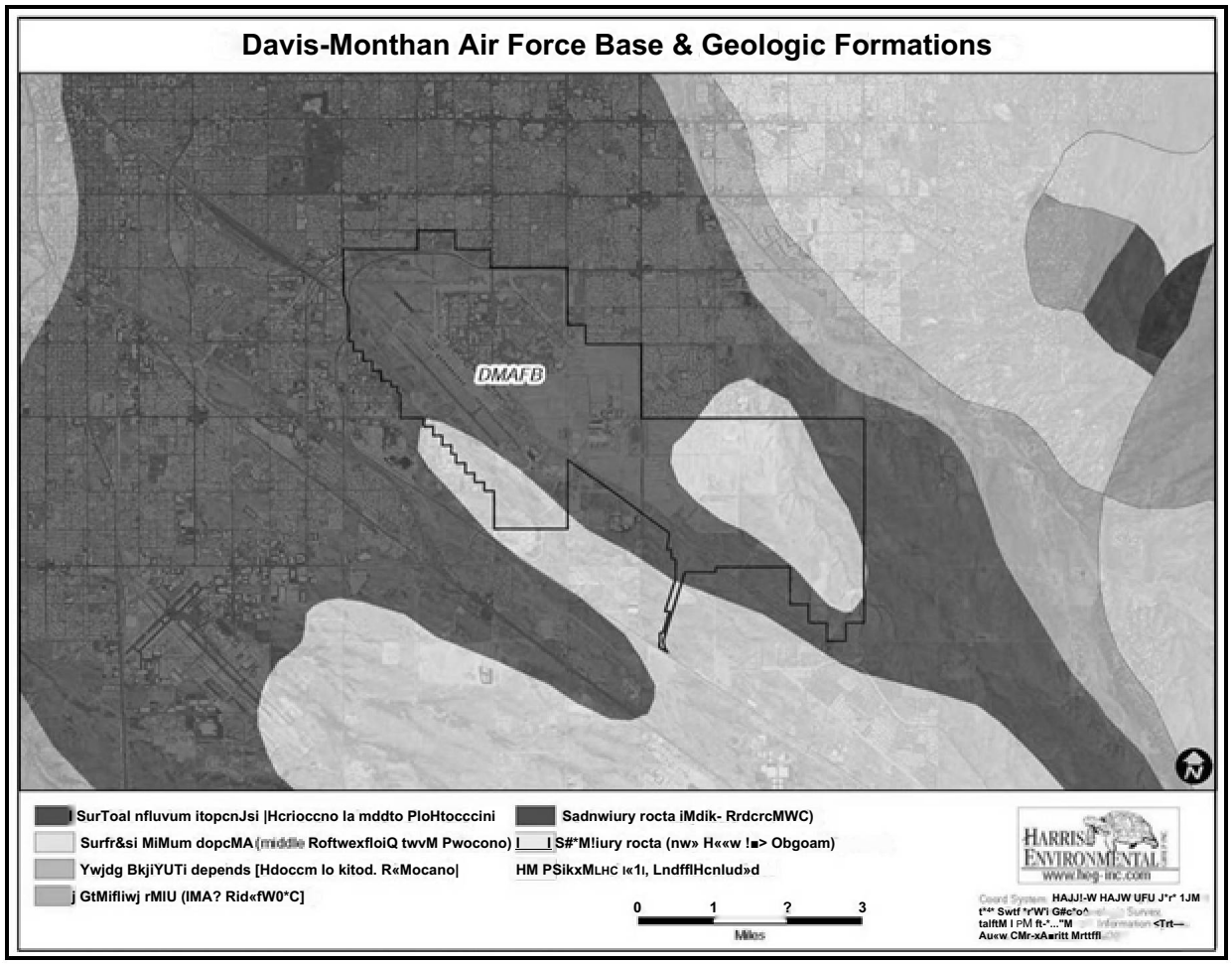


Figure 3. Davis-Monthan Air Force Base and Geologic Formations.

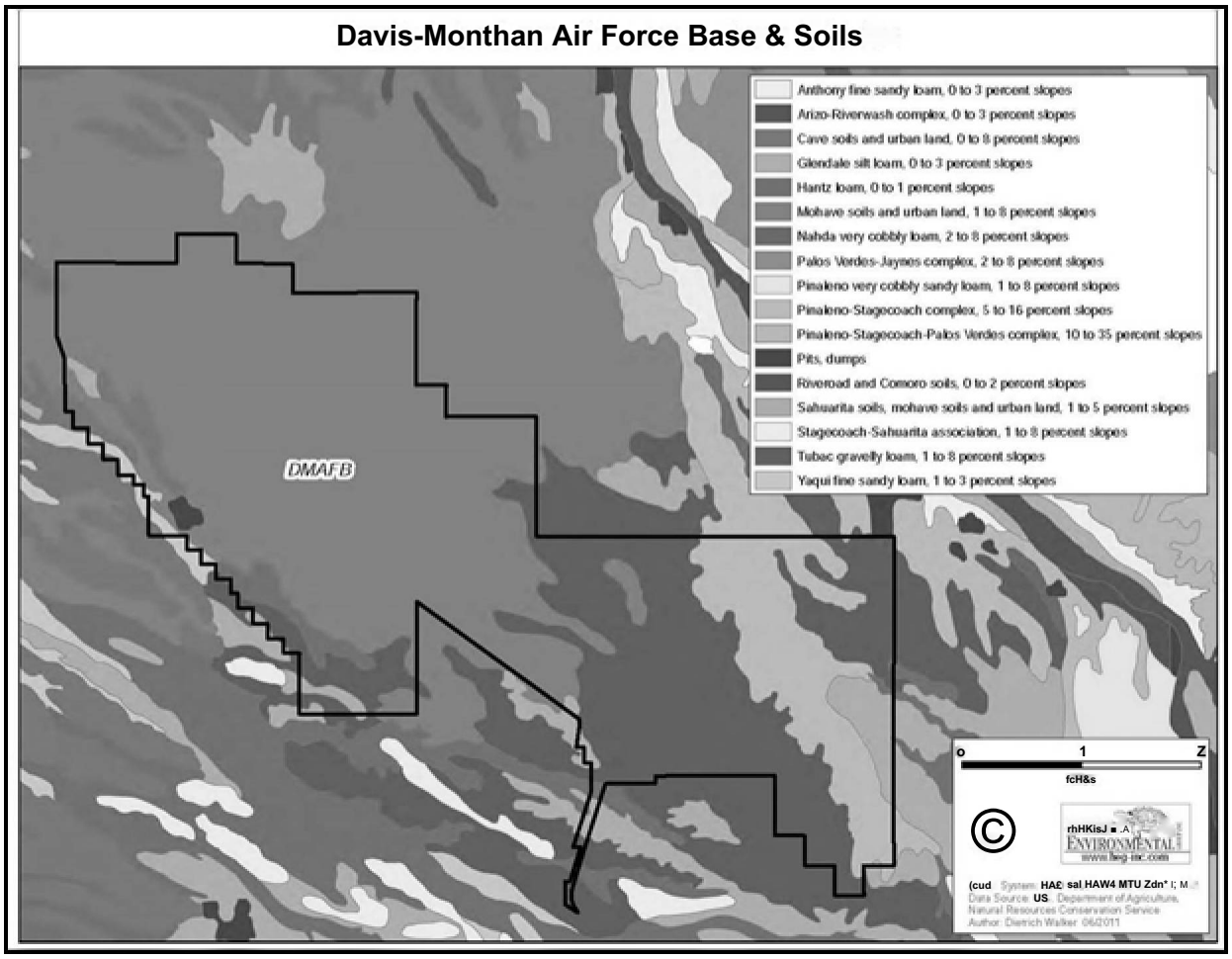


Figure 4. Davis-Monthan Air Force Base and Soils.

Soils in the eastern portion of the base along Atterbury Wash are primarily Pinaleno-Stagecoach complex, 5 to 15 percent slopes. This unit is 40 percent Pinaleno very cobbly sandy loam and 35 percent Stagecoach very gravelly sandy loam. The surface of Pinaleno soil is covered with 30 percent cobbles and 20 percent gravel. The surface layer is very cobbly or gravelly sandy loam. The subsoil is extremely cobbly or gravelly sandy clay loam down to 60 inches. Permeability of the Pinaleno soil is moderately slow and runoff is medium. Susceptibility to water and wind erosion is slight. Stagecoach soils are covered with 50 to 65 percent gravel and cobbles. The surface layer is very gravelly or cobbly sandy loam. The subsoil is very gravelly loam and extremely gravelly loam to 40 inches, and very gravelly loam sand to 60 inches or more. Caliche may be found at a depth of 40 inches or more. Permeability of Stagecoach soils is moderate and runoff is medium. Susceptibility to water and wind erosion is slight. More detailed descriptions of the soils types on DMAFB are provided in the U. S. Department of Agriculture (USDA 1974) soil survey for Pima County.

2.2.4 Hydrology
Installation Supplement

Watersheds

The Tucson Basin is drained by the Santa Cruz River that flows north 6 miles west of the base. The major tributary of the Santa Cruz River near DMAFB is the Rillito River, 6 miles north of the base, which flows west into the Santa Cruz River approximately 15 miles northwest of the base. DMAFB is intersected by the border of the Upper Santa Cruz and Rillito Watersheds (Figure 5). Pantano Wash, a major tributary of the Rillito River, is located 3.5 miles northeast of the base. Atterbury Wash, the primary drainage of the eastern part of the base drains into Pantano Wash. Julian Wash, a drainage of the western portion of the base flows northwest into the Santa Cruz River.

There are no perennial drainages within the boundaries of DMAFB. The low level and irregularity of rainfall results in erratic, and potentially, erosive flows in the local drainages. These drainages (referred to as arroyos regionally), like many in the desert Southwest, are ephemeral and flow only during and immediately after storms, otherwise remaining dry. The dominant drainage system on the installation is Atterbury Wash (Appendix D, Floodplain Analysis and Appendix P, Ephemeral Stock Pond along Atterbury Wash). This ephemeral wash has the highest potential for supporting wildlife and associated habitat on the base and likely serves as a xeri-riparian corridor for movements of many species.

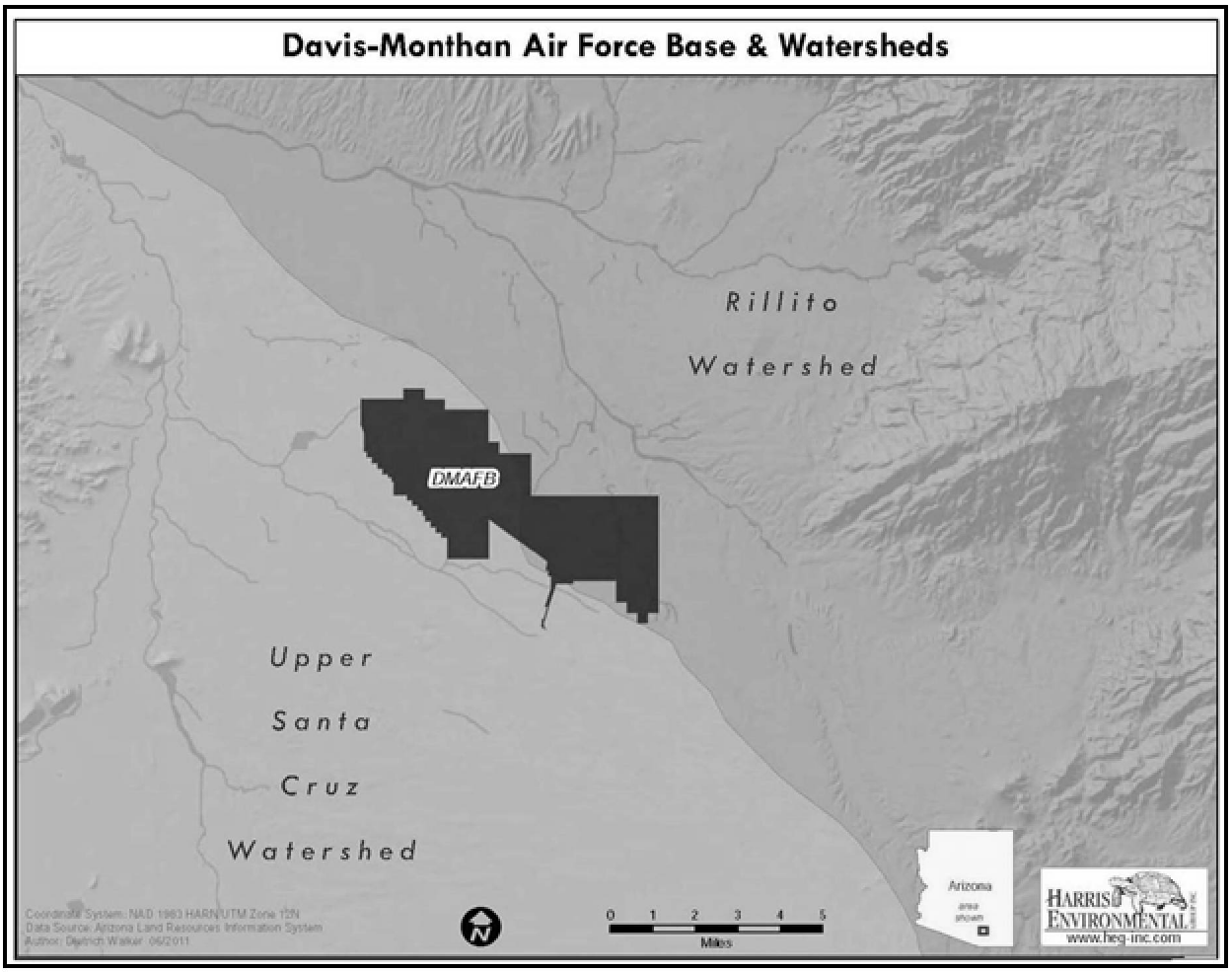


Figure 5. Davis-Monthan Air Force Base and Watersheds

Floodplains

Atterbury Wash, which passes through DMAFB, is prone to flash flooding during the rainy months of July to August. This dendritic ephemeral drainage contains almost 92,000 linear feet of water-cut channels. Most of Atterbury Wash is relatively undisturbed and contains a desert xeri-riparian vegetative community.

Although the National Flood Plain Insurance Map does not show any portion of DMAFB in a 100-year floodplain, a recent floodplain analysis of Atterbury Wash indicated an estimated peak discharge for a 100-year flood of 2,906 cubic foot/second (cfs) (Figure 7). The resulting floodplain would vary in width from 69 to 1,154 feet because of extreme changes in stream morphology. In some areas the banks are 20 feet high and in others they are nearly non-existent.

Artificial Drainage Patterns

Surface water drainage on the base is through a series of ephemeral drainages, many of which have been modified into ditches. Surface waters on DMAFB include approximately 142,000 linear feet of ephemeral drainages and tributaries that constitute U. S. jurisdictional waters (USAF 1996, Appendix D, Floodplain Analysis) (Figure 6). Runoff from the northwest half of the base generally flows through drainage ditches, leaving the base at the northwest corner via the stormwater drainage system. These ditches are drainages that have been channelized, diverted, or cut off, and many are mowed or otherwise maintained. Surface water from Atterbury Wash discharges via the stormwater drainage system to Lakeside Park, a small retention pond one mile north of the base boundary. This pond discharges into Pantano Wash and ultimately into the Rillito River and then the Santa Cruz River.

Stormwater runoff generally travels towards the northeast. Most of the runoff is directed to three large underground collection pipes: one along Fifth Street; one on the edge of AMARG south of the golf course; and one at the northern end of the runway. DMAFB has a National Pollutant Discharge Elimination System (NPDES) permit to discharge untreated rainwater collected in the dike area of the bulk fuel storage facility to the natural storm drainage system.

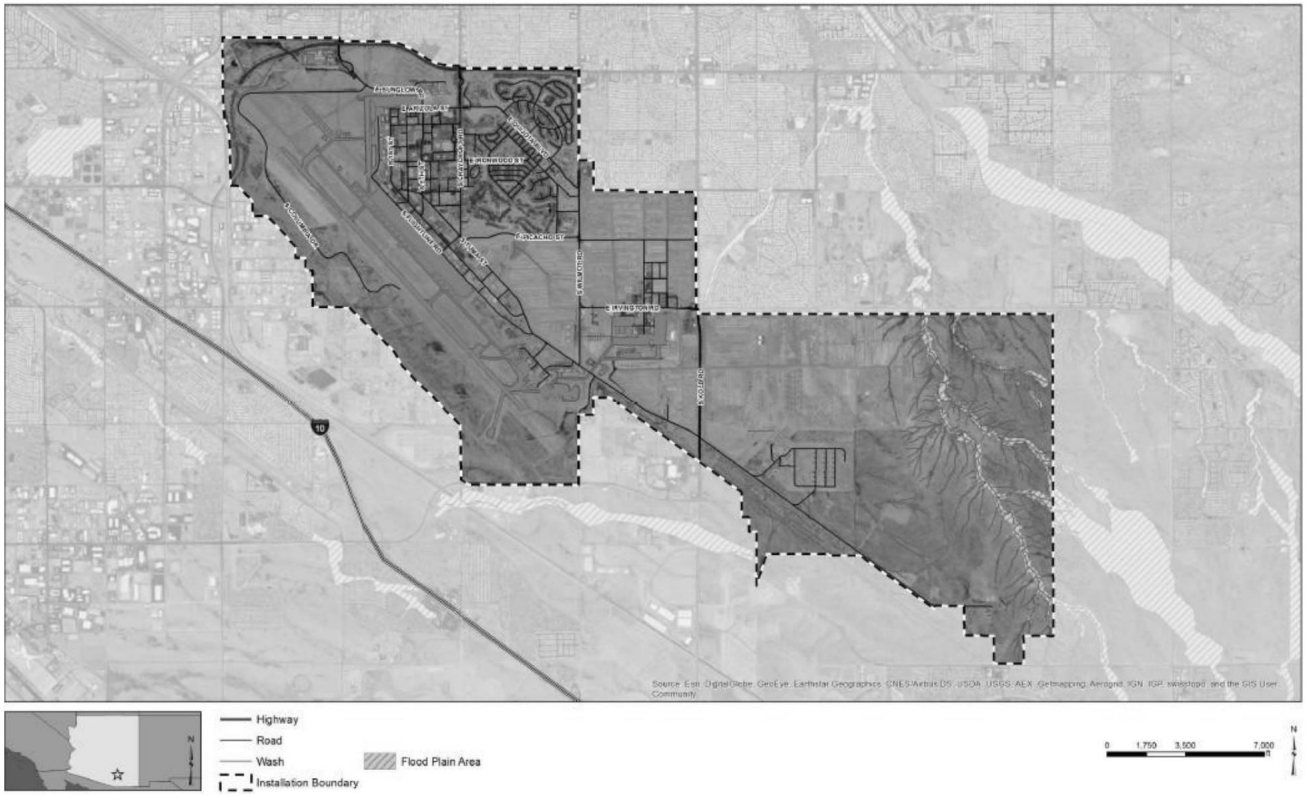
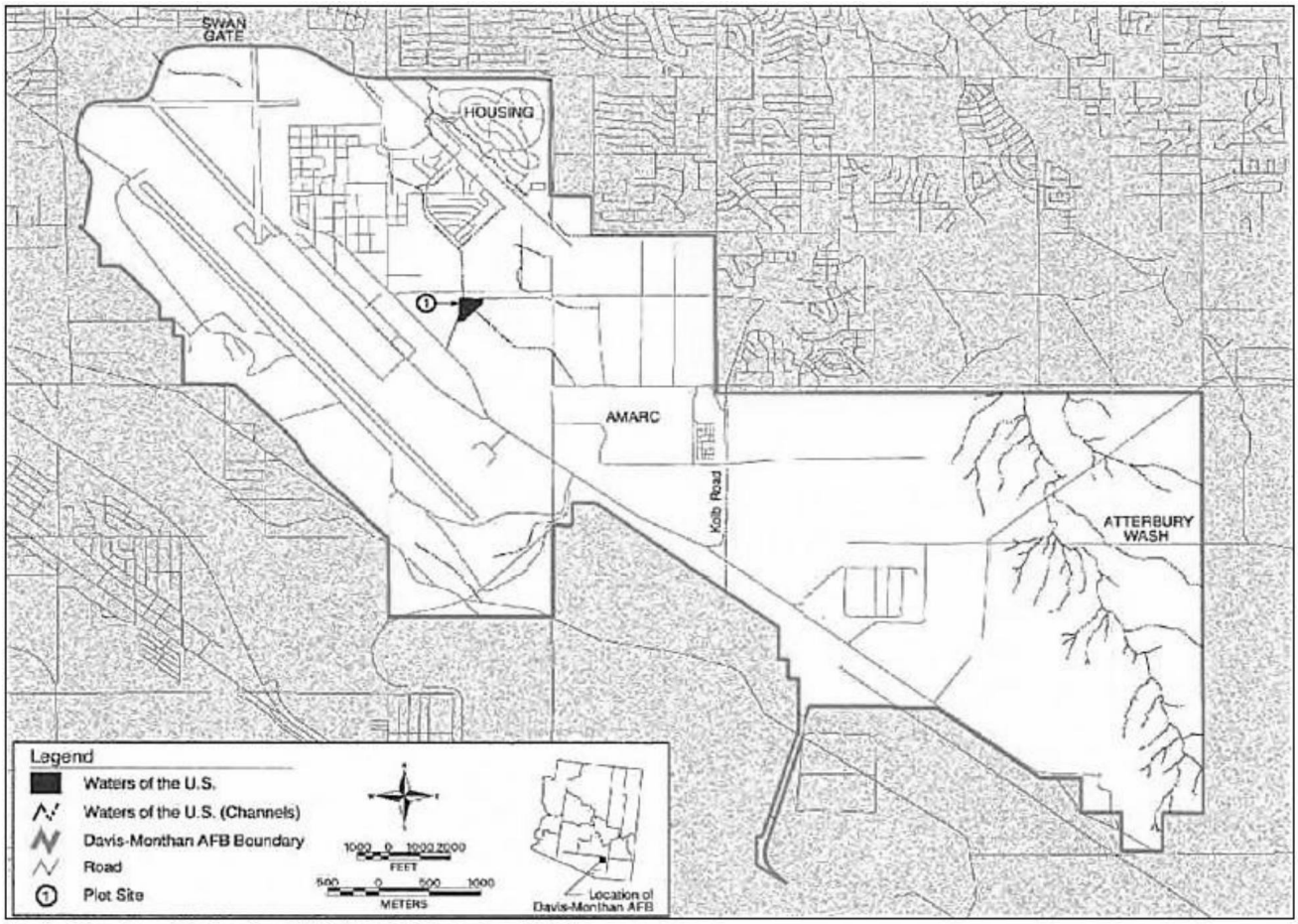


Figure 6. Davis-Monthan Air Force Base and Floodplains.



Davis-Monthan Wetlands 1114-152, 31 October 1996

Figure 7. Davis-Monthan Air Force Base and Wasters of the U.S.

Water Quality

DMAFB pumps, treats, and distributes its own water for consumption. The base operates 11 wells that pump groundwater from the Tinaja Beds and the Fort Lowell Formation of the Tucson Basin aquifer. Currently, the base is withdrawing more water from the aquifer than is replaced each year through natural recharge. The base uses gray water from the Pima County Publicly Owned Treatment Works (POTW) to irrigate areas where needed and reduce drawdown on the groundwater aquifer.

Surface water from the base may contain herbicides and pesticides related to grounds maintenance, particularly on the golf course and other developed portions of the base. The golf course has currently halted operation, but the area is being maintained and reviewed for future use. Excess surface water at six outfall locations originates in areas where industrial activities occur: the flight line, the bulk fuels storage area, AMARG, aircraft wash racks, vehicle maintenance areas, DRMO, the Weapons Storage Area, and Installation Restoration Program (IRP) sites. Stormwater from these areas has the potential to contain industrial pollutants such as fuels, oils and lubricants, detergents, waste oils, and hazardous chemicals. As such, the DMAFB complies with the Arizona Department of Environmental Quality (ADEQ), Water Quality Division's Arizona Pollutant Discharge Elimination System (AZPDES) 2016 General Permit for Discharge from Small Municipal Separate Storm Sewer Systems (MS4) to Waters of the United States through the development of the DMAFB Stormwater Management Plan (SWMP) and program, and through implementation of the DMAFB Stormwater Pollution Prevention Plan (SWPPP). DMAFB remains compliant with the above mentioned Stormwater Permits and is required to submit annual documentation to ADEQ.

Approximately 0.300 million gallons of wastewater per day is discharged from the DMAFB sanitary sewer system to the Pima County POTW. A pre-treatment facility was constructed in November of 1996 on DMAFB to remove excess heavy metals, oils and grease from industrial processes. DMAFB effluents are regulated as part of the Pima County POTW (NPDES) permit. Currently, the base is in compliance with permitted limits, sampling weekly, monthly and quarterly.

Wastewater exits the base in the extreme northwest corner through two 15-inch pipes. There are 18 septic systems on base that service the Flightline, AMARG, and the area east of Kolb Road. There are two surface water treatment impoundment areas on DMAFB. The impoundment areas collect water from the fire training area and the aircraft processing-in ramp. These detention ponds only have water seasonally. They are fenced such that animals do not have access and do not habituate themselves to the "water hole". These are regulated under separate Aquifer Protection Permits from the State of Arizona as are the septic systems.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

Installation Supplement

Geographically, DMAFB falls within the Tucson Basin and is located in the Sonoran Desert which is considered part of the Tropical-Subtropical Desertlands climatic zone. This climatic zone includes most of the world's deserts (yet interestingly does not include the adjacent Mojave and Chihuahuan deserts of the American Southwest; these deserts are considered Warm Temperate Desertlands). The deserts in this climatic zone all lie on or near the Tropic of Cancer or Tropic of Capricorn, and are the result of prevailing onshore winds that have either dropped their moisture or been sufficiently cooled by ocean currents to inhibit precipitation inland (Brown 1982). Rainfall in the Sonoran Desert is bimodal, averaging approximately 11.8 inches per year, with peaks during summer (July-September) and winter (November-March). Summer rains can be especially intense, resulting in short-duration, high-velocity floods, especially in higher order streams. In the Tucson Basin the average daily air temperatures range from approximately 71° F to 100° F during summer and from 37.4° F to 68° F during winter. Freezing temperatures are generally of short duration and snow occasionally falls in the Basin. The majority of the flora, in particular and to a certain extent, the fauna of the Sonoran Desert are adapted to these arid (xeric) conditions.

The Tucson Basin falls at the eastern central edge of the Arizona Upland Subdivision of the Sonoran Desertscrub Biotic Community. It is immediately adjacent to the Semi-desert Grassland biome above and the Lower Colorado River Valley Subdivision of the Sonoran Desert below (Figure 8). As such, DMAFB exhibits slight influences from adjacent subdivisions, in particular the Lower Colorado River Valley Subdivision; there are few if any influences from the Semi-desert Grassland biome. As an example of this, the extant native vegetation of DMAFB lies at the ecotone between the Paloverde-Cacti-Mixed Scrub Series and the Creosote-White Bursage Series (Brown 1982). In particular, elements of the Paloverde-Cacti-Mixed Scrub Series are found along and immediately adjacent to arroyos due to the increased moisture from ephemeral flows (considered xeri-riparian communities) and the intervening uplands support a flora more indicative of the Creosote-White Bursage Series (Figure 9).

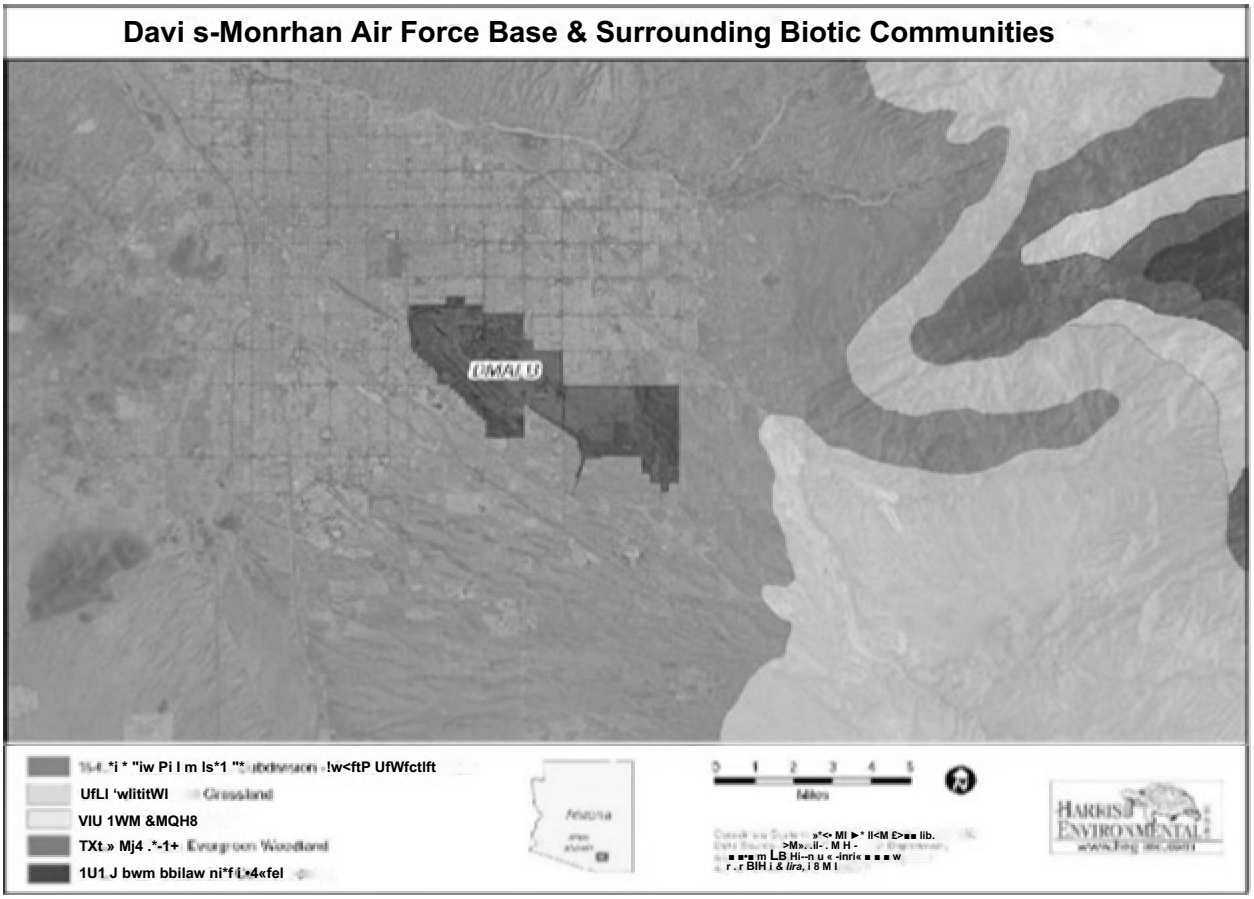


Figure 8. Davis-Monthan Air Force Base and Biotic Communities.

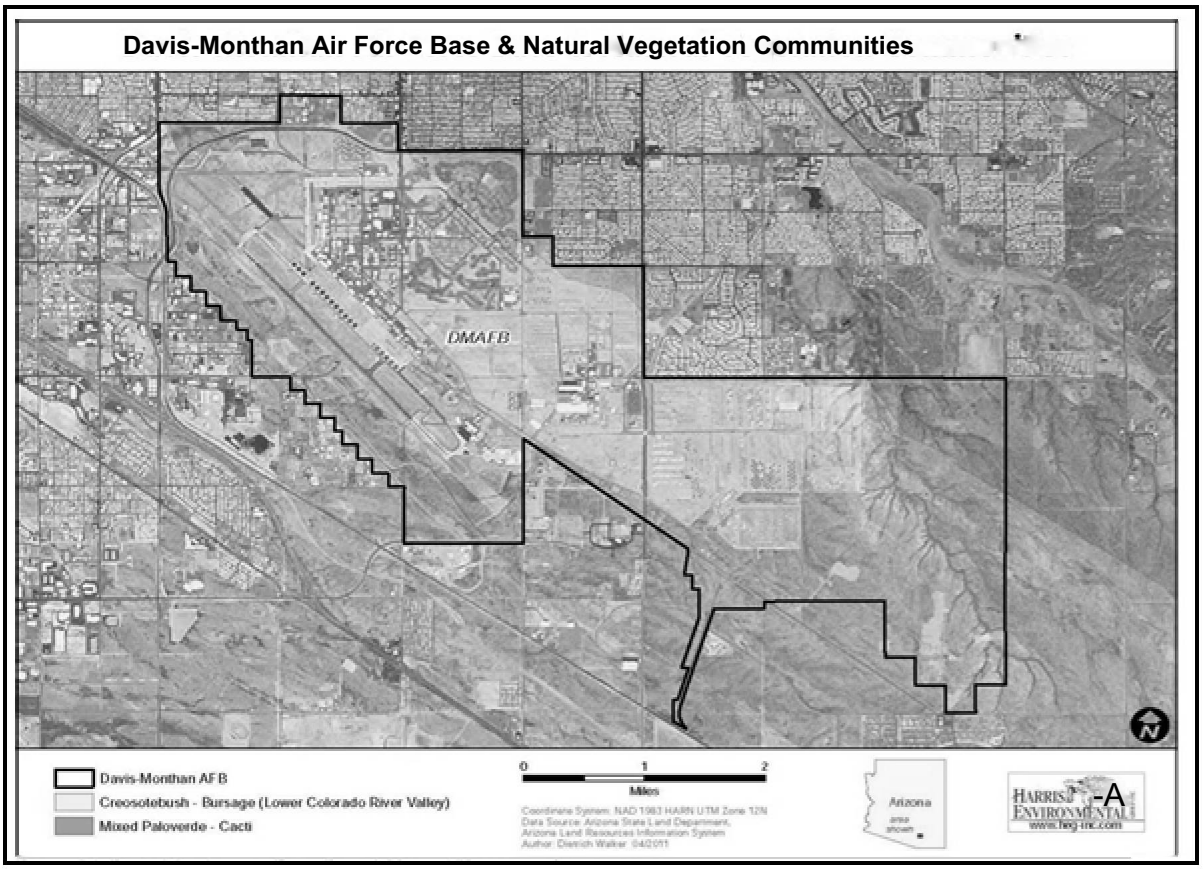


Figure 9. Davis-Monthan Air Force Base and Vegetation Communities.

2.3.2 *Vegetation*

2.3.2.1 Historic Vegetation Cover
Installation Supplement

Approximately 40 percent of the vegetation at DMAFB consists of relatively undisturbed native vegetation. The region of the Sonoran Desert has shifted in vegetation composition over the last approximately 130 years, primarily due to livestock grazing in the late 1800s and early 1900s. The historic vegetation cover is as described in section 5.1 above. Much of the remaining DMAFB is highly disturbed and has lost most of its original composition except in those isolated locations where Sonoran Desert native species have been used in landscaping. Grazing and other anthropogenic disturbances have altered the vegetative structure; and have led to the introductions of non-native plants, in particular some extremely invasive grasses. Native grasses in the Sonoran Desert consist of both perennial and annual species. In developed areas, the historic vegetative cover has been replaced with native and ornamental horticultural species used in landscaping and turf in recreational areas (Figure 10).

Figure 10. Davis-Monthan Air Force Base and Current Vegetation Cover

2.3.2.2 Current Vegetation Cover
Installation Supplement

The landscaped vegetation is present on the developed portion of the base. Both native and non-native plants have been used to landscape the base. Native plants present include agaves *(Agave* sp.); barrel *(Ferocactus* spp.), hedgehog *(Echinocereus* spp.), organpipe *(Cereus thurberi),* prickly pear *(Opuntia* sp.), Saguaro *(Carnegiea gigantea),* and senita cacti *(Pachycereus schottii);* blue and foothills palo verde *(Parkinsonia* spp.), Non-native plants include: junipers *(Juniperus* sp.), oleander *(Nerium* sp.), and pines *(Pinus* sp.), Mexican fan palms *(Washingtonia robusta),* and mesquite *(Prosopis juliflora, P. chilensis).*

Section 8.1 addresses the need to identify, manage, and protect distinct vegetation communities/wildlife habitats extant on DMAFB that are potentially important for species of conservation concern.

Natural Plant Communities

The vegetation of DMAFB contains elements of both subdivisions; more mesic drainage areas contain desert willow *(Chilopsis linearis),* mesquite *(Prospic sp.),* catclaw *(Acacia greggil),* seep *accharis salicifolia),* and palo verde *(Parkinsonia microphylla, P. florid).* The drier upland areas contain creosote bush *(Larrea tridentata),* white bursage *(Ambrosia dumosa),* burrowbush *(Hymenoclea monogyra),* saguaro *(Carnegia gigantea),* barrel cactus *(Echocactus wislizenii),* chainfruit cholla (Cylindropuntia fulgida), staghorn cholla (C. *vericolor),* and other species.

Of the base's 10,530 acres of land approximately 5,700 acres have been significantly altered by human activities (e.g., buildings, roads, airfields, and yards) and are considered developed, improved and semi-improved areas. The remaining acres are unimproved grounds of native Sonoran Desert vegetation. The unimproved areas consist primarily of three Sonoran Desertscrub communities: the Paloverde-Cacti-Mixed Scrub Series of the Arizona Upland Subdivision, the Creosote-White Bursage Series of the Lower Colorado River Valley Subdivision and Sonoran xeri-riparian series. Of the unimproved lands on DMAFB, the Creosote-White Bursage Series of the Lower Colorado River Valley Subdivision is dominant with scattered representatives of the Paloverde-Cacti-Mixed Scrub Series of the Arizona Upland Subdivision on higher, better drained soils.

The two subdivisions of plant communities most common in the Tucson/DMAFB area are the Arizona Upland and Lower Colorado Valley Subdivisions. DMAFB is located within the boundaries of the Arizona Upland subdivision, but due to proximity, similarity of vegetation, and topography aspects of the Colorado Valley Subdivision are evident. This is especially well-represented in low-lying portions of the Tucson Valley.

Arizona Upland Subdivision Community

The Arizona Upland Subdivision is variously referred to as the Arizona Desert, Paloverde-Cacti Desert, or the Cercidium-Opuntia Desert. Major portions of the subdivision occur on slopes, broken ground, and dissected sloping plains. It is the best watered, most arboreal, and least desert-like desertscrub in North America. The most common species include creosote bush *{Larrea tridentata),* foothill paloverde *{Parkinsonia microphylla),* saguaro *{Carnegiea gigantea),* staghorn cholla *{Cylindropuntia versicolor),* Engelmann prickly pear (O. *engelmannii),* barrel *{Echinocactus w is Ilze˙nil),* ocotillo *{Fouquieria splendens),* wolfberry *{Lycium* spp.), lotebush *{Ziziphus obtusifolia var. obtusifolia),* desert hackberry *{Celtis pallida),* and velvet mesquite *{Prosopis velutina).*

Lower Colorado Valley Subdivision Community

The Lower Colorado Valley subdivision is the largest subdivision of the Sonoran Desert; it also tends to be one of the more arid. Vegetation from this subdivision spreads gradually into adjacent subdivisions. The vegetation is distinguished by its simple composition, especially on the gravelly and sandy plains that make up a high percentage of the area. The two most common species are the creosote bush and white bursage *{Ambrosia dumosa).* The stature and abundance of plants increases along drainages (xeri-riparian communities); the most common species include burrow brush *{Ambrosia monogyra),* seep willow *{Baccharis salicifolia),* Anderson lycium *{Lycium andersonii),* and catclaw *{Acacia greggii).* Winter annuals are much more abundant in this subdivision than in any of the other regions of the Sonoran Desert.

Sonoran Xeri-Riparian Community

The third community type, Sonoran Desert Xeri-Riparian, can be found along Atterbury Wash and comprises a relatively small proportion of the total acreage of DMAFB. However, because of its structural complexity and spatial heterogeneity, this community serves the needs of several species. In and along drainages within the Sonoran Desert are scrublands of low to medium height (5 to 9.8 feet). The vegetation is denser than surrounding upland areas and the composition consists of more mesic -adapted species. Upland species found in these washes include baja desert-thorn *{Lycium richii),* catclaw, desert hackberry, and mesquite. The stream channel dominants are usually distinctively semi-riparian species such as seep willow, desert broom, mule fat *{Baccharis salicifolia),* and arrow-weed *{Pluchea sericea).* The deciduous desert willow is a common arboreal component, as is the increasingly prevalent exotic salt cedar *{Tamarisk* sp.). Fairly dense assemblages of shrubs occur along the banks including blue paloverde *{Parkinsonia* florida), jojoba *{Simmondsia chinensis),* desert lavender *{Condea emoryi),* and other Sonoran Desert species. Trees along the banks include mesquite, blue paloverde, catclaw, smoketree *{Psorothamnus spinosus),* and desert willow.

Atterbury Wash supports a xeri-riparian community and can be considered a focal point for the Base's species diversity. Due to the greater availability of food plants, cover, perching and nesting locations, and ephemeral water, many animal species are able to make use of the wash. Animals like the desert cottontail *{Sylvilagus auduboni),* Gambel's quail *{Callipepla gambelii),* doves *{Zenaida* sp.), the curved bill thrasher *{Toxostoma curvirostre),* Abert's towhee *{Melozone aberti),* canyon towhee *{Melozone fusca),* Say's phoebe *{Sayornis saya),* black-tailed gnatcatchers *{Polioptila melanura),* and other wildlife make use of Atterbury Wash and other washes in the Sonoran Desert (HDR 2015). Atterbury wash serves as a potentially important corridor for wildlife (e.g., deer, javelina, coyotes, bobcats, etc.) to move among the surrounding mountain ranges as well as between various distinctive valley bottom habitats. Figure 12 represents the vegetation communities in the unimproved areas of DMAFB and the Atterbury Wash structure.

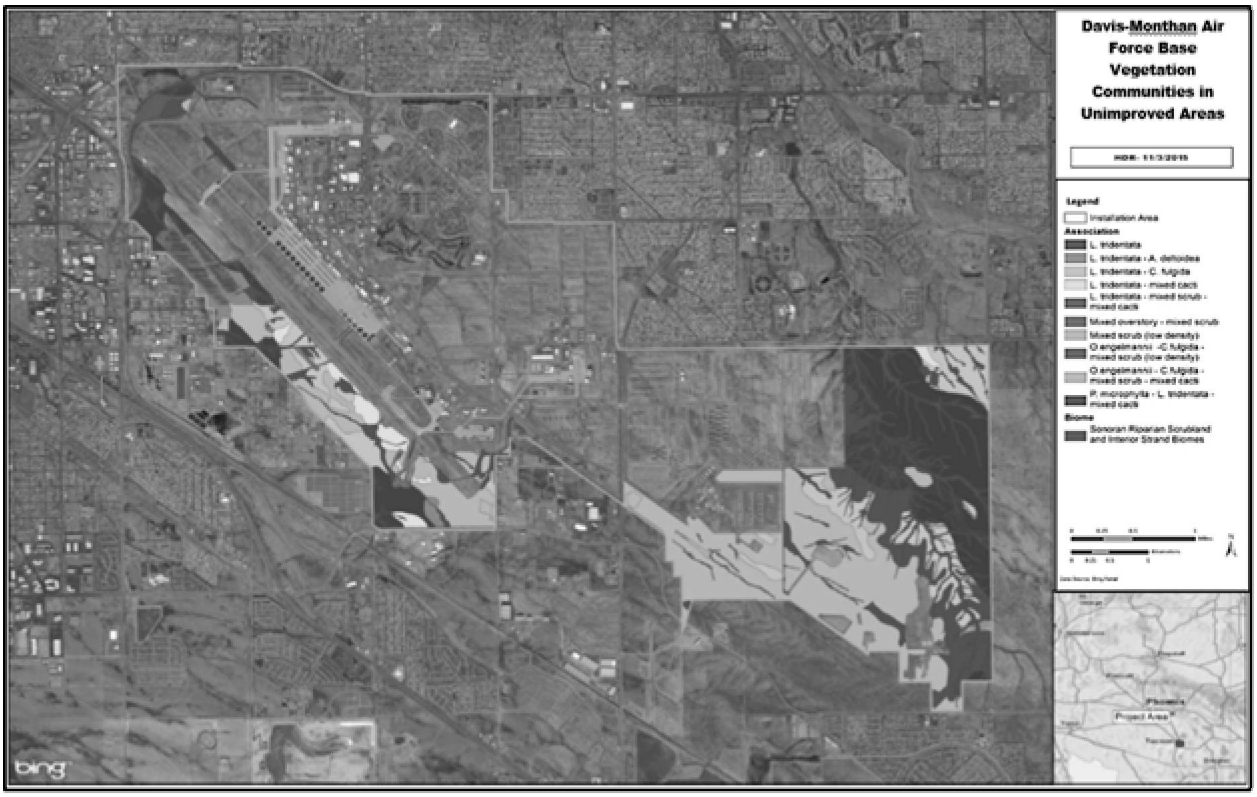


Figure 11. Davis-Monthan Air Force Base and Vegetation Communities in Unimproved Areas

2.3.2.3 Future Vegetation Cover
Installation Supplement

GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT): Describe how the application of projected climate scenarios may impact the vegetation associations for the ecological units within and surrounding the installation. Attach tables and graphics as necessary As indicated in AFMAN 32-7003, Chapters 3.10.2 & 3.10.3, include by reference Appendix X which should describe climate data sources, methods, and models.

2.3.2.4 Turf and Landscaped Areas
Installation Supplement

Landscaped Areas

Landscaping is not uniformly developed on DMAFB. Some areas are well-developed, such as the Chapel Center, the Airmen's Dining Hall, the Operations Building, and along Craycroft Road. Other areas lack landscaping altogether and consist of gravel beds without any vegetation whatsoever. Key landscape design standards at DMAFB include:

1) Limiting high water use plants;

2) Limiting turf areas;

3) Using water efficient irrigation;

4) Using passive rainwater harvesting;

5) Using xeriscape plants and design;

6) Integrating all landscape plans.

DMAFB use plants that are native to Arizona or native to the Southwest region as well as being low-water use plants for future landscaping projects. The Design Standards require that all plant materials be taken from the Arizona Department of Water Resources, Tucson Active Management Area approved low water use drought tolerant plant list.

DMAFB has developed a Landscape Planning document (Appendix H, Civil Engineering Standards) that ranks portions of the base according to several landscape zones, depending on the visibility or sensitivity of the area. This ranking determines the need and desirability to install, enhance or ignore landscaping at that location. Primary Zones are those areas perceived to be significant in establishing the visual quality and image of the installation. Such areas include the Main Gate, 12th Air Force Headquarters, Consolidated Support Center, Military Family Housing, Heritage Park, and Community Center Facilities. Secondary Zones include most of the already developed areas on the base: Civil Engineer Complex, dormitories, CSAR facilities, Phoenix Road side of the flight line, and the 41/43 Electronic Combat Squadrons (ECS) area. Tertiary Zones encompass those areas that will require very little to no long-term landscape development: POL storage tanks, the un-built area of Site 5, the operational side of the flight line, Hangar 8030, and the Control Tower. None of the natural areas of the base are included in these categories.

Mowed Grassland

The mowed grassland community is found throughout the installation, but mainly within and/or adjacent to the airfield, base housing, aircraft maintenance and regeneration center (AMARG), munitions storage, and recreational fields, and roadways. The grass in these areas is maintained to an extent that the height does not exceed one to three inches and is composed primarily of Lehmann's lovegrass and bermuda grass. Tumbleweed, Maltese star-thistle *(Centaurea melitensis),* desert broom and globemallow are scattered along the periphery of this community. Buffelgrass *(Pennisetum cilia re)* does occur within areas of the base and is recorded, managed and removed/treated through the use of the Installation Pest Management Plan (IPMP) (HDR 2015).

2.3.3 Fish and Wildlife

Installation Supplement

Native fauna at DMAFB consist of species adapted for survival in the hot, dry environment and is typical of the Sonoran Desert ecosystem. Surveys for endangered, threatened, candidate and sensitive species and their habitats have been performed within the DMAFB boundaries, most recently in 2015 and 2016, and continue to be an annual priority for compliance with the INRMP recommendations, when sufficient funding is available. Below provides a brief description of those species requiring special attention and protection as well as aspects of habitat preference. It must be noted that a species not specifically listed under the Endangered Species Act (ESA) or as an AZGFD Species of Greatest Conservation Need (SGCN) may be protected by other federal, state, or local regulations (e.g. Migratory Bird Treaty Act (MBTA), or Arizona Revised Statute (ARS) 17-314 and 3-903.

2.3.3.1 Wildlife Habitat

The diversity of habitat available on DMAFB provides opportunities for some species and restricts others, depending on their capability and propensity to tolerate human activities. The housing, grassy and landscaped areas offer water, which attracts and supports a wide range of avifauna, rodents, insects, and those species that prey upon them. Warehouses, large enclosures, and open aircraft in the storage areas can be attractive to bat and bird species, as well as bobcats and coyotes. Rodents burrow in open areas as well as beneath shrubs and rocks; resident and migratory avian species nest or roost in cacti, shrubs, and trees; and several reptile species which live in the area. However, Atterbury Wash is a hot spot for local faunal species diversity due to the presence of seasonal water, the greater cover, and consistency and density of the native vegetation.

2.3.3.2 Common Species

The Paloverde-Cacti-Mixed Scrub Series and the Creosote-White Bursage Series at DMAFB supports a wide range of resident and transitory species. Some of the more common bird and mammal species include Gambel's Quail, Roadrunner *{Geococcyx Californian us).* Mourning Dove *{Zenaida macroura),* Cactus Wren *{Campylorhynchus brunneicapillus),* black-throated sparrow *{Amphispiza bilineata),* coyote *{Canis latrans),* bobcat *{Felis rufus),* black-tailed jackrabbit *{Lepus californicus),* desert cottontail, Merriams kangaroo rat *{Dipodomys merriami)* and the round tailed ground squirrel *{Spermophilus tereticaudus)* (HDR 2015). As a result of the 2015 avian surveys, more than 50 species of birds were present or use the desertscrub community of the base, of which there were 556 individuals the most common being the house finch *{Carpodacus mexicanus)* (HDR 2015). Many of these individuals likely migrate to other locations seasonally, while other species probably reside on or near DMAFB year round (HDR 2015). Common reptile species from the 2015 reptile survey included the collared lizard *{Crotaphytus* sp.), desert spiny lizard *{Sceloporus magister),* greater earless lizard *{Cophosaurus texanus),* ornate tree lizard *{Urosaurus ornatus),* regal horned lizard *{Phrynosoma solare),* tiger whiptail *{Aspidoscelis tigris),* western banded gecko *{Coleonyx variegatus),* coachwhip *{Coluber flagellum),* gopher snake *{Pituophis catenifer),* and Mojave rattlesnake *{Crotalus scutulatus)* (HDR 2015). Invertebrates, including insects and spiders, are likely diverse across the DMAFB, as elsewhere in the Sonoran Desert.

Table 2 lists all bird species detected on DMAFB using bird point count survey data and raptor survey data collected during the 2014-2017 and historical raptor survey data collected during 1996-2003. The table provides common name, scientific name, 4-letter alpha-code, and conservation status. This list was compiled by Nora Clark, AZGFD, on 6/27/2020.

Table 2. DMAFB Comprehensive Bird List.

Common Name[1]	**Scientific Name**	**Code**	**Status[2-3]**
American Kestrel	*Falco sparverius*	AMKE	
American Pipit	*Anthus rubescens*	AMPI	
Anna's Hummingbird	*Calypte anna*	ANHU	
Ash-throated Flycatcher	*Myiarchus cinerascens*	ATFL	
Barn Swallow	*Hirundo rustica*	BASW	
Black-chinned Hummingbird	*Archilochus alexandri*	BCHU	
Black-chinned Sparrow	*Spizella atrogularis*	BCSP	PIF-D
Black-headed Grosbeak	*Pheucticus melanocephalus*	BHGR	
Black-tailed Gnatcatcher	*Polioptila melanura*	BTGN	
Black-throated Gray Warbler	*Dendroica nigrescens*	BTGW	
Black-throated Sparrow	*Amphispiza bilineata*	BTSP	
Brewer's Blackbird	*Euphagus cyacyanocephalus*	BRBL	
Brewer's Sparrow	*Spizella breweri*	BRSP	
Bronzed Cowbird	*Molothrus aeneus*	BROC	
Brown-crested Flycatcher	*Myiarchus tyrannulus*	BCFL	
Brown-headed Cowbird	*Molothrus ater*	BHCO	
Bullock's Oriole	*Icterus bullockii*	BUOR	
Burrowing Owl (Western subsp.)	*Athene cunicularia hypugaea*	BUOW	SGCN-1B

Cactus Wren	*Campylorhynchus brunneicapillus*	CACWR	
Canyon Towhee	*Melozone fusca*	CATO	
Cassin's Kingbird	*Tyrannus vociferans*	CAKI	
Chipping Sparrow	*Spizella passerina*	CHSP	
Common Raven	*Corvus corax*	CORA	
Common Yellowthroat	*Geothlypis trichas*	COYE	
Cooper's Hawk	*Accipiter cooperii*	COHA	
Costa's Hummingbird	*Calypte costae*	COHU	
Curve-billed Thrasher	*Toxostoma curvirostre*	CBTH	
Double-crested/Neotropical Cormorant	*Phalacrocorax auritus / P brasilianus*	DCCO/NECO	
Egret spp.[1]	*Ardea spp.*	n/a	
Eurasian Collared-dove	*Streptopelia decaocto*	ECDO	
European Starling	*Sturnus vulgaris*	EUST	
Ferruginous Hawk	*Buteo regalis*	FEHA	SGCN-1B
Gambel's Quail	*Callipepla gambelii*	GAQU	
Gila Woodpecker	*Melanerpes uropygialis*	GIWO	SGCN-1B
Gilded Flicker	*Colaptes chrysoides*	GIFL	PIF-D; SGCN - 1B
Great Blue Heron	*Ardea herodias*	GBHE	
Great-horned Owl[1]	*Bubo Virginian us*	GHOW	
Greater Roadrunner	*Geococcyx californianus*	GRRO	
Great-tailed Grackle	*Quiscalus mexicanus*	GTGR	
Green-tailed Towhee	*Pipilo chlorurus*	GTTO	
Hairy Woodpecker	*Leuconotopicus villosus*	HAWO	
Harris's Hawk	*Parabuteo unicinctus*	HASH	
Hepatic Tanager[1]	*Piranga flava*	HETA	
Hooded Oriole	*Icterus cucullatus*	HOOR	
Horned Lark	*Eremophila alpestris*	HOLA	
House Finch	*Haemorhous mexicanus*	HOFI	
House Sparrow	*Passer domesticus*	HOSP	

House Wren	*Troglodytes oedon*	HOWR	
Killdeer	*Charadrius vociferus*	KILL	
Ladder-backed Woodpecker	*Picoides scalaris*	LBWO	
Lark Bunting	*Calamospiza melonocorys*	LARBU	
Lark Sparrow	*Chondestes grammacus*	LASP	
Lazuli Bunting	*Passerina amoena*	LABU	
Lesser Goldfinch	*Carduelis psaltria*	LEGO	
Lesser Nighthawk	*Chordeiles acutipennis*	LENI	
Loggerhead Shrike	*Lanius ludoviclonus*	LOSH	
Lucy's Warbler	*Oreothlypls luciae*	LUWA	
Merlin[1]	*Falco columbarius*	MERL	
Mountain Bluebird	*Slalla currucoides*	MOBL	
Mourning Dove	*Zenaida macroura*	MODO	
Northern Flicker	*Colaptes auratus*	NOFL	
Northern Harrier	*Circus cyaneus*	NOHA	
Northern Mockingbird	*Mimus polyglottos*	NOMO	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	NRWS	
Orange-crowned Warbler[1]	*Vermivora celata*	OCWA	
Osprey	*Pandion haliaetus*	OSP	
Peregrine Falcon	*Falco peregrinus*	PEFA	SGCN-1A
Phainopepla	*Phainopepla nitens*	PHAIN	
Plumbeous Vireo	*Vireo solitarius*	PLVI	
Prairie Falcon	*Falco mexicanus*	PRFA	
Purple Martin (Desert subsp.)	*Progne subis hesperia*	PUMA	SGCN-1B
Pyrrhuloxia	*Cardinalis sinuatus*	PYRR	
Red-naped Sapsucker	*Sphyrapicus nuchalis*	RNSA	
Red-tailed Hawk	*Buteo jamaicensis*	RTHA	
Rock Pigeon	*Columba livia*	ROPI	
Rock Wren	*Salpinctes obsoletus*	ROWR	

Ruby-crowned Kinglet	*Regulus calendula*	RCKI	
Rufous-crowned Sparrow	*Aimophila ruficeps*	RCSP	
Rufous-winged Sparrow	*Peucaea carpalis*	RWSP	PIF-D; SGCN-1B
Savannah Sparrow	*Passerculus sandwichensis*	SASP	SGCN-1B
Say's Phoebe	*Sayornis saya*	SAPH	
Song Sparrow	*Melospiza melodia*	SOSP	
Spotted Towhee	*Pipilo maculatus*	SPTO	
Swainson's Hawk	*Buteo swainsoni*	SWHA	
Tree Swallow	*Tachycineta bicolor*	TRSW	
Turkey Vulture	*Cathartes aura*	TUVU	
Verdin	*Auriparus flaviceps*	VRDN	
Vermillion Flycatcher	*Pyrocephalus rubinus*	VEFL	
Violet-green Swallow	*Tachycineta thalassina*	VGSW	
Virginia's Warbler	*Leiothlypis virginiae*	VIWA	PIF - D
Warbling Vireo	*Vireo gilvus*	WAVI	
Western Bluebird	*Sialia mexicana*	WEBL	
Western Kingbird	*Tyrannus verticalis*	WEKI	
Western Meadowlark	*Sturnella neglecta*	WEME	
Western Tanager	*Piranga ludoviciana*	WETA	
White-crowned Sparrow	*Zonotrichia leucophrys*	WCSP	
White-throated Sparrow	*Zonotrichia albicollis*	WTSP	
White-winged Dove	*Zenaida asiatica*	WWDO	
Wilson's Warbler	*Cardellina pusilia*	WIWA	
Yellow Warbler	*Setophaga petechia*	YEWA	SGCN-1B
Yellow-rumped Warbler	*Dendroica coronata*	YRWA	

[1] Species detected as incidentals between standardized survey points; otherwise, all other species were detected at standardized bird point counts.

[2] Partners In Flight priorities for conservation; PIF-D are on the "D" Yellow Watch List meaning the Population Goal is to Reverse Decline.

[3] Arizona Game and Fish Department Species of Greatest Conservation Need Tier 1A and Tier 1B species.

Status Definitions from AGFD SWAP 2012

- *Tier 1A* contains those species for which the Department has entered into an agreement or has legal or other contractual obligations, or warrants the protection of a closed season.
- *Tier IB* represents the remainder of the vulnerable species.

Sources

- Sources used to compile this comprehensive bird list:
    - Annual 2014-2017 AGFD bird point count and raptor survey reports. The historic raptor data for 1996-2003 was referenced in a 2015 AGFD report.
- Source of alpha codes and scientific names:
    - www.birdpop.org Accessed June 26 2020. Pyle, P., and D.F. DeSante. Four-letter (English Name) and Six-letter (Scientific Name) Alpha Codes for 2154 Bird Species (and 108 Non-Species Taxa) in accordance with the 60th AOU Supplement (2019), sorted alphabetically by English name. The Institute for Bird Populations.
- Sources for conservation status:

o https://partnersinflight.org/resources/pif-watch-list-table-2016/ Accessed June 26, 2020. PIF Watch List Table 2016.
    - Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan: 2012-2022. Arizona Game and Fish Department, Phoenix, Arizona.

General Notes

- I omitted some species that were found in previous reports but need to be scrutinized further before including them on the comprehensive bird list for the DMAFB INRMP. An in-depth evaluation of data from previous years in this instance can be completed during winter 2020.

At a future date, this list could be improved for the reader if columns were added which specify such parameters as common, uncommon, incidental, transient, and/or breeding/winter/migrant. Obviously some of these species are transients and uncommon and thus are not present at DMAFB on a regular basis. Again, this can be completed during winter 2020.

2.3.4 Threatened and Endangered Species and Species of Concern

Installation Supplement

Because species populations are constantly fluctuating, it is difficult to collect and maintain precise data to monitor changes in population parameters of interest (e.g., population density, survivorship of offspring). Lack of resources, both financial and personnel, prevents regular surveys of species of conservation and management concern. However, DMAFB shall continue to survey for threatened, endangered, and candidate species, as well as maintain or enhance potential suitable native habitat.

The potential occurrence of each listed species based on their habitat requirements and the vegetation communities present at DMAFB are discussed in this section.

2.3.4.1 Federal Endangered, Threatened or Candidate Species

Pima Pineapple Cactus *(Coryphantha scheerl* var. *robustlsplna}*

Pima pineapple cacti (PPC) are listed as endangered by the USFWS and are protected by the State of Arizona Native Plant Law as a highly safeguarded plant. Pima pineapple cacti typically occur in alluvial basins or on hillsides in semi-desert grassland and Sonoran desertscrub in southern Arizona and northern Mexico. Soils range from shallow to deep, and silty to rocky, with a preference for silty to gravely deep alluvial soils. The plant occurs most commonly in open areas on flat ridge tops or areas with less than 10-15% slope (USFWS 2000).

Sonoran desertscrub is widespread in the undeveloped areas of DMAFB, falling on the eastern edge of the installation near the small arms range and EOD training area. This cactus is also known to occur at several localities within a few miles of the base. All undeveloped land on DMAFB was surveyed in 1990 and selected areas (400 acres) of sub-optimal habitat were re-surveyed in 2009 by AZGFD. As a result, no PPC were located. Surveys were conducted again in 2015 in undeveloped area which potentially provide suitable or marginally suitable habitat for the species. Again, no PPC were located.

Pima pineapple cacti are difficult to detect, and surveys often require multiple passes through an area (> 3 passes) from different directions in order to search with varying light angles (Appendix I, USFWS PPC survey protocol). Considering the close proximity of local populations, there is a moderate to high potential that PPC may occur on DMAFB, especially in the eastern undeveloped area where bajadas occur that support Sonoran desertscrub and well-drained soils. Specifically, marginally suitable habitat was observed within the smalls arms range, EOD Training Area, and suitable habitat was documented south of the small arms rang and west of the airfield (HDR 2015).

Pima pineapple cactus are thought to be in decline due to loss and degradation from grazing and associated range management practices, urban development, off-road vehicle use, competition from non-native grasses (e.g., buffelgrass *(Pennisetum ciliare)* and Lehmann lovegrass *(Eragrostis lehmanniana)),* and illegal collecting.

Nichol's Turk's Head Cactus *(Echinocactus horizonthalonlus* var. *nicholli)*

The Nichol's Turk's head cactus (NTHC) is listed as endangered by the USFWS. The NTHC occurs within elevation ranges of 2,400 to 4,100 feet. Potential habitat is present in unshaded microsites within the Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains and on inclined terraces and saddles of limestone mountainsides (USFWS 2019). The small barrel like cactus is blue-green to gray-green in color and ranges from 16 to 20 inches in height and 5 to 8 inches wide. Individuals are distinguishable by the pink to red flower which bloom near the apex of the single stem with 8 ribs.

The current known range of the species is within southwestern Pinal and north-central Pima counties, Arizona. Specifically, according to the NTHC Recovery Plan of 1986 and the USFWS five year review of 2009, individuals have been recorded in lands managed by the Tohono O'odham Nation, Arizona State Trust land managed by the Arizona State Land Department, private lands and the Waterman Mountains falling within the Ironwood Forest National Monument managed by BLM. Surveys have not been conducted in these areas to determine the population size.

In 1988 the Habitat Management Plan (HMP) for the protection of the NTHC was developed by the BLM for implementation within BLM administered lands in the Waterman Mountains, Pima County, Arizona (USFWS 2009). The Waterman Mountains were then designated the Waterman Mountains Area of Critical Environmental Concern to prioritize habitat protection and future land-use planning. In addition, the federal lands encompassed within the Ironwood Forest National Monument are managed primarily for conservation, protection and preservation purposes (USFWS 2009).

While habitat for the NTHC does not occur on the DMAFB installation, habitat is present within the offsite Interpretive Titan II Missile Site 12 which is located in the Waterman Mountains and the Ironwood Forest National Monument. A vegetation classification and mapping survey of the site was completed by AZGFD in Oct 2019, in the survey the presents of the NTHC was verified in Table 2 (P5) (Stingelin, A. 2019). A more detailed survey is scheduled to be completed in the spring of 2020.

Table 3 identifies Federal endangered, threatened or candidate species that do not occur on DMAFB or for which there is no suitable habitat or DMAFB is well outside the species range.

Table 3. Federal endangered, threatened or candidate species that do not occur on DMAFB

Species	Status	Does not Occur	No Suitable Habitat	Outside Species Range
Bald Eagle *(Haliaeetus* leucocephalus)	Protected by the MBTA and Bald and Golden Eagle Protection Act	X	X	

Golden Eagle	Protected by the MBTA and Bald and Golden Eagle Protection Act	X	X	
Northern Mexican Gartersnake *(Thamnophls eques megalops)*	Threatened	X	X	X
Sonoyta Mud Turtle *(Kinosternon sonoriense longlfemorale)*	Endangered	X	X	
California Least Tern *(Sterna antillarum browni)*	Endangered	X	X	
Southwestern Willow Flycatcher (Empidonax traillii extimus)	Endangered	X	X	
Yellow-billed Cuckoo *(Coccyzus americanus)*	Threatened	X	X	
Jaguar *(Pa nt he ra onca)*	Endangered	X	X	

23.4.2 AZGFD Wildlife Species of Greatest Conservation Need and US Forest Service Sensitive Species

California Leaf-Nosed Bat *(Macrotus californicus)*

The California leaf-nosed bat is a year-round resident of Arizona, occurring south of the Mogollon Plateau mostly within Sonoran desertscrub (AZGFD 2014). The species does not hibernate nor migrate. Natural roosting habitat includes caves and mines; the bats are also not known to roost in man-made structures (Noel 1993). The AZGFD's Heritage Data Management System shows most of the occurrences of California leaf-nosed bats are west of Tucson and DMAFB, Tucson being the eastern extent of the species' distribution (HDR 2015).

The absence of natural roosting habitat may make its presence on base unlikely. However, due to its range and available desertscrub habitat in unimproved areas, the California leaf-nosed bat may use DMAFB for foraging activities.

Mexican Long-tongued Bat *(Choeronycteris mexlcana}*

Mexican long-tongued bats inhabit mesic areas in canyons of mixed oak-conifer forests in mountains rising from the desert. They occur in Arizona as far north as the Santa Catalina Mountains. The species prefers caves and abandoned mines with dimly lit areas near the entrance for roosting. They may also be found in shallow caves or rock shelters. Mexican long-tongued bats could potentially occur in the area from late summer to early fall, and have been documented foraging at hummingbird feeders in and around Tucson. (Fleming 2012).

There is no roosting habitat for this species on DMAFB. Stored aircraft in the AMARG become too hot during the day to be used as roosting sites by bats. The bats feed primarily on fruit, pollen and nectar of night blooming plants (e.g., Saguaros and agaves), and sometimes insects. Feeding habitat is scarce at DMAFB and foraging Mexican long-tongued bats would have a low potential of occurring on the installation.

Spotted Bat *(Euderma maculatum)*

The spotted bat is one of the most distinctly colored bats in the US. It is distinguishable by its large pink ears, blackish coloration with large white spots on each shoulder, rump, and base of each ear (USDA 2007). The US Forest Service lists the species as sensitive and it is widely considered as a rare species, considered uncommon even within regions where they are known to occur. Its seasonal movements are not well understood, but it has been recorded from northwestern Mexico to southern Canada, likely hibernating in winter or moving into lower elevations supporting a combination of hibernation and winter feeding activity. The Spotted bat has been documented in New Mexico, Arizona, Nevada, Utah, California, Colorado, Idaho, Oregon, Washington, Montana and Wyoming (Montana Natural Heritage Program 2019).

Spotted bats rely on crevices and caves in tall cliffs for roosting, occasionally roosting in conifers and aspens. The species foraging habitat is variable and may consist of marshes, meadows, and riparian areas within open arid habitats to high-elevation mountain habitats ranging from below sea level to over 10,000 feet (Oregon Wildlife Institute 2016). Vegetation types which support moths, a key diet component likely suitable. The species has been recorded in subalpine meadows in northern Arizona as well as desert scrub communities in Nevada and eastern California.

DMAFB habitat does not provide roosting opportunities, but may be likely to support foraging activities along the Atterbury Wash and other drainages on base. Surveys conducted by the Center for Integrated Research on the Environment in coordination with the University of Montana between July 2016 and January 2019 to evaluate bat occurrences among several air force base locations, detected the potential presence of the Spotted bat near survey point UM-AZDM-05 located along a drainage southeast of the air field, see Appendix S. The bat was detected through acoustic monitoring but was unable to be manually confirmed.

Western Red Bat *(Lasiurus blossevillii)*

The western red bats is a medium sized bat, ranging from bright orange to yellow-brown with white tipped hairs, and short rounded ears. It may be distinguished from other bats by its rounded ears and long tail membrane. The bat is generally distributed in south central to southern and southeastern Arizona (AZGFD 2011). Historically is has been observed from the Grand Canyon, Sierra Ancha, Queen Creek, San Pedro Valley, Santa Rita Mountains, Canelo Hills, Huachuca and the Peloncillo mountains. The species may be present in Arizona from May through September. The Western red bat is listed by the US Forest Service as sensitive species.

The western red bat's preferred habitat includes riparian and wooded areas. Day roosts are in trees approximately 40 feet or more in height. Typically, they may hunt 1800-3000 feet from roosting locations (AZGFD 2011). Although DMAFB does not have wooded areas, the various palm trees on base may provide roosts for them. According to the U.S. Air Force Bat Acoustic Survey conducted by the Center for Integrated Research on the Environment in coordination with the University of Montana from July of 2016 through January of 2019, the western red bat was one of the 12 bat species confirmed to be on site between the months of April through July (USAF 2019).

Western Yellow Bat *(Lasiurus xanthinus}*

Western yellow bats are found throughout southern Arizona and are known to occur in the Tucson area. They are likely a year-round resident in the region. This species is often associated with palm trees and appear to prefer native California fan palms *(Washingtonia filifera).* They feed on insects and do not forage far from their roosts. Due to the proximity of observations in Tucson, the presence of fan palms on DMAFB, and their feeding habits, western yellow bats have a high potential for occurring on the base. This species will be closely considered when landscape management of fan palms on base occurs (e.g., pruning existing palms and planting new palms). Currently the population status of western yellow bats is not well known. Likely threats include the disturbance (e.g., burning, pruning) of both native and non-native landscape palms.

In the past, specimens from southern Arizona and northern Mexico were assigned to *L. ega xanthinus,* a smaller and lighter colored subspecies than *L.* e. *panamensis* from southern Mexico, and southern Texas. Genetic studies resulted in elevating *L.* e. *xanthinus* to species level and applying to it the name *Lasiurus xanthinus* (Baker *et alA988).* The reclassification of this genus of bat means occurrences of southern yellow bat are actually western yellow bats (AZGFD 2011c).

Cactus ferruginous pygmy-owl *(Glaucidium brasilianum cactorum)*

The cactus ferruginous pygmy-owl (CFPO) is protected under the Migratory Bird Treaty Act (MBTA) and is a state-listed SGCN (AZGFD 2012). The ESA status for the Arizona Distinct Population Segment (DPS) was rescinded in 2006 (USFWS 2006) and ratified in 2007. Following these actions, Defenders of Wildlife and the Center for Conservation Biology petitioned the USFWS to re-establish the endangered status for CFPO. In June 2008, the USFWS announced its plans to initiate a 12-month finding of the owl's status (USFWS 2008b). The 12-month finding concluded in October 2011 determining the western subspecies of the cactus ferruginous pygmy-owl was not a valid taxon and, therefore, not eligible for listing under the ESA; it also states that the owl does now warrant listing throughout all or a significant portion of its range (Doi 2011). There is a 2012 lawsuit to list the species as endangered and the USFWS is currently performing a species review.

The cactus ferruginous pygmy-owl, as its name infers, is a diminutive plain light brown bird with occasional white spots on the upper wing. It can be found through the southwestern U.S. and into Mexico. Pygmy-owls in Arizona are found in Sonoran desertscrub communities, such as dense thickets bordering dry desert washes consisting of palo verde *(Parkinsonia* spp.), ironwood *(Olneya tesota),* mesquite *(Prosopis* spp.), and Saguaro *(Carnegiea gigantea),* and in streamside cottonwoods *(Populus deltoides),* willows *(Salix* spp.) and adjacent mesquite bosques (AZGFD 2001). They commonly nest in old woodpecker cavities within Saguaros (National Geographic Society 1987). A few widely scattered saguaros with old woodpecker cavities occur along Atterbury Wash in the vicinity of the small arms shooting range. The proximity of these possible nesting sites to the range creates a risk that the owls could ingest lead shot or prey that has ingested lead shot and succumb to acute lead toxicosis. The highest quality nesting and foraging habitat for this species on DMAFB is located along Atterbury Wash (USFWS 2005).

Vegetation removal directly and indirectly affects CFPO by creating or enlarging open areas that CFPO evidently avoid, to reduce exposure to predation. Such open areas restrict movement because flight distances rarely exceed 100 feet (30.5 m) (USFWS 2002). As such, reasons for decline of cactus ferruginous pygmy owls is currently unknown.

Ferruginous Hawk *(Buteo regalls}*

Ferruginous hawks are protected under the MBTA and ARS 17-236. They are classified as uncommon to rare nesters in the grasslands of northern and west central Arizona (Arizona Game and Fish Department) and, therefore, would only be expected to occur as migrants or winter residents at DMAFB. Marginal feeding and roosting habitat for migratory and wintering ferruginous hawks can be found on DMAFB including open, disturbed, grassy areas such as AMARG which supports a large population of ground squirrels, one of the preferred prey sources of the ferruginous hawk. Old aircraft parked in AMARG provide feeding and roosting perches for raptors. In addition, foraging habitat is present north and west of the airfield. Migrant and winter resident ferruginous hawks would have a moderate to high probability of occurring on DMAFB and their presence on the installation has been recorded during raptor surveys conducted by AZGFD personnel.

American Peregrine Falcon *(Falco peregrinus anatum)*

The American Peregrine Falcon was listed as an endangered species by USFWS, but was removed from the list of endangered and threatened wildlife in 1999 due to recovery of the species (USFWS 2019). The falcon is still protected under the MBTA and is considered a Bird of Conservation Concern by USFWS (USFWS 2019). It is also protected under ARS 17-236, the Arizona state statute for the taking and possession of raptors. Nesting habitats for the American peregrine falcon include large cliffs and steep terrain overlooking forests or riparian areas. Peregrines are also known to occupy and breed in large urban areas with sufficient prey abundance. While present in nearby mountains, there are no nesting sites within or adjacent to the DMAFB. Arizona contains both year-round resident individuals and migrating peregrines (AZGFD 2002). Peregrine falcons feed primarily on birds and hunt mainly over grasslands, meadows, and open country (National Geographic Society 1987). Suitable prey sources for peregrine falcons, such as relatively large concentrations of rock doves *(Columba llvla),* are present in AMARG and the developed areas of DMAFB. Spring or fall migrant American peregrine falcons would have a low to possibly moderate potential of occurring on DMAFB, however none been recorded during raptor surveys conducted by AZGFD personnel.

2.3.4.3 Other Species of Conservation Concern on DMAFB

Lesser long-nosed bat *(Leptonycterls curasoae yerbabuenae}* SGCN 1A

The lesser long-nosed bat was formally listed as an endangered species by the USFWS but was later delisted in 2018 due to the threats of the subspecies being eliminated or reduced to the point that the bat has recovered and no longer meets the definition of endangered or threatened under the ESA (USFWS 2019).

Lesser long-nosed bats occur in arid desertscrub habitats from Central America to the southwestern region of the U.S. Populations in northern Mexico and the southwestern U.S. are migratory, and are present from late May through early September. The lesser long-nosed bats roosts in caves, abandoned mines/tunnels, and saguaro cavities (Voyles 2011). Potential natural roost sites, in the form of saguaro cavities, are available at DMAFB. Therefore, permanent roosts of lesser long-nosed bats could occur at DMAFB. Potential man-made roost sites, in the form of stored aircraft fuselages, are also abundant. Potential maternity locations need to stay below 90° F to be used for roosting (Noel 1993). The daytime internal temperature of the aircraft would become too hot by late spring to be used as successful maternity roosts. While these man-made roost sites would not serve as permanent roosts, lesser long-nosed bats could use the aircraft for temporary night roosts while feeding.

The lesser long-nosed bat feeds on the flowers of agaves and large columnar cacti such as saguaro, organpipe, and senita cactus. Hummingbird feeders also serve as a potential food resource in the area. Pregnant females arrive from Mexico in May and maternity colonies occur primarily in the western part of the bat's range where saguaros are abundant. Later, males, females, and juveniles move to the agave dominated areas in the eastern part of the bat's range. Lesser long-nosed bats could use DMAFB for feeding, but would more likely be found in outlying areas where a greater abundance of food resources exists.

Cave myotis *(Myotis velifer)* SGCN 1B

The cave myotis roosts in caves, mines, buildings, bridges, and culverts south of the Mogollon Plateau (Hoffmeister 1986). This species forages in desertscrub habitats just above the vegetation. Although cave myotis are known to migrate south for hibernation, they have been recorded overwintering in southern Arizona.

This species would likely not occur on DMAFB during daylight hours due to a lack of suitable roosting habitat. The cave myotis is known to occur within 1.24 miles (2 kilometers) of the installation; therefore, the potential for this species foraging at DMAFB would be high. DMAFB should consider this species and its habitat when prioritizing management strategies.

Burrowing Owl *(Athene cun leu la ria ssp. hypugaea)* SGCN 1B

The burrowing owl (BUOW) is protected under the MBTA (USFWS 2011b) and ARS 17-236. The bird is listed by USFWS as a Bird of Conservation Concern in Bird Conservation Region (BCR) 33, which includes the U.S. portion of the Mohave and Sonoran Deserts (USFWS 2008a). The species nests in burrows in open ground and prefers open plains, prairies, and fields. It is often seen by day standing on the ground and on fence posts. Burrowing owls tend to use the same burrows over the course of multiple years, and also use satellite burrows. The species is found from Canada to Florida and as far south as the tip of South America. Northern populations migrate south during the winter.

Since burrowing owls do not dig their own burrows but rely on those dug by fossorial mammals (e.g. ground squirrels), burrowing owls depend on their burrow year-round for survival. This differs from tree-nesting birds that rebuild a new nest if their former nest is destroyed. To comply with the MBTA and specifically, the Nest Destruction Policy of the MBTA, DMAFB will coordinate closely with USFWS and AZGFD to address potential project impacts to the owl for projects proposed within habitat occupied by burrowing owls.

The burrowing owl program on DMAFB is one of the more visible and active protected species programs at DMAFB. The base population is dynamic from year to year but stays at approximately 50 active burrows. DMAFB has worked closely with the AZGFD to monitor this species. Research of BUOW has included burrow site selection (Estabrook 1999), demography (Conway and Ellis 2004), survivorship and movements of juveniles (Grandmaison and I ngraldi 2008), migratory behavior (Ogonowski and Conway 2006), and linkages of BUOW on DoD installations and adjacent lands (DoD 2010), BUOW nest site distribution (Abbate, Hofer, Lowery 2014, 2016, 2018).

Swainson's Hawk *(Buteo swalnsoni)* SGCN 1C

Swainson's hawk are protected under the MBTA and ARS 17-236. Their habitat consists of prairies, rangeland, desert, and brush areas. The species breeds in western North America and migrates to Argentina for the winter. They build platform nests of branches and twigs and often re-use nests from previous seasons (up to 50 % re-use). Minor disturbances in the vicinity of nests have occasionally led to nest abandonment (Ehrlich 1988).

Before 1997, one pair nested on the base in the vicinity of the airfield and was the only known pair in Pima County. Nesting pairs are usually found in the vicinity of the airfield. The pair raised two chicks on the base. Both chicks and the adult male were banded; the adult female was not. In 1997, two Swainson's hawk nests were documented on DMAFB. One had three male chicks and the other had one male chick and one female chick. All five were banded. It could not be determined whether either adult male was the one observed at DMAFB before 1997. Since 1997, one to two pairs have nested per year on the base. The birds are monitored closely and if their presence shows signs of danger or risk to airfield operations, steps are taken to relocate the nest out of harm's way. DMAFB contracts with AZGFD to conduct periodic migratory bird surveys and document any potential occurrences. Raptor nesting and observation locations from the survey can be seen in and Figure 12 and Figure 13.

Figure 12. Davis-Monthan Air Force Base 2015 Raptor Nest Locations.

Figure 13. Davis-Monthan Air Force Base 2015 Raptor Observation Locations.

Cooper's Hawk *(Acclpiter cooperii)*

Cooper's hawk is protected by the MBTA and is protected and managed under Commission order 25 (falconry) and under the AZGFD's live wildlife rules (Voyles 2011). The species occurs throughout the U.S. and into southern Canada. Habitat includes coniferous forests, riparian areas, wooded areas, and more recently, urban areas. Cooper's hawks hunt small mammals and birds using stealth and bursts of speed to capture prey.

Historically, several pairs of Cooper's hawks have nested on the installation. In 2015, 10 Cooper's hawks were observed during raptor surveys in a variety of habitats on the installation. One nest was noted in a coniferous tree within the residential Land Use Affinity (LUA) in 2015 (HDR 2015). Figure 14 shows the locations of the avian point count locations used in 2015.

Figure 14. Davis-Monthan Air Force Base 2015 Avian Point Count Locations.

Great Horned Owl *(Bubo virginianus}*

Great horned owl is protected by MBTA and ARS 17-236, and is managed under Commission order 25 (falconry). Habitat for this species includes woodlands, canyons, stream sides, and deserts. There are many active nests on DMAFB. There are historic nests in AMARG, including an old nest in the eastern part of the base. Other possible nests are on or near the firing range, creating a risk that owls could ingest lead shot or prey that has ingested lead shot and succumb to acute lead toxicosis.

Loggerhead Shrike *(Lanius ludovicianus}*

Loggerhead shrikes are protected by MBTA. The species tends to nest and feed in small to mid-sized trees in open areas, and in open or brush areas with short to mid-level grasses. Such areas are present on the base. Potential habitat includes areas adjacent to the west side of the airfield, part of the EOD area, AMARG, and north of the airfield along the edge of an old riparian corridor. Resident and migratory loggerhead shrikes would be expected on DMAFB.

Mountain Plover (Charadrius montanus)

The mountain plover is protected by the MBTA. Mountain plovers winter in California, southern Arizona, Texas, and Mexico (USFWS 2011c). Species generally spends five months on wintering grounds annually (AZGFD 2010a). Potential wintering grounds on DMAFB include turf areas such as the golf course and airfield.

Sonoran Desert Tortoise *(Gopherus morafkai)* SGCN 1A

The Sonoran Desert tortoise was previously listed as a candidate species by USFWS, but was later removed from consideration as endangered or threatened in 2015 finding that the tortoise has not experienced any appreciable reduction in its overall range or abundance relative to presumed historical levels, and the amount and distribution of its habitat supports sufficient resiliency to sustain the species into the near future (USFWS 2010b; DoD 2015). The Sonoran desert tortoise is currently listed as sensitive by U.S. Forest Service (USFS) and BLM, and is an SGCN (AZGFD 2019).

In 1990, desert tortoise surveys were conducted on all undeveloped land on DMAFB (Taiz 1990). No desert tortoises were located; however, detectability can be low in areas that have sub-marginal habitats and low population densities. These areas may require multiple surveys in order to detect tortoise individuals or indicators of their presence (i.e., scat and shelter sites). The habitat within DMAFB is characterized as inter-mountain valley floor with flat sandy washes and minimal topographical relief. Sonoran Desert tortoises are closely associated with rocky bajadas (lower slopes of mountains) and hillsides, and, to a lesser extent, flat areas (including incised washes between or adjacent to flat terrain) (Riedle et al. 2008).

In 2020, Arizona Game and Fish Department will conducting a survey for the Nichol's Turks' Head Cactus on the Titian Missile Silo 570-3 in Avra Valley, Arizona, discovered a Desert Tortoise carcass that had been intentionally cut open (Clark, Grandmaison, Ingraldi, 2020). This discovery will develop into a future project to determine the status of the population of the Desert Tortoise on the site.

Habitat for the species includes palo verde (Parkinsonia spp), mixed cactus, desert grassland habitat, and caliche caves in banks of dry washes. There is a low to moderate potential that suitable habitat for desert tortoise occurs on Atterbury Wash located in the southeastern portion of DMAFB. This wash, especially near the head of the drainage, has the greatest likelihood of having exposed caliche and associated shelter sites. Surveys, when funding availability is present, are recommended within potential areas near Atterbury Wash that may have habitat components for cover, forage, or that support movement of tortoises between the Rincon Mountains and DMAFB.

Potential causes of the decline of Sonoran desert tortoises throughout their range include: urban sprawl, cattle grazing, disease, drought, mining, roads, drainage ditches and irrigation diversions, and legal and illegal driving of motor vehicles throughout the desert.

Gila Monster *(Heloderma suspectum}* SGCN 1A

Protection for the Gila Monster is provided under Arizona Game and Fish Commission Order 43. Gila monsters inhabit shrubby, grassy, and succulent desert areas. They frequent mountain foothills dominated by Saguaros and palo verde; they are also known to inhabit washes that extend down into valleys. Gila monsters tend to be found in canyon bottoms or arroyos with permanent or intermittent streams, where they burrow or seek shelter in mammal burrows, woodrat nests, dense thickets, caliche caves, and under rocks. The species eats small mammals, eggs, reptiles, insects, and carrion. Atterbury Wash on the eastern side of the base could provide potential habitat for Gila monsters (as well as other smaller washes in the area), especially near the head of this drainage (southeastern area of DMAFB) where there is a greater likelihood of finding exposed caliche. Sightings have occasionally been reported on DMAFB, although no formal surveys have documented their presence. There is a high potential that Gila monsters occur on DMAFB.

Tucson Shovel-Nosed Snake *(Chionactis occipitalis klauberi)* SGCN 1A

The Tucson Shovel-Nosed Snake was previously listed as a candidate species by USFWS but was later removed from consideration in 2014 stating the species did not warrant listing as endangered or threatened due to lack of population discreteness, relatively high genetic diversity across the entire range and no significant stressors to the species range outside of urbanized areas (USFWS 2010c; DoD 2014). The AZGFD defines the Tucson shovel-nosed snake as vulnerable and lists it as SGCN (AZGFD 2009c; AZGFD 2019).

The Tucson shovel-nosed snake can be found in scattered sand hammocks, crowned with mesquite or other desert shrubs; however, the snake prefers creosote-mesquite floodplain habitats, with soft, sandy loam soils with sparse gravel (AZGFD 2010b). Major threats to Tucson shovel-nosed snakes involve loss of habitat, off-road vehicle use, and road construction, use, and maintenance. The species has suffered considerable population decline as a result of loss of habitat due to agricultural development (AZGFD 2010b). The West Airfield, EOD Area, and Valencia Road Solar Power System sites occur in the current range of the Tucson shovel-nosed snake (USFWS 2010c).

2.3.4.14 Arizona Department of Agriculture Protected Plant Species

Saguaro *(Carnegiea gigantea)*

The saguaro is protected by the Arizona Native Plant Law as a highly safeguarded native plant. This category includes those plants native to this state and listed as endangered, threatened, or candidate in the ESA of 1973. Saguaros occur in the Sonoran desert of southern Arizona, extreme southeastern California, and adjoining northwestern Mexico. Saguaros occur on well drained soils, desert slopes and flats, especially rocky bajadas. They are a large, columnar cactus with stout, erect, many-ribbed stems and branches and can reach heights of up to 50 feet. On DMAFB, saguaros occur at a low density. One crested saguaro occurs on base as a planted ornamental. The potential of a naturally growing crested saguaro occurring on DMAFB would be low.

Needle-spined Pineapple Cactus *(Echinomastus erectocentrus* var. *erectocentrus)*

Needle-spined pineapple cactus is listed as a salvage restricted plant species by the ADA. This category includes those plants that require a permit to remove it from its location. This cactus inhabits desert grasslands mixed with open woodlands on low gravelly hills, bajadas, and alluvial fans at elevations ranging from 2,953 and 4,921 feet in elevation (eFloras, 2009, AGFD 2009a).

According to the AZGFD Heritage Data Management System, most of the recorded occurrences are more than 10 miles (16.1 kilometers) east and northeast of DMAFB. Documented populations are located to the south of DMAFB in the southlands planning sub-area of the City of Tucson Habitat Conservation Plan (Tucson HCP 2011). In the Tucson area, the needle-spined pineapple cactus occurs in widely scattered clusters, so isolated individuals are not very likely to be documented (Tucson HCP 2011). Based on elevation range and habitat preference, there is a low to moderate potential of this plant species occurring on DMAFB (Baker 2007).

2.3.5 Wetlands and Flood plains

Installation Supplement

An analysis of potential Waters of the U.S. was conducted in 1996. Areas appearing to contain potential Waters of the U.S. were indicated on Mylar overlays of the color infrared (CIR) images; these maps were then used for field delineation in accordance with the *Corps of Engineers Wetlands Delineation Manual.* All previously identified non-wetland Waters of the U.S., such as ponds, streams and drainages, were checked during the field survey. Jurisdictional boundaries were defined as the ordinary high water mark indicated by shelving, scouring, vegetation zonation, and debris. Stream channels were drawn on the CIR maps and channel length determined using digital orthophotographs and Arc/Info Version 7.0.4, a geographic information system (GIS). No jurisdictional wetlands were identified during the 1996 survey.

The survey identified 141,349 linear feet and 9.49 acres of Clean Water Act (CWA)-protected Waters of the U.S. on DMAFB (Table 4). The CWA-protected habitats on DMAFB are all ephemeral drainages; there are no perennial drainages on DMAFB. Several channelized ephemeral drainages carry runoff from the developed portions of DMAFB and exit the base via underground or open drainage systems. Atterbury Wash is the primary ephemeral drainage on the undeveloped portion of the base (Figure 7).

Table 4. Water Resources on Davis-Monthan Air Force Base, Arizona (USAF 1996).

General Location	*Type*	*Description*	*Area (ac)*	*Length (ft)*
Atterbury Wash	Water of the U.S.	Ephemeral Drainages		91,750
Railroad Access	Water of the U.S.	Ephemeral Drainages		317
Kolb Road	Waters of the U.S.	Ephemeral channelized to Pantano Wash east to Kolb Road		6,358
Airfield SE	Water of the U.S.	Ephemeral Drainages		6,061
Airfield SC	Water of the U.S.	Ephemeral Drainage		963
Swan Gate	Water of the U.S.	Ephemeral channelized southwest of gate		2,987

Golf Course	Water of the U.S.	Ephemeral channelized drainages and depressions at confluence of drainages	9.49	21,066
Base Housing	Water of the U.S.	Ephemeral channelized drainages		7,440
AMARG North	Water of the U.S.	Ephemeral channelized drainages		4,407
		Total Waters of the U.S.	**9.49**	**141,349**
		Total Wetlands	**0**	**0**

2.3.6 Other Natural Resource Information
Installation Supplement

2.3.6.1 Protection of Bat Species in Arizona

All bats in Arizona are protected by law. ARS Title 17 authorizes the Arizona Game and Fish Commission to set hunting seasons and prohibits the taking of wildlife outside of its prescribed season (17-231, 17-234 and 17-309). As per Commission Order 14, there is no open hunting season on bats, meaning it is always illegal to take them. Article 17-101 defines "take" as "pursuing, shooting, hunting, fishing, trapping, killing, capturing, snaring or netting wildlife or the placing or using of any net or other device or trap in a manner that may result in the capturing or killing of wildlife." Provisions for special licenses to take bats and other restricted live wildlife are given in Arizona Game and Fish Commission Rule 12, Article 4. A general bat survey inventory would be useful to assess bat use and relative abundance on DMAFB.

2.4 Mission and Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning
Installation Supplement

As there are no federally listed threatened and/or endangered species documented within the DMAFB boundaries, there have been no natural resources constraints to missions and mission planning. DMAFB maintenance and operation activities as well as construction activities are required to document an appropriate level of review subject to each individual project to record any and all potential impacts. Due to the presence of potentially suitable habitat, surveys and monitoring continue to provide a substantive review of natural resources and threatened and endangered species which may occur on base.

The Interpretative Titan II Missile Site 12 located within the Ironwood Forest National Monument, managed by the BLM, may provide suitable habitat for the Nichol's Turk's Head Cactus (NTHC) *(Echinocactus horizonthalonius* var. *nicholii).* The small, blue-green barrel cactus, which is listed as endangered, is known to occur within the Waterman Mountains, Pima County, Arizona. Missile Site 12 is a 328 acres site of federal Withdrawn Land that is still under control of the USAF. In 2019, DMAFB working with the AZGFD Contract Branch commissioned a vegetation classification and map survey of the Titian Missile Silo 570-3 Interpretive site, during the survey the present of the NTHC was document (P5) (Stingelin, A. 2019). Based on this survey additional funds were requested and received to conduct a more intense survey for the presents of the NTHC on the site. The survey is scheduled to be completed by mid 2020.

2.4.2 Land Use
Installation Supplement

The total acreage of DMAFB is approximately 10,17.7 acres (see Figure 1 for Land Use Areas). Improved lands include areas of mowed, seeded, and landscaped grounds in administrative, recreational, and housing areas. These include lawns and athletic fields. Improved lands also include areas located around facilities, including buildings, roads, parking lots, and airfield pavements. Semi-improved grounds at DMAFB are primarily vacant land that is mowed but otherwise unimproved (e.g., industrial areas and areas next to the flight line). Unimproved lands at DMAFB consist of areas in native vegetation. An additional 274 acres at DMAFB are under easement to the City of Tucson. This easement encompasses the entire perimeter of the base from Wilmot Rd to Swan Rd along Golf Links and also the section of Kolb Rd from Irvington to just beyond where Yuma crosses Kolb.

2.43 Current Major Mission Impacts on Natural Resources
Installation Supplement

There are a variety of mission-related activities on DMAFB that have the potential to adversely impact the environment. Past activities of this sort were addressed in the Environmental Assessment of 1998 (Appendix A.) and other environmental analysis documents. Potential impacts from activities associated with the current mission at DMAFB include:

Biological Resources. Ground disturbance, vegetation clearing, and other activities could reduce habitat for wildlife. Bird aircraft strikes could potentially cause direct harm to raptors, mourning doves, and other birds. Ingestion of lead shot by foraging birds on shooting ranges littered with lead shot could cause the birds to succumb to acute lead toxicosis as could predators of such birds.

Socioeconomics. With approximately 6,700 military and 3,200 civilian employees, DMAFB is the second largest employer in the Tucson area.

Noise. DMAFB has one runway, 13,640 feet long, running from southeast to northwest. The Air Installation Compatible Use Zone from 1992 includes about 3,319 acres outside the base.

Water. DMAFB's water comes from wells. In the Tucson area, the aquifer's water level has dropped 50 to 100 feet due to mining (i.e., using water without replenishment) of the water reserves. Mission-related activities could potentially affect jurisdictional Waters of the U.S. including the drainage of Atterbury Wash.

Air. The Environmental Protection Agency (EPA) has classified DMAFB as a major source of carbon monoxide, nitrogen oxides, and volatile organic compounds (VOC). The base also emits hazardous air pollutants (HAP).

Solid Waste. Non-hazardous waste management on DMAFB involves removal of domestic and industrial wastes by the Pima County landfill operator.

Hazardous Waste. DMAFB, like other Air Force installations, has undertaken a program of environmental remediation. The ERP has identified 53 sites at DMAFB potentially requiring remedial action. Of the 53 sites, 32 are closed with no further action. 21 sites are closed awaiting regulatory concurrence. Five sites are in remediation with long-term monitoring. The Military Munitions Response Plan (MMRP) identified 15 sites potentially requiring remedial action. Of the 15 sites, four are closed with no further action. Seven are closed awaiting regulatory concurrence. Four sites are awaiting remedial investigation. The base has no Solid Waste Management Units (SWMU). EOD ships unserviceable or excess munitions to the Army, usually to Toole, Utah. Disposition is determined by Hill AFB. EOD conducts training and emergency detonations for munitions that cannot be shipped off-site, and report those events to ADEQ. Non-explosive hazardous wastes are stored in 90-day accumulation points. Once a container becomes filled it is transferred to the hazardous materials storage facility, or HAZMART. A DLA contractor picks up the waste and ships it to various EPA-permitted treatment, storage, and disposal facilities, depending on how the waste is characterized.

2.4.4 Potential Future Mission Impacts on Natural Resources
Installation Supplement

While no major changes in the mission at DMAFB are anticipated, any future activities related to the 355th Wing's mission or associate units' missions could have an impact on the environment. The General Plan for DMAFB recommends improvements and provides the installation's Demolition List and Facility Development Plan (DMAFB 1994, 1995, 1996). The General Plan is posted on the Air Force Portal internet site. The General Plan considers all potential future impacts to natural resources and attempts to make them compatible with or least consider current INRMP goals.

Potential future impacts could include (but are not limited to) vegetation clearing in the immediate vicinity of the runway which could affect nesting habitat for Swainson's hawks and other birds and ground disturbance related to installation of additional solar panels throughout the base. Any future road or parking lot construction or improvements on DMAFB will consider salvage operations of extant native vegetation and/or the re-planting of the disturbed area with native species and the installation of passive water harvesting structures. Examples of such structures include (e.g. curb cuts and rainwater catchment basins; Appendix J, Rainwater Harvesting for Landscaping Use and Appendix K, Water Harvesting Guidance Manual). Any future ditch construction or improvements will follow the Pima County Watercourse Maintenance Guidelines (Appendix L) in order to maximize natural drainage patterns and support water harvesting and subsequent localized infiltration. Further, any improvements to areas surrounding buildings will consider re-vegetation with strictly native vegetation (following Appendix H, Civil Engineering Standards) and installation of various micro-basins depending on contours, topography and soils (Appendix J, Rainwater Harvesting for Landscape Use).

3 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. Executive Order (EO) 13834, *Efficient Federal Operations;* DoDI 4715.17, *Environmental Management Systems;* AFI 32-7001, *Environmental Management;* and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems - Requirements with guidance for use,* 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 manage associated risks, and instill a culture of continual improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

4 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.

Installation Supplement

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	*GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT): In this section, describe the organization necessary to implement the INRMP. Note that the installation, as a whole, is responsible for implementation of the INRMP, but that there are certain offices of primary responsibility for portions of the INRMP Indicate the responsibility of each of the installation command elements for oversight and implementation of the INRMP Identify:* • *Organizations on the installation that are important for the implementation of the INRMP Identify the roles and responsibilities of each organization. Provide an organizational chart if helpful* • *Other DoD organizations that will assist with the implementation of the INRMP (e.g., AFCEC, tenant units, etc.)* • *Other federal agencies that contribute to implementation of the INRMP* • *State agencies that contribute to the implementation of the INRMP. Identify the appropriate INRMP signatory agency for the state* • *Universities or non-governmental organizations involved in the implementation of the INRMP. Identify existing cooperative agreements outside organizations* • *Contractors that have a role in the implementation of the INRMP. May mention a support contractor by name if the contract has been awarded and is still active. (Please note that Sikes Act defines inherently governmental roles and identifies roles that contractors may serve.)*
AFCEC Natural Resources Media Manager/SME/Subject Matter Specialist (SMS)	
Installation Natural Resources Manager/POC	
Installation Security Forces	
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	
Installation Wildland Fire Program Manager	
Pest Manager	
Range Operating Agency	
Conservation Law Enforcement Officer (CLEO)	
National Environmental Policy Act (NEPA)/Environmental Impact Analysis Process (EIAP) Manager	
NOAA)/ National Marine Fisheries Service (NMFS)	
US Forest Service	
USFWS	

Add installation-specific and other appropriate roles. Consider adding unique entries for contractors and tenant organizations, as necessary	

5 TRAINING

USAF installation NRMs/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

USAF installation NRMs/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

GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT):

- NRMs at Category I installations must take the course DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov)
- Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing fortheir related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses
- All individuals who will be enforcing fish, wildlife, and natural resources laws on USAF lands must receive specialized, professional training on the enforcement offish, wildlife, and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/)
- Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement
- The DoD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies, and other information regarding the management of natural resources on DoD installations

Example/boilerplate language (to be update/replaced with installation-specific content:

Natural resources management training is provided to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key natural resources management-related training requirements and programs:

- *Add installation-specific training.*

6 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 (AFRIMS) records disposition schedule (RDS). 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

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 (AFRIMS) records disposition schedule (RDS). 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

Add installation-specific content.

6.2 Reporting

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

Installation Supplement

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

Installation Supplement - Reporting

Add installation-specific content.

7 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

The Operational Component Plans for natural resources at DMAFB include wildlife management, protected species survey and assessment, outdoor recreation management, land use management, landscape management, pest management, and GIS management. DMAFB has worked with USFWS, AZGFD, and University of Arizona in the past to conduct inventory and monitoring studies and clearance surveys for species of conservation concern either known to occur on base or those that potentially occur on base (e.g., Estabrook 1999, Ogonowski and Conway 2006, Grandmaison and Ingraldi 2008, Lowery and Ingraldi 2009a), (Abbate, Hofer, and Lowery 2014), (Stingelin 2017), (Stingelin 2019).

7.1 Fish and Wildlife Management
Installation Supplement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

7.1.1 Wildlife Management Plan

This current INRMP serves as the updated version of DMAFB's wildlife management plan. Wildlife management program plans will be integrated and considered in land use planning, base landscape activities, any potential impact to ESA listed endangered or threatened species or State or DMAFB species of concern, outdoor recreation enhancements or alterations, pest management initiatives, and water management programs. There are no fish or aquatic resources at DMAFB, and there is no hunting or public access on base. The primary goal of the plan is to maintain, develop, and restore, as necessary, a diverse viable habitat that supports wildlife populations and is consistent with DMAFB's mission. Secondary and tertiary objectives may include the establishment of a Watchable Wildlife Area, a natural history interpretive garden at Heritage Park to increase awareness of Sonoran Desert flora and fauna, and the completion of interpretive stations on the existing nature trail. Additionally, development of interpretive materials (or making available existent materials) describing the natural history and uniqueness of the Sonoran Desert (e.g., brochures) will benefit the military mission. This will provide base personnel with a sense of appreciation for the Sonoran Desert, and therefore, contribute to his/her well-being and sense of place while serving at DMAFB.

Wildlife management through this INRMP at DMAFB is conducted in accordance with an open-ended, cooperative agreement (CA) in perpetuity among DMAFB, USFWS, and AZGFD for the purposes of protecting, developing, and managing wildlife resources. This agreement stipulates the following:

1) USFWS and AZGFD acts in an advisory capacity to DMAFB regarding the management of wildlife and associated habitat at DMAFB;

2) No exotic plants or animals will be introduced at DMAFB without prior written approval of USFWS and AF as indicated in the Design Compatibility Guidelines for DMAFB (Appendix H, Civil Engineering Standards);

3) All parties will cooperate in carrying out wildlife and habitat studies required under NEPA or deemed important for species of management concern;

4) Hunting is prohibited on base. However, dove "hazing" on the runways and flight lines will be conducted, as necessary, in coordination with AZGFD and USFWS to ensure permitting requirements are met;

5) An interdisciplinary approach to resolving natural resources problem relating to multiple-use will be used;

6) All parties will meet once a year to discuss wildlife management issues;

7) The use of chemicals for the control of nuisance wildlife will be in accordance with federal and state regulations, including best management practices to avoid harm to non-target species.

7.1.2 Non-Consumptive Wildlife Management[H1]

Non-consumptive wildlife management (e.g. bird watching and other watchable wildlife) focuses on the protection and appreciation of existing wildlife and habitat through passive, non-invasive means. Wildlife habitat protection includes permitting native vegetation to grow naturally in unimproved areas of the base and to enhance disturbed areas (improved, semi-improved lands) when feasible, to provide food and cover for birds, small mammals, amphibians, reptiles and invertebrates. Unimproved lands on DMAFB, though not in its entirety, have largely been identified as undevelopable in the 2016 Installation Development Plan. This will ensure, to the extent practicable, the natural habitat present will remain intact, furthering the protection of native wildlife and vegetation throughout the eastern and southeastern portions of the base. Avoidance of these areas will also aid in the protection of resources identified in the ICRMP as well as maintain the 100 year floodplain, allowing Atterbury Wash to remain unaltered from its current state.

7.1.3 Existing Wildlife Management Programs

The wildlife management program at DMAFB is the responsibility of the Natural Resources Element of the Asset Management Flight of the 355th Civil Engineering Squadron. Sections 5.2 - 5.4 describes the existing vegetation, habitat and wildlife (both common species and species of conservation concern) on base. Wildlife management on DMAFB is focused on maintaining existing habitat and ensuring the viability of existing populations.

Management objectives specified in this plan include:

1) Avoiding clearing or mechanical disturbance of natural desert vegetation areas when not required for mission accomplishment;

2) Ensuring that vegetation along taxiways is cut at the proper height to discourage birds from seeking cover there, hence reducing human mortalities;

3) Management of pest species e.g., occasional control of ground squirrel populations (Appendix F, Installation Pest Management Plan);

4) Fostering AZGFD, universities, and other collaborations with DMAFB to provide important information on both common species and species of concern, including ongoing efforts to monitor burrowing owls on DMAFB;

5) Continue DMAFB and AZGFD collaborative annual raptor surveys, Tucson Bird Count Surveys on DMAFB, and AZGFD primary database and repository for winter raptor surveys;

6) Continue to conduct habitat, mammal, amphibian, and reptile surveys on DMAFB in the future.

7.1.4 Issues, Concerns and Potential Conflicts associated with Wildlife and Habitat

Past and recent surveys have documented potential suitable habitat for listed USFWS threatened and endangered species to occur on DMAFB, though the presence of those species have not been recorded. The base must also consider the known occurrences of burrow owls *(Athene cunicularia* ssp. *hypugaea);* since 1998, survey events have recorded up to 81 burrows locations. In 2014 32 active burrowing owl burrows were documented by A ZGFD(AZGFD 2014). AAZGFD continues to conduct borrowing owl surveys each season, to include burrow identification and banding. If an active burrows is in direct conflict with development of semi-improved areas the Burrow Owl Project Clearance Protocol developed by the Arizona Burrowing Owl Working Group will be followed. A copy of the protocol can be found in Appendix M. Potential issues/concerns/conflicts include, but are not limited to:

1) Maintaining, enhancing, and restoring wildlife habitat on DMAFB, in some instances, could come into conflict with the missions of the 355th Wing and associate units;

2) Informing and maintaining keen awareness of DMAFB personnel, especially the Natural Resources Element of the Asset Management Flight, as to the importance of managing, conserving, and enhancing wildlife and habitat on base. This is imperative to the implementation of this INRMP;

3) Minimizing BASH near the airfield caused by doves. Mourning doves present the largest threat to flight operations in the airfield area. Doves create a hazard because they are attracted to the infields along the sides of the runway where they congregate and feed in the short grass and weedy vegetation. Migration for doves occurs from August to November. In an effort to reduce seed production during the migratory period and reduce the attractiveness of the airfield for the doves, adjust mowing height lower during this period. Maintain the ACC standard from December to June; beginning in July and continuing through November, reduce the mowing height to 7 inches to reduce the amount of seed production from grasses. This time period also corresponds to the monsoon season which results in increased growth rates for all vegetation. Other perching birds (e.g., rock doves or "pigeons") near the flight line may create BASH incidents as well. However, with the exception of non-native European starlings *(Sturnus vulgaris),* house sparrows *(Passer domesticus),* and rock doves *(Columba Hvia),* all birds are protected by law (Appendix G). Appendix M, provides BASH Recommendations for burrowing owls, for a discussion with recommendations for reducing the possibility of aircraft collisions with burrowing owls;

4) Improving communication among the different elements at DMAFB that deal with wildlife (e.g., Natural/Cultural Resources office, BASH, Pest Management element, Grounds Maintenance, Housing) will greatly improve implementation of this INRMP. As such, all BASH incidents will be documented to gather information to assist in developing mitigation measures. DMAFB will maintain a database documenting all air strikes with wildlife and provide that information to the Natural/Cultural Resources Department. The Wing Safety office provides oversight of the data base for DMAFB use.

7.1.5 Nuisance Wildlife

Protocol for nuisance wildlife species are addressed and documented in the 2018 BASH Plan (Appendix G) and the 2019 Installation Pest Management Plan (Appendix F).

Coyote and Fox: Coyotes *(Canis latrans)* are seen occasionally on base, and periodically are found too close to operations or living quarters. These animals are captured and released off site. The USDA Animal Damage Control unit in Phoenix provides training and consultation for the capture of coyotes and in the use of dart guns. The USDA Airport Biologist embedded in the 355th Wing Flight Safety Office may also assist as needed.

Badger: Badgers *(Taxidea taxus)* are found occasionally on base too close to operations or living quarters. The animals are captured and released in another location. The USDA Animal Damage Control unit provides training for the capture of badgers and in the use of dart guns. AZGFD also provides consultation. The USDA Airport Biologist embedded in the 355th Wing Flight Safety Office may also assist as needed.

Bear: There was an unsubstantiated bear *(Ursus* sp.) sighting at DMAFB by a control tower worker in 1996. Bears have been sighted in the Tucson Valley during hot dry summer conditions in the mountains. Bear encounters on DMAFB are highly unlikely.

Spotted Skunk: At least on one occasion the pest management crew has captured a spotted skunk *(Spilogale putorius)* and moved it to another location.

Javelina: Javelina *(Pecari taj'acu)* are occasionally observed on DMAFB, in particular in AMARG and along the west side of the airfield during light flight line activities. The USDA Airport Biologist embedded in the 355th Wing Flight Safety Office may also assist as needed.

Bobcat: Bobcats *(Lynx rufus)* are regularly seen in the AMARG area and occasionally on other base property.

7.2 *Outdoor Recreation and Public Access to Natural Resources*
Installation Supplement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

7.2.1 Existing Outdoor Recreation Management Programs

DMAFB does not currently maintain an Outdoor Recreation Plan (Connie Knoob pers. comm.). Outdoor recreation activities at DMAFB include hiking, biking, jogging, walking, archery, skeet and trap shooting, park and pool use, and recreational vehicle (RV) camping. There is no public access to recreation on DMAFB. Only authorized individuals such as active duty and retired military and government-employed civilians can use designated recreation areas unless military mission needs require suspension of such use.

Outdoor recreation activities on DMAFB are a shared responsibility of the Environmental Quality Office and Services Squadron. Actual duties depend on the specific projects and are arranged in coordination between the two offices. The Environmental Quality Office develops technical materials for interpreting the resources. Services Squadron is responsible for making sure that the installation's population is aware of the outdoor recreation opportunities on and off base. This is accomplished by publicizing outdoor events and recreational areas in brochures supplied to base personnel and by frequent publication of articles in base newspapers.

All installation personnel, both civilian and military, will act responsibly in the public interest in managing the outdoor recreation resources that are an integral part of the installation. There will be a conscious and active concern for the inherent value of these resources in all installation plans, decisions, actions, and programs. All current and planned activities (e.g., master planning, construction requests, site approval requests, and training exercise plans) will be planned and conducted to ensure effective and timely coordination with DMAFB natural resources management personnel.

The DMAFB natural resources manager will coordinate with all affected installation offices. Proponents of actions that would affect installation outdoor recreation resources will coordinate with the installation natural resources manager at the outset of planning and throughout planning and implementation. The DMAFB natural resources manager will then review the work request or job order to ensure that it is compatible with this plan.

122 Outdoor Recreation Management Issues and Concerns

1) Potential outdoor recreation opportunities include the development of a Watchable Wildlife Area, a natural history interpretive garden at Heritage Park to increase awareness of Sonoran Desert flora and fauna, and the completion of the interpretive stations on the existing nature trail;

2) No off-highway vehicle or mountain biking activities are permitted on DMAFB. Mountain biking is prohibited, unless otherwise occurring within the specifically designated area of the 100 Acre Woods Bike Park. The park is within AF lands and is a joint project with the City of Tucson, located just to the north of Golf Links Road northwest of the airfield. The use of off-highway vehicles and mountain bikes will cause significant environmental degradation at DMAFB, especially due to the relatively small area of remaining Sonoran Desert landscape. Mountain biking trails exist in the area immediately east of DMAFB at "Fantasy Island" as well as in Tucson Mountains. The Fantasy Island trail system is on State Trust Land that borders the east side of DMAFB, and is accessed by using the City of Tucson Green Way Bike Path System.

7.3 Conservation Law Enforcement
Installation Supplement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

As there is no hunting or fishing on DMAFB, there is no Natural Resources Enforcement Program. There is no public access on base, and recreational activities are limited in terms of area or action depending on location within the base. The DMAFB Natural Resource Manager provides oversight in close coordination with AZGFD, when necessary. DMAFB complies with laws and regulations when conducting maintenance and operation actions as well as construction projects. An environmental review process is established through the use of AF 103, AF 332 and/or AF 813, as mentioned earlier. Additional oversight is provided by the Nellis ISS personnel.

7.4 *Management of Threatened and Endangered Species, Species of Concern, and Habitats*
Installation Supplement

Applicability Statement

This section applies to USAF installations that have threatened and endangered species on USAF property. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

7.4.1 Status of Management Programs with Species of Conservation Concern

To date, no federally threatened and endangered species have been recorded on DMAFB. The management of species of conservation concern at DMAFB is the responsibility of the Natural Resources Element of the Asset Management Flight of CES/CEIE. An assessment of endangered, threatened, candidate and sensitive species and their habitat was performed for DMAFB by the U.S. Army Corps of Engineers in 1994 (USACE 1994). The report describes those species known to occur or that have the potential to occur on DMAFB requiring special attention and protection as well as aspects of habitat preference. In addition to this, annual projects are programmed, these project include invasive species, vegetation classification, migratory and raptor surveys, amphibian and reptile surveys and rare/species of concern (as defined by USFWS, AZGFD and DMAFB) surveys. Most recently this review of potential base natural resources was conducted in 2015 and 2016. The results were consistent with initial findings; no federally threatened or endangered species have been recorded as occurring on base. Numerous federal and state regulations exist for the protection of wildlife species (Appendix B).

There are no formal programs at DMAFB specifically designed for the management of protected species. However, in 2009 a Planning Level Survey for the Pima Pineapple Cactus, Tucson Shovel-nosed Snake, and Western Burrowing Owl was conducted within the proposed Solar Power System Locations on DMAFB. The findings from this work as well as annual surveys and monitoring will contribute to species management both on the installation.

In the past DMAFB had worked with the University of Arizona under a cooperative agreement on a study of burrow selection by burrowing owls (BUOW) on the installation during 1997-1998 (Estabrook 1999). This research was supported by DMAFB and AZGFD Heritage funds. Work on BUOW continued with the University of Arizona and AZGFD Research Branch with investigations focusing on demography (Conway and Ellis 2004), survivorship and movements of juveniles (Grandmaison and Ingraldi 2008), and migratory behavior (Ogonowski and Conway 2006). In addition to this, DMAFB has coordinated with AZGFD and consultant driven efforts to record the dynamic burrowing owl population on base. More recently, AZGFD conducted surveys in 2014, and HDR conducted surveys in 2015. The base population of BUOW is variable, but there are approximately 30 to 50 active burrows at any one time (AZGFD 2014, HDR 2015). AZGFD ongoing monitoring efforts indicated that DMAFB's burrowing owl population may be one of the most robust populations in the immediate region and likely serves as a source of emigrants to nearby populations or as founder birds for new populations in the area.

Another study by AZGFD focused on Swainson's hawk. Before 1997, one pair nested on DMAFB; it was the only known pair in Pima County. The pair raised two chicks. Both chicks and the adult male were banded; the adult female was not. In 1997, two Swainson's hawk nests were observed on DMAFB. One had three male chicks and the other had one male and one female chick. All five were banded. It could not be determined whether either adult male was the one observed at DMAFB before 1997. Since that time, at least one pair has nested on base every year. DMAFB Natural Resources and Tucson Audubon Society volunteers continue to monitor the base to determine the presents of the species on base in an opportunistic fashion, copies of the Audubon Society survey results are provided to the base and AZGFD. If the presence or behavior of this species changes significantly in the near future, a more formal study (e.g., determination of population and natural history parameters such as survivorship, movements (i.e., with telemetry), home range, and numbers and identity of annually returning individuals) would be warranted due to the rarity of this species in the immediate region.

DMAFB has and will continue to work with AZGFD, and as needed USFWS, on clearance surveys for target sensitive species prior to construction activities (e.g., vegetation clearing in flight zone) (Lowery and Ingraldi 2009a, 2009b).

7.4.2 Threatened and Endangered and Sensitive Species Issues and Concerns

The primary management concerns of protected wildlife and plant species and associated habitats on DMAFB are:

1. Managing and monitoring current populations of burrowing owls throughout DMAFB as this is the most robust population in the region and is therefore essential to the conservation of the species in this area;
2. Managing and monitoring current populations and habitats of other raptors on DMAFB including Swainson's hawks, Cooper's hawks, and great horned owls;
3. Continue annual projects with AZGFD that include surveys for all sensitive wildlife and plant species of conservation concern potentially occurring on DMAFB;
4. Protecting all, or at least portions, of the native Sonoran desertscrub habitat extant on base (especially along Atterbury Wash including an adequate buffer zone) from disturbance or encroachment by mission-related activities unless required by the DMAFB mission. With much of DMAFB surrounded by an expanding urban population, the eastern portion of the base, especially Atterbury Wash, may serve as an important corridor for many wildlife species to move between suitable habitats (e.g., between Santa Rita and Rincon mountains). This work will be coordinated with the City of Tucson Habitat Conservation Plan (https://www.tucsonaz.gov/pdsd/city-tucson-habitat-conservation-plan-hcp; Appendix O) and the Pima County Sonoran Desert Conservation Plan (http://webcms.pima.gov/government/sustainability_and_conservation/conservation_science/the_sonoran_desert_conservation_pl to ensure optimal wildlife corridor connectivity (Appendix N).

Ensuring the DMAFB mission is not impacted by management of natural resources including maintenance of native vegetation in the vicinity, but outside of the managed control zone of taxiways and the end of runways to reduce BASH.

Figure 15. Davis-Monthan Air Force Base Golf Course Area Palm and Saguaro Distribution.

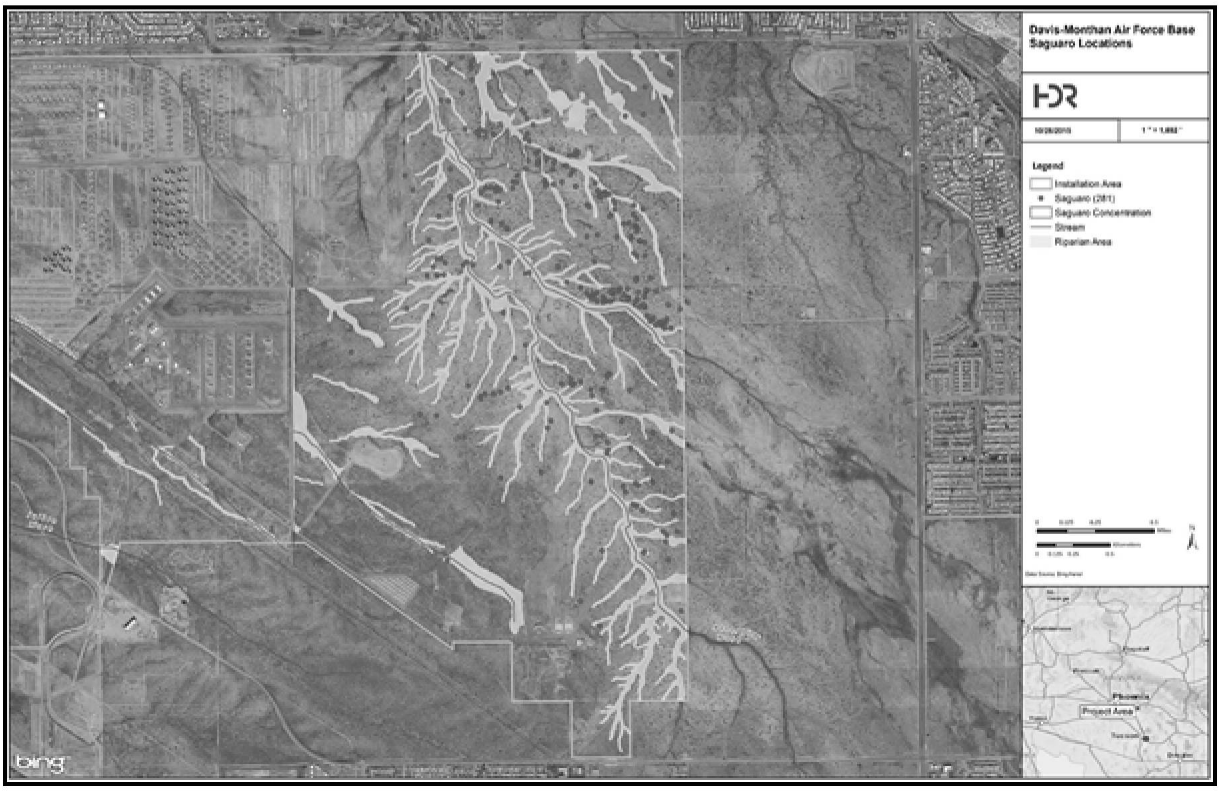


Figure 16. Davis-Monthan Air Force Base Saguaro Locations and Drainages near Atterbury Wash.

7.5 Water Resource Protection

Installation Supplement

Applicability Statement

This section applies to USAF installations that have water resources. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The watershed protection program at DMAFB is the responsibility of the Natural Resources Element of the CES/CEIE. The only existing water resources program at present consists of intermittent water quality testing of base stormwater runoff. This runoff generally flows through drainage ditches from the northwest half of the base, leaving at the northwest corner via the stormwater drainage system (Water Program Mgr., pers. comm.). Sampling efforts are a requirement of DMAFB's AZPDES 2016 General Permit for Discharge from Small MS4 to Waters of the U.S. As part of the permit, DMAFB is required to have a stormwater program which will aid in the control of stormwater runoff, minimization of the introduction of pollutants, public awareness efforts and training regarding stormwater mindfulness of personnel. This information is documented in the DMAFB SWMP and SWPPP which are annually updated and reviewed per requirements from ADEQ.

7.5.1 Existing Water Resources Programs

Floodplains

Atterbury Wash, which passes through DMAFB, is prone to flash flooding during the rainy months of July to August. Additional information can be found in section 4.4.2.

Artificial Drainage Patterns

Surface water drainage on the base is through a series of ephemeral drainages, many of which have been modified into ditches. Additional information can be found in section 4.4.3.

Water Quality

DMAFB pumps, treats, and distributes its own water for consumption. The base operates 11 wells that pump groundwater from the Tinaja Beds and the Fort Lowell Formation of the Tucson Basin aquifer. Additional information can be found in section 4.4.4.

7.5.2 Water Resources Issues or Concerns

Issues and concerns regarding water resources on DMAFB include (but are not limited to):

1) Because Atterbury Wash is prone to flash flooding, development in that area must contend with possible flash flooding following seasonal thunderstorms;

2) An ephemeral earthen stock tank identified along Atterbury Wash that may serve as a breeding site for several amphibians and provide insect prey and water for foraging bats;

3) Six drainage areas on DMAFB contain industrial activities that have the potential for mixing industrial pollutants with storm water runoff, as mentioned above. The AZPDES Industrial Stormwater Non-mining Multi-Sector General Permit (MSGP) is currently in place for industrial activities, but water quality/contaminants testing will continue or increase in scope and periodicity. Additionally, DMAFB has numerous APPs for various other industrial activities on the base. Information about the AZPDES MSGP and APPs is available in Appendix C, Stormwater Management Plan and Stormwater Pollution Prevention Plan;

4) Continued depletion of groundwater reserves;

5) Other non-point pollution sources, e.g., golf course, equestrian center, shooting range (there is one small munitions range in which ammunition with lead is used that has not been remediated on DMAFB, remediation has not occurred due to the low volume of lead present) used strictly for the military and other federal agencies; there is also a skeet range that uses clay targets and a paint-ball range, both used for recreation);

6) Relative lack of water quality monitoring per number five above;

7) Where possible, passive rainwater harvesting methods such as gentle berming and site grading will be incorporated during project development.

7.6 Wetland Protection
Installation Supplement

Applicability Statement

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

Program Overview/Current Management Practices

7.6.1 Existing Wetlands Programs

An analysis of potential Waters of the U.S. on DMAFB was undertaken in 1996. The survey identified 141,349 linear feet and 9.49 acres of CWA protected Waters of the U.S., all of which are ephemeral drainages. There are no perennial drainages on DMAFB. See section 5.5 for additional information.

7.6.2 Wetlands Issues or Concerns

There are no known problems associated with Waters of the U.S. on DMAFB. Existing facilities and operations have been built away from the area of Atterbury Wash, and there are no planned activities that will impact those areas in the near future. Some remaining concerns are:

1) An ephemeral stock tank was identified along Atterbury Wash and appears to hold water for at least several months in the spring (following adequate winter rains) and summer (following adequate monsoon rains). This area could serve as habitat for desert breeding anurans (e.g. Couch's spadefoot *(Scaphiopus couchi),* Sonoran desert toad *(Incilius alvarius),* Great Plains toad *(Anaxyrus cognatus),* and a foraging area for bats (e.g. Western pipistrelles *(Pipistrellus hesperus)).* This site needs to be surveyed to further determine its viability as an ephemeral aquatic habitat for wildlife. Concerns could include siltation and filling from upstream erosion and sediment flows caused by soil disturbing activities or wildfires. This project has been added the list of projects for AZFGD;

2) Environmental awareness training covering environmental constraints and regulations protecting drainages and initiate land disturbing activities is being developed. Will focus on how an event impacting lands protected under the CWA could elicit regulatory sanctions.

7.7 Grounds Maintenance
Installation Supplement

Applicability Statement

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

Program Overview/Current Management Practices

7.7.1 Existing Grounds Maintenance Programs

The approach to landscape design at DMAFB must be one that is responsive to the native environment and climate. When designing landscapionng, be sure to check out SEINet swbiodiversity.org, U of A Extension, NCRS Plant Materials Center, and Pima County.gov, etc for available information about plant materials specific to the region will be studied to determine which varieties are suitable. Landscaping and site design are most important at building entrances and in parking lots because these areas have the greatest visibility and provide the best educational opportunities. Expectations incorporate recreational opportunities as part of the overall quality of life for an AF installation. For this reason, a comprehensive pedestrian "path" system located near Heritage Park was developed. This path system offers the much-needed link between the major activity nodes. It is extremely important that all landscape elements are compatible with the requirements of a desert climate. A practical approach to landscape design should facilitate an "oasis" response to the desert environment. Grounds maintenance is contracted to private companies, but directives shall be in place that prohibit plantings of landscaping vegetation that are not native to the Sonoran Desert.

Landscaping is not uniformly developed on DMAFB. Some areas are well-developed, such as the Chapel Center, the Airmen's Dining Hall, the Operations Building, and along Craycroft Road. Other areas lack landscaping and consist of gravel beds.

7.7.2 Grounds Maintenance Issues and Concerns

Key landscape design standards at DMAFB include:

1) Limiting turf areas and eliminating high water use plants;

2) Using water-efficient irrigation (e.g. drip irrigation, timing of water application and/or 'smart' watering systems to water when needed) and xeriscape design principles and species to reduce water usage;

3) Initiating and implementing passive rainwater harvesting techniques wherever feasible;

4) Integrating all grounds maintenance and landscape plans with appropriate INRMP offices (e.g., Natural Resources, Pest Management).

7.8 Forest Management
Installation Supplement

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section **IS/IS NOT** applicable to this installation.

Program Overview/Current Management Practices

GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT): Discuss:

- *The current forest management program and initiatives*
- *Forest types found on the installation. If available, show the distribution of forest types by table, graph, or map*
- *The current status and scope of commercial forestry operations*
- *The existing network of forest access roads and trails*
- *The acceptable timber harvesting practices for the installation*
- *Forest management issues and concerns*
- *How forest management practices are used to support the military mission and achieve INRMP goals*
- *How a changing climate could impact existing and future management activities*

7.9 Wildland Fire Management
Installation Supplement

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 this installation.

Program Overview/Current Management Practices

7.9.1 Existing Wildland Fire Management Programs

There is no active wildland fire management program on DMAFB. Firefighting duties are covered under an agreement between DMAFB Fire Protection and Emergency Services and the City of Tucson Fire Department.

7.9.2 Wildland Fire Management Issues and Concerns

The Sonoran Desert is not a fire-adapted system nor is it prone to large-scale fires. It does not carry enough fine fuels to move fires up into and across tree canopies (which are rarely contiguous) or along the ground. Historically, wildfires were started from lightning strikes and burned for a short duration across a relatively small area at low intensities. Yet, with the introductions of several fire-adapted, dense, bunch grasses to the Sonoran Desert, such as buffelgrass *(Pennisetum cilia re),* fountain grass *(Pennisetum* sp.), and Lehmann's lovegrass *(Eragrostis lehmanniana),* the potential for large scale fires has increased. Once these species invade an area and subsequently burn, native Sonoran Desert vegetation is severely damaged or destroyed leading to a large-scale conversion to a nonnative bunchgrass - dominated landscape. These bunchgrass communities are then much more prone to subsequent, intense wildfires posing threats to not only the native vegetation communities but to DMAFB properties, structures, and humans. DMAFB will determine existing conditions of all nonnative invasive grasses and initiate control and restoration measures as well as monitoring future invasions. To aid in the control of invasive non-native species, the DMAFB will continue to conduct annual surveys to document the presences and location of the species when funding availability allows, as well as, continue to implement the Installation Pest Management Plan (Appendix F) for consistent maintenance efforts.

While DMAFB does not have a Wildlands Fire Prevention Plan, the Fire Protection Flight does have an overall firefighting plan for the base as a whole. Fire extinguishers located in all base facilities do not contain sodium ferrocyanide or ammonia-based products (e.g., diammonium sulfate) (Lisa 2011), which can cause acute toxicity to aquatic invertebrates and fish.

7.10 Agricultural Outleasing
Installation Supplement

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section **IS/IS NOT** applicable to this installation.

Program Overview/Current Management Practices

GUIDANCE FROM AFMAN 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT): Discuss current cropland or grazing outgrants, and include the following elements:

- *A description of how cropland and grazing outgrants support the installation mission and INRMP goals*
- *The location of lands outgranted for crop production or grazing leases*
- *Identity of prime and unique farmlands, highly erodible land, and delineated wetlands, as determined through consultation with the Natural Resources Conservation Service*
- *A discussion of cropland conservation management systems appropriate for the area*
- *A discussion of identified resource concerns and conservation practices planned and implemented to address resource concerns*
- *A discussion of the principal forage species being grazed by livestock, and how these plants are being monitored and managed*
- *A discussion of expected livestock utilization patterns*
- *A discussion of appropriate livestock stocking rates*
- *A protocol for outgrant management that identifies the parameters that will be used to determine when livestock can graze various pastures and when to remove or reduce grazing pressure in order to sustain overall ecosystem health and integrity*
- *A discussion of the outgrant land use regulations for outgrantees, and how compliance with the land use regulations will be monitored*
- *A description of existing and proposed improvements within outgrants, and a description of outgrantee services rendered in lieu of a portion or all the cash payment due the United States Government*
- *Identify mission related restrictions such as: Incompatible crop rotations, irrigation water use, or pesticide use*
- *How a changing climate could impact existing and future management activities*

7.11 Integrated Pest Management Program
Installation Supplement

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, etc.). This section **IS/IS NOT** applicable to this installation.

Program Overview/Current Management Practices

7.11.1 Existing Integrated Pest Management Programs

The pest management program at DMAFB is the responsibility of the Pest Management Element of the Operations Flight of the Civil Engineering Squadron (Appendix F, Installation Pest Management Plan). DMAFB was selected as a model pesticide installation by the AF for reducing its pesticide use by 50 percent. Private contractors provide pest management for the recreation areas and housing maintenance.

The Pest Management Element follows the guidelines outlined in the Installation Pest Management Plan (Appendix F), except when there are special circumstances. They also work with USDA Animal Damage Control in Phoenix and receive training from Pima County Animal Control. DMAFB technicians are certified for pesticide management through DoD training. Pima County has accepted the training as sufficient to meet County pesticide requirements and restrictions. If larger animals need to be darted and removed, the base contact the AZGFD Area Supervisor to schedule assistance in the capture and relocation. Daily incident reports are prepared summarizing pests, chemical and non-chemical activities, site, building number, area, and remarks. Executive Order 13112 provides further information on preventing and controlling the spread of nonnative species found on the installation.

7.11.2 Integrated Pest Management Programs Issues and Concerns

Pest management issues and concerns at DMAFB include, but are not limited to:

1. The primary pest management concern on DMAFB at present is the persistent spread of the extremely invasive non-native buffelgrass. Invasive species of secondary concern include fountain grass and Lehmann's lovegrass. DMAFB will determine existing conditions of primary or dominant non-native invasive grasses and initiate control and restoration measures as well as monitoring future invasions. DMAFB will implement activities that will increase the use of arid-adapted native grasses while reducing the density of buffelgrass and fountain grass. As an example, mowed grasslands could be transitioned to native grasses, especially if there are areas where non-native grasses may impact the listed species or species of concern such as on undisturbed areas or semi-improved lands. See the National Invasive Species Council (NISC) Invasive Species Early Detection and Rapid Response: Resources Guide. Available at the following web site: (https://www.doi.gov/sites/doi.gov/files/uploads/EDRR%20Resource%20Guide_02_17_2016_Final_0.pdf).
2. Round-tailed ground squirrels near the flight line attract raptors that increase the potential for bird-aircraft strikes.
3. Ground squirrels are a primary concern within recreation areas and athletic fields.
4. Africanized honeybees entered southern Arizona in early 1993; since then there have been many swarms in Arizona confirmed by the ADA. Coordination of pest management, fire protection, security forces, and medical group personnel is necessary to protect base personnel should a swarm occur.
5. Venomous snakes on DMAFB present a minor health risk to humans and animals.
6. There is a need to ensure continued coordination between Pest Management and other offices on DMAFB, particularly the Natural Resources Element within the Asset Management Flight (Natural Resources Manager). The daily incident reports forms that are prepared summarizing pests, chemical and non-chemical activities, site, building number, area, and remarks will be integrated with the Natural Resources databases for more comprehensive management in the future.

7.72 *Bird/Wildlife Aircraft Strike Hazard (BASH)*
Installation Supplement

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 this installation.

Program Overview/Current Management Practices

7.12.1 Existing Bird/Wildlife Aircraft Strike Hazard Programs

Existing Bird Aircraft Strike Hazard Programs are covered in the most recent (2018) DMAFB Bird/Wildlife Aircraft Strike Hazard (BASH) Plan (Appendix G).

Plan summary

1. Purpose: To provide a base program designed to minimize aircraft exposure to potentially hazardous bird/wildlife strikes where DMAFB units conduct flying operations.

2. Conditions for execution: This plan is based on hazards from both resident and migrant bird populations, as well as, any other wildlife. Implementation of specific portions of the plan is continuous, while other portions require implementation as dictated by bird/wildlife activity.

3. Operations to be conducted:

    1. The establishment of a Bird/Wildlife Hazard Working Group (BHWG), to include representatives from AZGFD and USFWS;

    2. Establishment of procedures to identify, communicate, and report high hazard situations to aircrews and supervisors to determine if altering/discontinuing flying operations is required.

    3. Provisions to provide information to all assigned and transient aircrews on specific bird/wildlife hazards and procedures for avoidance;

    4. Provide aircraft and airfield operating procedures designed to avoid high hazard situations;

    5. Actions to eliminate/reduce environmental factors that attract birds/wildlife to the airfield. Decrease the attractiveness of the airfield to birds/wildlife by eliminating, controlling and reducing environmental factors which support the birds/wildlife;

7.12.2 Bird/Wildlife Aircraft Strike Hazard Issues and Concerns

1. DMAFB specific wildlife hazards to air operations historically include raptors (e.g., red-tailed hawks, kestrels), ravens and mourning doves;

2. DMAFB also is home to other desert wildlife including roadrunners, quail, burrowing owls, javelinas and coyotes (Section 5.3). These are less of a threat to aircraft but occasionally cross the runway environment, especially at dusk/dawn. Javelinas are most active at night and are occasionally seen during periods of light flight line activity;

3. Round-tailed ground squirrels near the flight line attract raptors that increase the potential for bird-aircraft strikes.

4. Minimize the lethal take of raptor species on and around the airfield by using non-lethal hazing techniques.

7.13 Coastal Zone and Marine Resources Management
Installation Supplement

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 this installation.

7.14 Cultural Resources Protection
Installation Supplement

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 this installation.

Program Overview/Current Management Practices

7.14.1 Existing Cultural Resources Programs

The DMAFB is responsible for the establishment of the cultural resources management program and development of the Integrated Cultural Resource Management Plan (ICRMP). The ICRMP was revised in 2018 in accordance with AFI 32-7065. Day-to-day implementation of the plan is the responsibility of the Cultural Resources Manager (CRM).

Of the 10,530 acres of the main base associated with DMAFB, 7,793.55 acres have been surveyed. This accounts for approximately 73% of the base. Remaining portions of the base are considered built infrastructure which is defined as structures, buildings, roads, sidewalks, parks, maintained recreational areas and/ or other hard surfaces. Table 5 below documents a summary of known cultural resources at DMAFB, as well as, the Titan II Missile Site 12, Titan II Missile Museum, Gator Site at Mt. Lemmon and the FOL Aruba and Curacao.

Federal actions that result in new surface disturbances require processing under 54 United States Code (USC) § 306101 et seq., also known as Section 106 of the National Historic Preservation Act (NHPA). Under this regulation, all historic properties, significant features, or objects that have not been evaluated for eligibility to the National Register of Historic Places (NRHP) must be managed as eligible until evaluation and consultation efforts determine otherwise. Additionally, the Arizona State Historic Preservation Office requires all cultural work ten years or older, to be ineligible for use for reasons of exempting current and future federal undertakings. Accordingly, former cultural resources activities such as excavations, archaeological surveys, architectural inventories, or mapping activities that have taken place on DMAFB-managed lands in the past should not be taken as *de facto* clearance for future activities. All projects that could affect known sites will require evaluation of potential effects on a case-by-case basis (ICRMP, 2018).

Table 5. Summary of known cultural resources at Davis-Monthan Air Force Base.

DMAFB Properties	Archaeological Sites (Eligible)	Architectural Resources Evaluated (Eligible)	Architectural Resources Not Evaluated, Built 1959-1965	Architectural Resources to reach 50 years during Fiscal Year 2018-2023	Known Traditional Cultural Properties	Known Sacred Sites
Main Base	20	14	4	0	0	0
Titan II Missile Museum	0	24	0	0	0	0
Titan II Missile Site 12	1	0	0	0	0	0
Gator Site, Mt. Lemmon	0	0	0	0	0	0
FOL Curacao	0	0	0	0	0	0
FOL Aruba	0	0	0	0	0	0

1.1.1 Existing Cultural Resources Issues or Concerns

Even though a significant portion of the installation has been surveyed or inventoried for cultural resources, there is always the potential for unknown archaeological sites, human remains or traditional cultural properties to be discovered during ground disturbing activities. If a discovery is made, proper action must be taken to minimize damage to the resource and ensure compliance with applicable laws and regulations. All discoveries of Native American cultural items, including NAGPRA-defined objects, must comply with NAGPRA and 43 CFR 10, Native American Graves Protection and Repatriation Act Regulations (ICRMP, 2018). It is also a federal offense, under the provisions of Archaeological Resources Protection Act (ARPA) and 32 CFR 229, to excavate, remove, damage, or otherwise deface any archaeological resources located on federal lands. The provisions of ARPA apply to archaeological material greater than 100 years in age, regardless of the NRHP status of the site where they are found. Any person wishing to excavate or remove archaeological resources from an AF installation must apply for an ARPA permit. AF-contracted work is exempted from the permit provision of ARPA. In the event of a permit request, the CRM should notify the AFCEC Cultural Resources Subject Matter Expert (ICRMP, 2018).

The following discovery procedures have been established as part of the ICRMP:

AF or Contractor personnel that make a potential cultural discovery should:

- Immediately notify the CRM (or Base Commander for OCONUS) of the nature and location of the discovery;
- Immediately cease potentially damaging activities and take efforts to ensure protection of resources until arrival of the CRM or designee

The CRM should:

- Ensure that all cultural items are left in place and that no further disturbance is permitted to occur;
- Sufficiently identify the location of the discovery to provide efficient relocation, yet take efforts to minimize the types of signs that could attract personnel and place the discovery in danger;
- Notify Security Forces of the discovery;
- Direct installation personnel and contractors to take efforts to resume mission-associated activities in a reasonable and timely manner.

Security Forces should:

- Notify the Wing Commander regarding the location, nature, and circumstances of the discovery;
- Provide security/protection for the site to prevent unauthorized disturbance, looting, or vandalism.

If human remains are discovered or if there is sufficient reason to suspect that human remains are present (such as the observation of an oval-shaped rock or earthen mound), the CRM should:

- Determine (with the aid of a coroner or forensic anthropologist) if the remains are human, and whether or not they are associated with an archaeological deposit;
    - o If the remains are not human, and not associated with an archaeological deposit, work may continue;
    - o If the remains are human, Security Forces should notify local law enforcement agency and a coroner, who will determine if the remains are recent, or ancient (with the aid of a forensic anthropologist). If the human remains are modern, the matter may become the responsibility of law enforcement officials who will determine when project activities may resume;
- Invite consultation with Native American tribes, as appropriate. If the human remains are determined to be Native American, the provisions of NAGPRA apply, and the regulations outlined in 43 CFR 10 should be followed.

Regulatory and AF requirements that are necessary to protect cultural resources have the potential to be in conflict with the base mission. Base activities or projects that could pose a mission conflict include:

- Continued use, repair, modernization, adaptation/reuse, preservation and/or demolition of existing facilities, including historic buildings;
- New construction of facilities;
- Land use (e.g., training exercises, flight operations, off-road vehicular traffic, forest management, threatened and endangered species management, wildland fire suppression, erosion control, prescribed burning, live ordnance use);
- Ground disturbance.

The installation attempts to eliminate and/or resolve conflicts by assuring that projects with the potential to impact cultural resources are properly planned and executed. The CRM and installation project managers and planners work together to identify and manage potential conflicts. Impacts to cultural resources resulting from standard or routine activities may be avoided or mitigated by following established environmental and cultural resources management procedures (i.e., completing AF Form 332)

7.15 Public Outreach
Installation Supplement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overvlew/Current Management Practices

7.15.1 Existing Public Outreach Programs

There is currently no consolidated public outreach program at DMAFB. Rather, public outreach is accomplished through multiple programs, including but not limited to the ICRMP, INRMP, SWMP and BASH. It is comprised of two main approaches which overlap community engagement and on-base focused efforts. Environmental awareness by means of community outreach is a requirement of the AZPDES MS4 permit issued by ADEQ. As a result, DMAFB participates in the Pima Association of Governments (PAG) Stormwater Management Working Group (SWMWG). This working group aims to promote stormwater awareness, green infrastructure, watershed planning and low impact development throughout the region by participating in local events such as Earth Day, dispensation of flyers and materials, and youth education. Specific DMAFB public outreach events also include air shows and the Junior Enlisted Appreciation Day. These events aid in the distribution of general awareness flyers and information, and have knowledgeable staff on hand to discuss base information, natural resources and environmental procedures.

On-base personnel and contractors, in some cases, are required to participate in training offered as part of the different base programs. Training courses are available through the Environmental Management System, the Environmental Awareness Course Hub (TEACH), the Air Force Institute of Technology and eDASH. Courses range from general topics of concern to position specific requirements. General environmental awareness topics include best management practices and good housekeeping, litter control, hazardous materials management, certified pesticide, herbicide and fertilizer application, spill prevention and control measures, used oil and spent solvent management, fueling and vehicle maintenance procedures, and stormwater awareness. Training requirements of the ICRMP for the CRM and managing staff include the Environmental Impact Analysis Process, Applying the EIAP/NEPA Process: Air Force Specific, Introduction to Cultural Resource Management, and American Indian Cultural Awareness Course. Natural resource topics rely on online and in-person seminars. Our community partners; Tucson Electric Power, Pima County Environmental Quality, AZGFD, Tucson Clean and Beautiful and BLM participate in outreach events, on-base meetings and provide training when required. DMAFB has also developed procedures, guidelines and policies for contractor compliance to ensure environmental requirements and regulation are met. An example of this is the implementation of the Civilian Contractor's Environmental Guide.

Some programs that are being assessed, developed further and remain a priority by DMAFB include:

1) Develop a Watchable Wildlife Program (https://www.azwatchwildlife.com/);

2) Initiate volunteer programs supporting natural resources conservation including:

   a) Restoration work including planting of native vegetation and developing and constructing passive rainwater harvesting systems (https://www.tucsonaz.gov/water/rainwater-harvesting-rebate);

   b) Expand the invasive non-native plant species early detection, eradication, and control programs (e.g., buffelgrass) (http://aznps.com/Restoration.php, http://aznps.com/invasives.php or https://www.desertmuseum.org/buffelgrass/);

   c) Initiation of a citizen scientist program with the National Phenology Network, an organization that brings together citizens, students and teachers, scientists and managers from government and non-government agencies to monitor the impacts of climate change on plants and animals in the United States. Citizen scientists record annually recurring aspects of species life histories such as leafing, flowering and fruiting, emergence of insects, and migration of birds. (http://www.usanpn.org/);

3) Develop a Sonoran Desert interpretive garden around a highly visibility area of DMAFB (http://arboretum.arizona.edu/);

4) Develop a Sonoran Desert interpretive center focusing on the unique qualities of the Sonoran Desert with brochures and suggestions for outdoor recreational opportunities on and off base.

7.16 Climate Change Vulnerabilities
Installation Supplement

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

7.16.1 Climate Change Analysis for DMAFB

The Air Force Civil Engineer Center (AFCEC) engaged Colorado State University (CSU) to aid U.S. Air Force (USAF) installations in meeting the DoD requirements 4715.21, 4715.03 and AF 32-7064 which addresses inclusion of climate change assessments and impacts into INRMPs. As a result, the *Climate Change Summaries for Incorporation into Installation INRMP, Davis-Monthan Air Force Base* was developed in March of 2019, Appendix R. The team was comprised of scientists, ecologists, environmental planners, military land managers and engineers. Site-specific downscaled temperature and precipitation climate projections for two future emission scenarios were modeled for the main installation within DMAFB. The models were referenced to assess potential impacts of future climate on the installation's natural resources and propose potential adaptation strategies for goal, objective and work plan development considerations.

Parameters utilized in the models included a 30-year baseline of historical climate data between 1980 and 2009, climate data from 2026 to 2035 to represent the decadal average for 2030, and climate data from 2046 to 2055 for the decadal average for 2050. Historical climate data was obtained from DAYMET, which illustrates approximately 1 kilometer (km) spatial resolution, and OCONUS which is 50 km grid resolution. Future emissions scenarios were represented by two possible outcomes: the Representative Concentration Pathway (RCP) 4.5- moderate emissions, RCP 8.5- high emissions. For more details regarding assumptions and characteristics of the models, refer to Appendix R.

7.16.2 Physical Environment

7.16.2.1 Climate

Climate projections for DMAFB (Table 6) suggest minimum and maximum temperatures will increase over time under two emission scenarios - a moderate carbon emission scenario (RCP 4.5 and a high emission scenario RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030, and extracted data from 2046 to 2055 for the decadal average for 2050.

For the decade centered around 2030, both of the scenarios project a similar degree of increase in average annual temperature (TAVE) of between 1.9 °F (1.1 °C) and 2.2 °F (1.2 °C) over historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 3.0 °F (1.7 °C). RCP 8.5 expresses a slightly greater warming of 4.5 °F (2.5 °C) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects a large increase in PRECIP of 42% while RCP 8.5 shows an increase of 26%. For 2050, RCP 4.5 projects a moderate increase in PRECIP of 17% while RCP 8.5 shows a smaller increase of 13%.

Table 6. Summary of Climate Data.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	13.2	18.7	15.4	16.6	14.9

TMIN (°F)	53.0	55.2	55.6	55.0	57.2
TMAX (°F)	83.5	85.0	86.8	85.8	88.2
TAVE (°F)	68.2	70.1	71.2	70.4	72.7
GDD (°F)	6917	7287	7551	7368	7832
HOTDAYS	145.4	155.8	169.2	162.1	176.2
WETDAYS	0.1	0.1	0.1	0	0

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

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 7). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. Design storms were used to model stream channel overflow in the hydrology assessment.

Table 7. Design storm precipitation.

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	0.79	0.73	0.51	0.56	0.74
	Day 2	0.89	1.35	1.00	1.16	1.00
	Day 3	0.77	0.73	0.53	0.78	0.58
	Total	2.45	2.81	2.04	2.50	2.32
Percent change from baseline			15%	-17%	2%	-5%

7.16.2.2 Hydrology

Stream Channel Modeling

Modeling of stream channel overflow (or flood modeling) was conducted for DMAFB to examine the extent of flooding along Atterbury Wash associated with climate projections. Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data (Table 8). The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Inundation projections were influenced by four variable inputs: (1) variation in total precipitation between design storms, (2) variation between the daily distribution of precipitation over the three-day period, (3) land cover change over the watershed area used in hydrologic modeling, and (4) land cover change in the area within the installation used in hydraulic modeling.

Projected inundation associated with each climate scenario and the relative change from baseline conditions are summarized in Table 8. The spatial extent of projected flooding is depicted in a series of maps below: Figure 17, Figure 18, and Figure 19, also available in Appendix R. Projected changes in stream channel overflow can be used to assess potential vulnerabilities to species, habitat, mission, and built and natural infrastructure.

The baseline design storm was estimated to produce 2.45 inches of precipitation over the three-day period (Table 7). Design storm precipitation is projected to increase in 2030 and decrease in 2050, with more extreme variability under the RCP 4.5 emission scenario (Table 7).

Stream channel overflow associated with the baseline design storm was estimated to inundate approximately 68 acres along Atterbury Wash (Table 8). Modeling projections estimate inundation at DMAFB will increase for all climate scenarios. More inundation is expected in 2030 as design storms associated with this timeframe have more total precipitation. Storms are projected to be smaller in 2050 and therefore less inundation is projected to be less than in 2030, but slightly higher than the historical baseline.

Table 8. Projected inundation from stream channel overflow

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050
Projected inundation (acres)	67.8	89.3	72.3	81	72.6
Change in inundation area from baseline (acres)		21.5	4.5	13.2	4.8
Percent change from baseline		31.7%	6.7%	19.5%	7.1%

7.16.2.3 Ecosystem Classification

DMAFB is located within the Dry Domain, Tropical/Subtropical Desert Division, American Semi-Desert and Desert Province (Bailey, 2014). Ecosystems in the Tropical/Subtropical Desert Division are arid and have high air and soil temperatures. Since direct solar radiation ad outgoing radiation are high, there is extreme variations between day and night temperatures (Bailey, 2014).

7.16.2.4 Vegetation

Five major natural ecosystems on DMAFB were identified using USGS GAP Analysis Land cover. The ecosystems included mixed palo verde - cacti, creosote-white bursage, upland scrub, desert scrub and desert riparian. Natural ecosystems as well as developed land and crop/pasture areas are summarized in Table 9.

Table 9. Ecosystem coverage by area.

Ecosystem Type	Area (acres)	Coverage
Mixed Paloverde - Cacti	2415.9	22.3%
Creosote-White Bursage	819.0	7.6%
Upland Scrub	690.9	6.4%
Desert Scrub	20.4	0.2%
Desert Riparian	3.3	<0.1%
Developed and Barren Land	6868.2	63.5%

Under future climate conditions, desert ecosystems are likely to be exposed to increased air temperature, changes in precipitation, decreased soil moisture, more extreme high temperature events, and increased wildfire over the coming century. Although predictions of monsoon activity in North America are highly uncertain (Bukovsky, Gochis, & Mearns, 2013), more frequent and/or more intense tropical storms could alter desert stream geomorphology and riparian vegetation communities, particularly those in dry washes or floodplains. The desert ecosystem is expected to shift westward and upward in elevation over the coming century (Barrows, 2011; Barrows & Murphy-Mariscal, 2012), and, in some areas, may replace upslope vegetation that is less suited to increasingly hot and dry conditions (Friggens et al., 2013; Lenihan, Bachelet, Neilson, & Drapek, 2008).

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 also depend on changes in precipitation and fire. Increased drought frequency could also 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.

As warmer temperatures increase evaporation and water use by plants, soils are likely to continue to become drier. Average rainfall is likely to decrease during winter, spring, and summer. Increased evaporation and decreased rainfall are both likely to reduce the average flow of water sources. Drier soils will increase the need for irrigation at the installation, but sufficient water might not be available (EPA, 2016).

Climate summaries for the analyzed scenarios project an increase in average annual temperature of between 2.4 °F (1.3 °C) and 4.8 °F (2.7 °C) over the historic average. Precipitation modeling projects a moderate increases in precipitation in July and August in both scenarios and decadal averages analyzed. But the amount of moisture available for the organisms in all ecosystems at DMAFB might not change or could potentially decrease due to the increase in average temperature.

This could result in higher evapo-transpiration rates leading to an earlier, more rapid seasonal drying-down of open water/wetland communities, lincreased water stress in nearby basin-floor communities and later, less frequent, briefer wetting of nearby playas. The shrinkage of areas of perennial flow/open water, coupled with higher water temperatures at locations/times when water temperatures are not controlled by groundwater discharges or snowmelt; persistence of these hydrologic conditions later into the fall or early winter; and reduced groundwater recharge (Comer et al., 2012).

Creosote Bush Scrub communities might be vulnerable to climate change effects, mainly due to its dependence on seasonal rainfall for successful germination and potential effects of climate change on plant pollinators. Land use changes in response to climate change will increase vulnerability as well. A qualitative analysis of vegetation cover type maps in the MC2 Dynamic Global Vegetation Model (from here on referred to as MC2) was done to assess potential changes to land cover and uses under the projected climate change scenarios, Figure 17, Figure 18, and Figure 19. Historically, vegetation type at DMAFB has been Subtropical Grassland in the total area of the installation. Under the current projected scenarios, vegetation cover at DMAFB is projected to convert to Subtropical Shrubland.

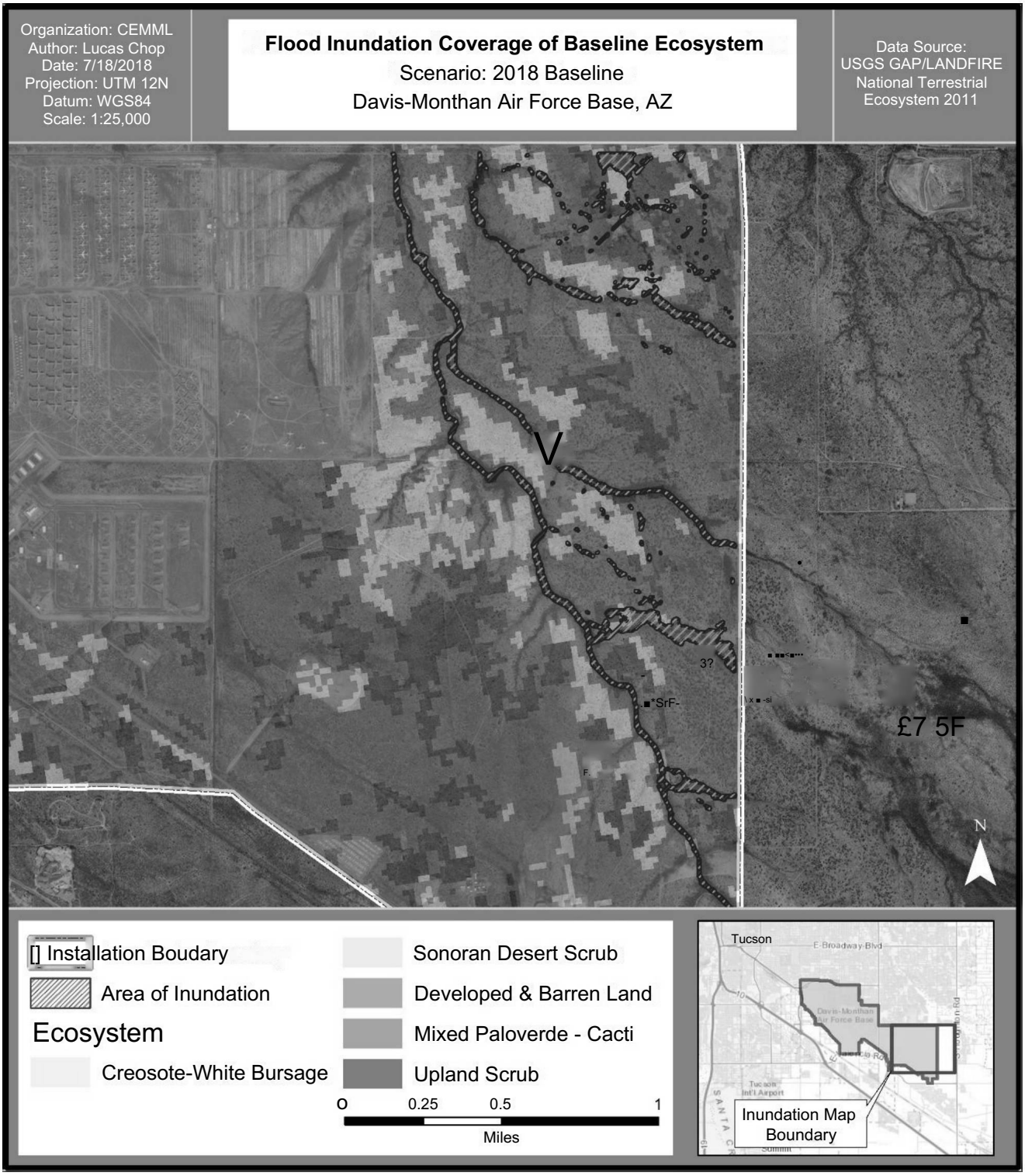


Figure 17. Ecosystem Coverage and Projected Inundation for Baseline Scenario

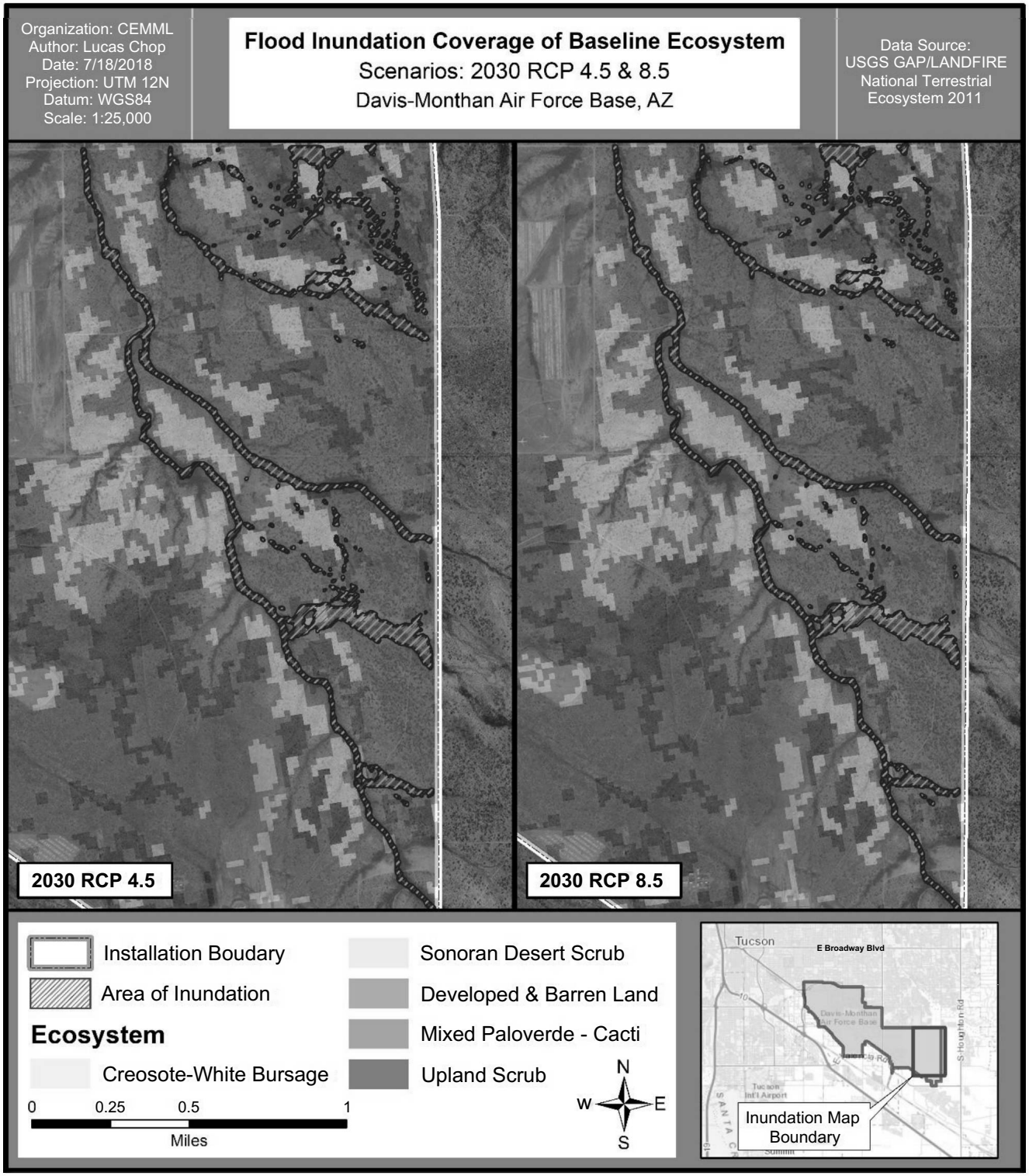


Figure 18. Ecosystem Coverage and Projected Inundation for 2030 Scenarios.

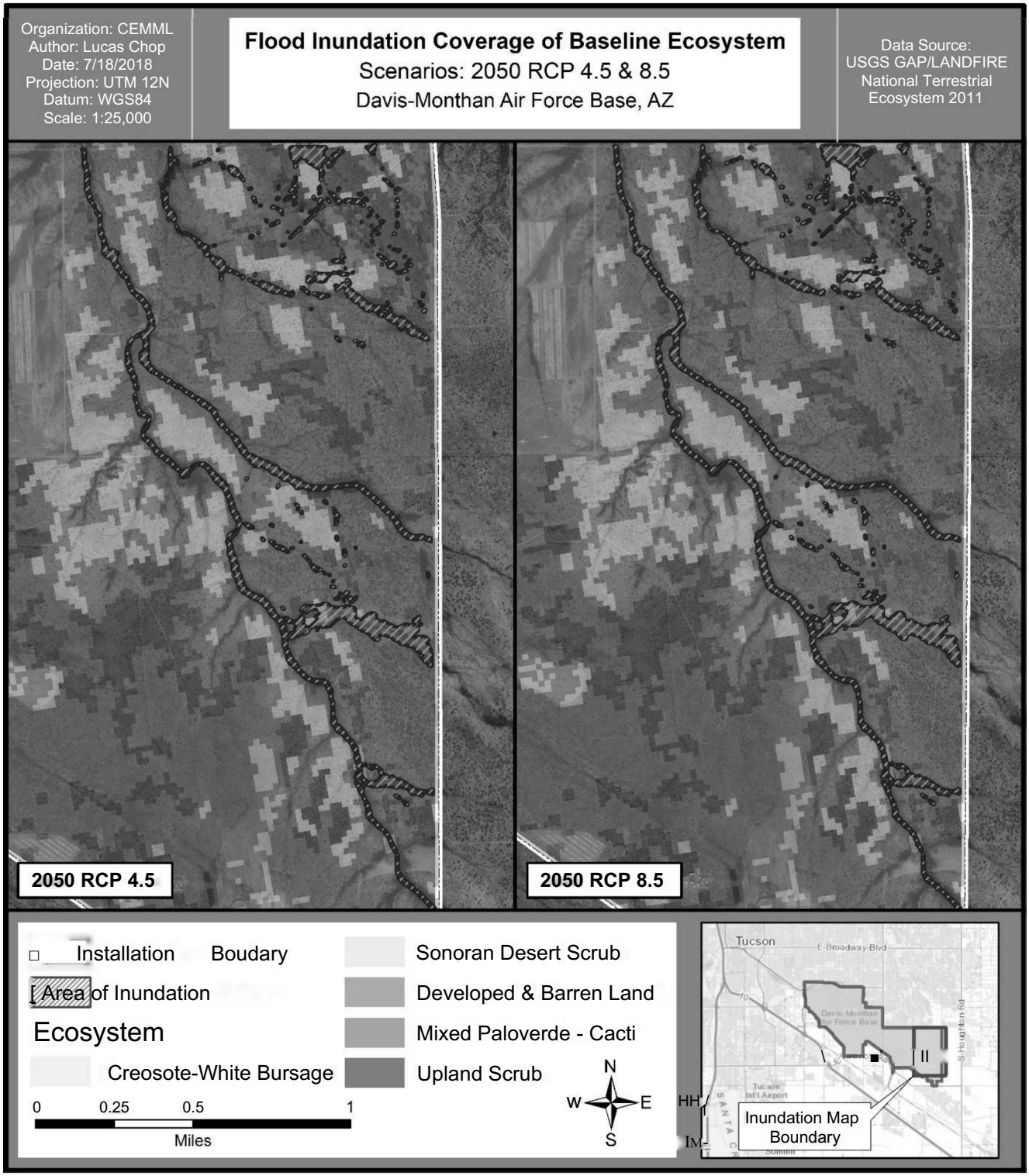


Figure 19. Ecosystem Coverage and Projected Inundation for 2050 Scenarios.

7.16.2.5 Fish and Wildlife

Wildlife populations at DMAFB could experience significant impacts due to climate change. Scarcity of water is currently an issue for wildlife populations at DMAFB and this will likely continue to be under the climate projections. Despite projections of increased precipitation, water scarcity will probably increase because much of the precipitation will fall in the winter and during brief intense convectional storms. High run off and evapotranspiration rates due to increasing temperatures will reduce water availability for wildlife (Archer, Predick, Chambers, & Pellant, 2008). Generalist species will likely be better able to adapt to climate change through behavioral adaptations. For example, the Gila monster is diurnal on cooler days and nocturnal on hot days (Stahlschmidt, DeNardo, Holland, Kotler, & Kruse-Peeples, 2011).

Density of woody shrubs has increased three-fold from the 1970's to the late 1990's in parts of the Sonoran desert due to higher winter precipitation (Brown, Valone, & Curtin, 1997). This trend is likely to continue due to increasing amounts of winter precipitation. Changing vegetation communities will likely have a negative impact on specialist wildlife species that have historically depended on specific native plant species for their survival (Dukes & Mooney, 1999). Other wildlife species could change in an unpredictable manner. For example, a widespread species such as the common chuckwalla is predicted to lose 92% of its suitable habitat in the Sonoran Desert due to climate change (Barrows, 2011). Other common species in the Sonoran Desert, such as the kangaroo rat *(Dipodomys desert'd* and silky pocket mouse *(Perognathus flavus),* have experienced significant declines as a result of changing vegetation induced by climate change. On the other hand, rare species such as the desert pocket mouse *(Chaetodipus penicilatus)* and Bailey's pocket mouse *(Chaetodipus balleyii)* have responded positively to changing vegetation (Brown et al., 1997).

Climate change will likely favor newly arriving invasive species that often have the ability to outcompete native species that are already experiencing reduced fitness due to environmental conditions shifting away from historic standards (Hellmann, Byers, Bierwagen, & Dukes, 2008). Though this trend is a global one, it is expected to be far more pronounced in the southwest (Archer et al., 2008).

7.16.2.6 Threatened and Endangered Species and Species of Concern

Habitat change and disruption to food availability are two major climate-related threats to all species at DMAFB. Habitat requirements for so species, such as need for refugia, may change as those species 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 mis-match between food availability and food needs of threatened and endangered species. Populations of some threatened and endangered species are further imperiled by life stages that are sensitive to temperature and precipitation changes projected in the climate scenarios.

7.16.2.7 Mission Impacts on Natural Resources

Natural Resource Constraints to Mission and Mission Planning

Maintaining civil infrastructure in an operable condition and adequate airspace are the primary resources required to sustain DMAFB's diverse set of missions. Flooding is not anticipated to be a major concern at DMAFB due to an extremely small increase in flood plain extent in an area with little to no infrastructure. The climate at DMAFB is expected to get wetter and hotter, which could have secondary effects on the mission such as vegetation shifts and species migrations leading to an increased regulatory environment.

Future impacts to the mission at DMAFB 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, Stein, & Edelson, 2011);
- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

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).

Fish and Wildlife Management

Fish and wildlife management will not change greatly at DMAFB with regards to climate change. Current management issues such as drought, pest species and BASH concerns will likely persist in the future. Drought could become a more pressing issue as runoff and evapotranspiration rates increase. As freshwater becomes scarcer, wildlife could be attracted to irrigated, developed areas, resulting in increased BASH concerns. Use of native vegetation in cantonment areas that does not require irrigation could reduce the attraction for wildlife, thus reducing BASH concerns and minimizing wildlife relocation efforts. Conducting surveys will be important in monitoring arrival and spread of invasive species, which have the potential to outcompete native species already experiencing reduced fitness due to environmental conditions shifting away from historic standards (Hellmann et al., 2008).

Outdoor Recreation and Public Access to Natural Resources

Opportunities for outdoor recreation and public access to natural areas at DMAFB is not likely to change with regards to climate change. Recreational opportunities are currently limited to non-consumptive activities such as hiking, biking, jogging, walking, archery, skeet and trap shooting, park and pool use, and RV camping. These activities are not open to the public, and have a light impact on natural areas and will likely continue to have minimal impacts on the environment regardless of climate change.

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

Management actions taken to protect threatened and endangered 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. Species can exhibit behavioral, plastic and genetic response to environmental conditions. Genetic variation within a species has been associated with exposure to environmental conditions, however, populations may not be able to undergo selection for preferred traits if environmental conditions change rapidly (Hoffmann & Sgro, 2011). Behavioral changes, such as host-plant or food source switching, and plastic responses, such as changes in body size associated with longer growing seasons, have already been observed (Iwamura et al., 2013; Ozgul et al., 2010).

Many current threatened and endangered 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.

Wetland Protection

Habitats protected by the Clean Water Act on DMAFB are all ephemeral drainages; there are no perennial drainages. Several channelized ephemeral drainages carry runoff from the developed portions of DMAFB and exit the base via underground or open drainage systems. Atterbury Wash is the primary ephemeral drainage on the undeveloped portion of the base. There are no jurisdictional wetland on DMAFB per the 1996 delineation (Appendix E).

Wetland ecosystems wordwide will face increases in air and surface water temperatures, alterations in the magnitude and seasonality of precipitation and run-off, and shifts in reproductive phenology and distribution of plants and animals (Parmesan & Yohe, 2003). These ecosystems 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. Because wetland systems and the projected impacts of climate change are highly variable geographically, there is a pressing need to develop a place-based understanding of climate change threats to wetland ecosystems (Cowardin, Carter, Golet, & LaRoe, 1979).

Wildland Fire Management

Wildfires at DMAFB are likely to increase substantially in likelihood and size due to grass invasion that may be facilitated by

increased precipitation. The impacts associated with invasive grass encroachment will drown out the influences of climate change, though climate change may exacerbate the situation.

Fire in the Sonoran Desert is rare due to a lack of contiguous fuels. Fires typically cannot move from one patch of vegetation to the next and large fires are exceedingly unlikely. However, non-native grasses have begun to invade this ecosystem and there is potential for DMAFB to suffer from large-scale invasion due to the proximity of highly populated areas where invasive grasses are likely to be introduced. If invasive grasses can be kept at bay, fire activity is likely to remain static with only occasional, very small fires. If the grasses invade at a large scale, fire activity will increase drastically, regardless of the climate scenario. The degree to which this may occur is difficult to estimate and beyond the scope of this study.

Rainfall is projected to increase across all scenarios, with increases of 22-41% by 2030 dropping to 10-11% by 2050. The increased rainfall by 2030 may favor grass invasion creating a fuel bed in which ignitions are much more likely to occur and through which fire is much more likely to propagate. In this scenario, the Sonoran Desert will no longer be fuel-limited and fire would likely become a more regular occurrence.

7.17 Geographic Information Systems (GIS)
Installation Supplement

7.17.1 Geographic Information Systems

7.17.1.1 Natural Resource Management Units

Identification, classification, and mapping of installation natural resource management units serves as a foundation for all other GIS mapping endeavors at DMAFB. The natural resource management units at DMAFB for this INRMP follow the general categories of improved, semi-improved, and unimproved lands. These categories generally represent broad areas of similar habitat or ecosystems that are likely to require similar management practices and would form appropriate management zones for natural resource programs.

Improved and Developed Lands

Approximate acreage: 2,200 acres

Environment: Approximately 820 acres of mowed, seeded, and landscaped grounds; approximately 1,380 acres of paved ground and facilities.

Facilities: Runways, hangars, shops, warehouses, administrative buildings, stores, schools, chapel, library, hospital, housing, golf course, athletic fields, tennis courts, RV camp, swimming pool.

Land Use Categories: Airfield, Aircraft Operations and Maintenance, Administrative, Community Commercial, Community Services, Medical, Accompanied Housing, Unaccompanied Housing, and portions of Outdoor Recreation.

Natural Resources Coordination: Landscape Management, Pest Management, and Outdoor Recreation.

Narrative: Landscape management efforts focus on improved lands where the majority of areas important to the base's image are located. Both primary and secondary landscape development zones are found in this unit. Outdoor recreation includes a number of facilities in this unit such as parks, swimming pool, and athletic fields. These are Class I recreation areas. Since wildlife and protected species management focuses primarily on habitat areas outside the developed locations, its role in this unit is likely to be minor except in cases where wildlife appear in developed locations. Of particular importance would be the implementation of landscaping practices that utilize primarily native vegetation. This would serve to attract native species of birds and insects (e.g., butterflies). Additionally, these lands could focus on control of invasive non-native grass species (e.g. buffelgrass *(Pennisetum ciliare)* and fountain grass *(Pennisetum* sp.)).

Semi-improved lands

Approximate acreage: 3,500 acres

Environment: Primarily vacant land, mowed grassland, and relatively undeveloped lands.

Facilities: Retention ponds, drainage systems, roads.

Land Use Categories: Industrial, Outdoor Recreation, Open Space.

Natural Resources Coordination: Land Use, Landscape Management, Pest Management, Wildlife and Protected Species Management, and Outdoor Recreation.

Narrative: Wildlife and protected species programs that may take place in semi-improved lands include wildlife surveys, programs in which semi-improved lands are planned for return to unimproved status, control of invasive non-native grass species or BASH reduction programs. Portions of semi-improved lands include Class II outdoor recreation areas (natural areas) used for hiking, running, walking, and horseback riding. Semi-improved lands also include the tertiary landscape development zone where little or no landscape development takes place and mowing is the primary activity.

Unimproved lands

Approximate acreage: 4,530 acres

Environment: Native vegetation, Sonoran desertscrub, Sonoran desert xeri-riparian.

Facilities: Roads.

Land Use Categories: Outdoor Recreation (limited), Open Space.

Natural Resources Coordination: Land Use, Pest Management (particularly invasive exotic grasses), Wildlife and Protected Species Management, and Outdoor Recreation.

Narrative: Wildlife and protected species programs are likely to focus on unimproved lands where actual and potential wildlife habitat exists in a more natural state. Programs in unimproved lands may include wildlife surveys and monitoring, habitat restoration and enhancement, control of invasive non-native grass species (e.g. buffelgrass and fountain grass), erosion control in Atterbury Wash, and the development of nature and interpretive trails. Portions of unimproved lands also include Class II outdoor recreation areas (natural areas) used for hiking, running, walking, and horseback riding. No landscape development actions are planned for unimproved lands.

7.17.1.2 Current DMAFB GeoBase System

DMAFB's GIS is a GeoBase system and is the responsibility of the 355th CES/CEIE Programs Flight. Currently, the base's entire infrastructure, including water, gas, and communications lines, is included in the GeoBase system. Also, all real property (i.e., buildings, roads, parking lots, etc.) records for DMAFB are entered into the GeoBase. This includes building locations and numbers, square footage, responsible organization, condition code, and replacement cost. The locations of ERP sites are also entered into GeoBase as are the locations of owl burrows and other data from DMAFB raptor surveys. Additionally, all survey data from the past and more recent survey data (e.g. Lowery and Ingraldi 2009a, 2009b, (Abbate, Hofer, and Lowery 2014), (Stingelin 2017), (Stingelin 2019), have been added to our GIS applications and planning purposes. Other spatial databases to be developed that would aid in the planning process and potentially benefit natural resource management include Pest Management incidents, BASH incidents, Tucson Bird Counts, and a comprehensive record of Landscape Management's distribution of native and non-native plants used in landscaping on DMAFB. A recommended list of data sets to be entered into GeoBase is provided in Table 4. This list is not intended to be inclusive and will constantly evolve and be adapted to reflect current natural resource management priorities, issues, and concerns.

7.17.1.3 GIS Issues and Concerns

Because species populations are constantly fluctuating, it is difficult to collect and maintain precise data to monitor changes in population parameters of interest (e.g., population density, survivorship of offspring). Lack of resources, both financial and personnel, prevents regular surveys of species of conservation and management concern. Therefore, the data for a particular species may not always reflect current conditions or status. Every effort possible will be made to keep all natural resource survey and monitoring data on priority species current and incorporated into the DMAFB GeoBase. The data base is maintained by an AFCEC contractor and overseen by Luke AFB staff. The information may be accessed for future land use planning and construction projects, as well as, operation and maintenance activities.

Table 10. Recommended GIS datasets related to management of natural resources.

Aerial photography	Pesticides and herbicides

BASH incidents	Present land use
Groundwater contaminant plumes	Recreational sites/trails
Hazardous materials management/incidents	Runoff/drainage patterns
Invasive Exotic species	Sensitive habitats
Land use areas	Threatened and endangered species
Landscape plant species and location	Tucson Bird Count data
Burrowing Owl nest location	Nesting raptors
Pest Management incidents	Natural and artificial surface drainages

8 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the entire natural resources program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement

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The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement—Management Goals and Objectives

8.1 WILDLIFE SPECIES OF CONSERVATION CONCERN

GOAL 1: Manage persistence of current populations and habitats of birds of prey on DMAFB (e.g., burrowing owls, Swainson's hawks, Cooper's hawks, great horned owls, and loggerhead shrikes).

Objective 1.1: Continue to work closely with AZGFD and other Federal and State agencies in on-going research of burrowing owl on DMAFB.

Project 1.1.1: Continue and expand research on life history (e.g., demography, habitat, movements) of burrowing owls.

Project 1.1.2: Limit unnecessary loss, disturbance, or fragmentation of habitat for burrowing owls.

Project 1.1.3: Continue annual surveys for inventory of burrowing owl nesting and wintering habitat on DMAFB.

Project 1.1.4: Initiate a telemetry study to determine movement and habitat use of burrowing owls.

Objective 1.2: Continue working with AZGFD on study of Swainson's hawk distribution, abundance and nesting success on DMAFB.

Project 1.2.1: Conduct annual and seasonal surveys for the continuation of the monitoring program for Swainson's hawks nesting or breeding on DMAFB.

Project 1.2.2: Limit unnecessary loss, disturbance, or fragmentation of suitable habitat for Swainson's hawks.

Objective 1.3: Initiate projects for more common birds of prey (e.g., Cooper's hawks, great horned owls, loggerhead shrikes) on their distribution, abundance, habitat use and nesting success on DMAFB.

Project 1.3.1: Conduct annual and seasonal surveys, and ensure the continuation of the monitoring program for the common birds of prey extant on DMAFB.

Project 1.3.2: Limit unnecessary loss (e.g. shooting of raptors by U.S.D.A. Wildlife Services), disturbance, or fragmentation of suitable habitat for common birds of prey to ensure persistence on DMAFB.

GOAL 2: Identify, restore, manage, and protect distinct vegetation communities/wildlife habitats extant on DMAFB that are potentially important for species of conservation concern.

Objective 2.1: Continue annual vegetation restoration projects and surveys throughout DMAFB with an emphasis on Sonoran Desert vegetation in the base's eastern section (especially Atterbury Wash) and invasive non-native species.

Project 2.1.1: Categorize vegetation community types (e.g., Arizona Upland, Lower Colorado, Sonoran Xeri-riparian) and sample representative areas within each community to describe species composition, condition, and connectivity with adjacent habitats off-base.

Project 2.1.2: Use extant vegetation communities to designate survey priorities for species with a moderate to high potential for occurring on DMAFB.

Project 2.1.3: Protect extant native vegetation communities and restore areas with invasive nonnative species to a natural state.

Project 2.1.4: Avoid clearing or mechanical disturbance of natural desert vegetation areas and limit unnecessary loss, disturbance, or fragmentation of suitable habitat for species of conservation concern.

Project 2.1.5: When and where possible develop adequate compensation plans for actual or potential habitat losses resulting from land and water projects in accordance with State and Federal laws. Habitat compensation plans will seek compensation at a 100% level, where feasible.

GOAL 3: Assess mammal species richness and abundance on DMAFB.

Objective 3.1: Work with AZGFD and/or other Federal agencies to conduct inventories for major groups of mammals potentially occurring on Base.

Project 3.1.1: Continue to conduct surveys for bat species potentially occurring on base (see section 5.4) with an emphasis on distinct habitat types (e.g., Sonoran Desert Uplands, Xeri-riparian [i.e., Atterbury Wash], and stock pond along Atterbury Wash).

Project 3.1.2: Specifically target areas with native and/or ornamental palm trees on base to survey for western yellow bats and their preferred roosting habitat. Utilize HDR 2015 surveys to maintain and expand locations of palms and Saguaro on base (HDR 2015). If applicable, work with Grounds Maintenance to coordinate pruning techniques to minimize disturbance to native bats.

Project 3.1.3: Erect artificial roosting sites, also known as bat house boxes, (e.g., See Bat Conservation International guidelines http://www.batcon.org/index.php/get-involved/install-a-bat-house.html) throughout DMAFB to promote colonization by native bats. Bats are known predators of pest species of insects (e.g., mosquitoes) and act as a natural insect control approach.

Project 3.1.4: Initiate annual surveys for small mammal (i.e., rodents) species potentially occurring on base with an emphasis on distinct habitat types (e.g., Sonoran Desert Uplands, Xeri-riparian [i.e., Atterbury Wash], stock pond along Atterbury Wash).

Project 3.1.5: Initiate annual surveys for medium to large mammal (e.g., coyotes, fox, javelina, deer, bobcat, and mountain lion) species potentially occurring on base with an emphasis on the xeri-riparian community and stock pond along Atterbury Wash. Survey for signs (tracks, scat) and camera trapping methods would be most applicable.

GOAL 4: Assess reptile and amphibian species richness and abundance on DMAFB.

Objective 4.1: Work with AZGFD and/or other Federal agencies to conduct inventories for reptiles and amphibians with an emphasis on species of conservation concern. Several surveys for amphibians and reptiles, in both an urban setting and a more natural setting, have been conducted in the Tucson Basin and can serve as a basis for developing surveys at DMAFB (see Germaine 1995, Rosen 2003).

Project 4.1.1: Based on results of habitat surveys, initiate surveys for Sonoran desert tortoises and Gila monsters on DMAFB, placing an emphasis in the Sonoran desert vegetation in the upper areas of Atterbury Wash (HDR Inc., 2015).

Project 4.1.2: Continue to build upon amphibian survey from 2015 conducted by HDR (HDR Inc., 2015) with an emphasis during the summer monsoon (rain) season near Atterbury Wash.

Project 4.1.3: Continue to build upon surveys from 2015 conducted by HDR for all species of common reptiles, with an emphasis on distinct habitat types (e.g., Sonoran Desert Uplands, Lower Colorado, Xeri-riparian [i.e., Atterbury Wash], and the stock pond along Atterbury Wash [Appendix P]) (HDR Inc., 2015).

GOAL 5: Manage for the persistence of threatened, endangered and sensitive species and their habitats on DMAFB

Objective 5.1: Determine the distribution and status of Sonoran Desert Tortoises within DMAFB.

Project 5.1.1: Map the distribution of Desert Tortoises within DMAFB and document all survey data in the DMAFB GeoBase system.

Objective 5.2: Determine the distribution and status of the Nichol's Turk's head cactus within the DMAFB interpretive Titan II Missile Site 12 boundaries within the Ironwood Forest National Monument.

Project 5.2.1: Initiate surveys in coordination with BLM and AZGFD to determine potential habitat and presence of the cactus.

Project 5.2.2: Map the distribution of any potential Nichol's Turk's head cactus in the DMAFB GeoBase system.

GOAL 6: Manage for the migratory bird species seasonal use and distribution across DMAFB.

Objective 6.1: Determine the distribution and status of the migratory bird species seasonal use and distribution across DMAFB.

Project 6.1.1: Initiate annual surveys and continue monitoring spatial and temporal use of migratory songbirds within DMAFB.

8.2 PEST MANAGEMENT

Management goals and objectives for DMAFB are distinctly geared toward controlling particular pests. The primary pest management (PM) goals at DMAFB are to effectively control common pest species such as birds (e.g., pigeons), reptiles (e.g., venomous snakes), and insects (e.g., bees, wasps, termites and cockroaches) and invasive weedy plant species for the protection of property and health of personnel. Specific objectives for managing natural resources in the achievement of such goals are provided below.

GOAL 1: Assess extent of invasive non-native species distribution on DMAFB.

Objective 1.1: Identify invasive non-native species (priority buffelgrass) presences, extent of distribution and density on DMAFB.

Project 1.1.1: Prioritize areas of greatest concern and initiate control/eradication programs (potentially using volunteers from DMAFB). There are many such successful local volunteer programs (http://aznps.com/invasives.php).

Project 1.1.2: Initiate an invasive species early detection and rapid response plan across DMAFB (https://www.invasivespeciesinfo.gov/subject/early-detection-and-rapid-response).

Project 1.1.3: Ensure that invasive non-native species are not used as landscaping plants (Appendix H, Civil Engineering Standards).

Project 1.1.4: Conduct invasive species surveys in and along Atterbury Wash focusing on invasive nonnative grasses and tree species (e.g., Salt Cedar (Tamarisk sp.), African sumac (Rhus iancea), and Oleander (Nerium oleander)).

Project 1.1.5: Once areas are identified and prioritized, develop joint control strategies with other federal, state, and local cooperating agencies and adjacent landowners to increase the effectiveness of control measures. For example:

1) Pima County Sonoran Desert Conservation Plan (http://webcms.pima.gov/government/sustainability_and_conservation/conservation_science/the_sonoran_desert_conserva

2) City of Tucson Habitat Conservation Plan (https://www.tucsonaz.gov/pdsd/city-tucson-habitat-conservation-plan-hcp).

GOAL 2: Restore areas of invasive nonnative grasses to native Sonoran Desert vegetation.

Objective 2.1: Restore areas of invasive nonnative grasses to Sonoran Desert vegetation.

Project 2.1.1: Replant areas cleared of invasive nonnative species with Sonoran Desert vegetation.

GOAL 3: Identify feral cat populations on DMAFB.

Objective 3.1: Target areas likely to support populations of feral cats (e.g., abandoned buildings, sports playing fields, schools) and survey to determine extent of distribution and density of feral cats on DMAFB.

Project 3.1.1: Initiate removal methods to reduce and/or eliminate feral cat populations on DMAFB.

Project 3.1.2: Initiate program to educate DMAFB staff and residents as to the detrimental effects of both feral cats and domesticated pet cats that are allowed outdoors. Develop informational brochures.

Project 3.1.3: Initiate reporting procedures and protocols to track observations, by DMAFB staff and residents, of feral cats throughout base.

GOAL 4: Reduce likelihood of Bird/Wildlife Aircraft Strike Hazard incidents.

Objective 4.1: Initiate control methods to reduce the attractiveness of the airfield to birds and other wildlife.

Project 4.1.1: Control ground squirrels near the flight line to reduce the potential for BASH incidents involving raptors (e.g., hawks and owls) which prey on ground squirrels.

Project 4.1.2: Reduce the potential for BASH incidents by controlling mourning doves near the flight line.

Project 4.1.3: Ensure vegetation along taxiways and at the end of runways is cut at a proper height to reduce BASH caused by mourning doves and other birds. Adjust efforts based on growth season to reduce seeding and thus the attractiveness of the airfield for doves.

Project 4.1.4: Develop coordination and informational channels between BASH team and Natural Resources Element (CEIE staff members to ensure protection of non-target species.

Project 4.1.5: Develop and implement non-lethal raptor hazing techiques for the BASH program.

GOAL 5: Continue to reduce the use of chemical pesticides on DMAFB.

Objective 5.1: Reduce chemical pesticide use whenever feasible.

Project 5.1.1: Use non-chemical solutions (e.g., baited traps, mowing to reduce habitat) for pest management problems whenever possible to avoid exposure of humans and wildlife to poisonous or toxic chemicals.

GOAL 6: Improve communication among all different elements at DMAFB that interact with natural resources in general and wildlife in particular.

Objective 6.1: Work to integrate management of wildlife through communications and informational exchanges of all involved parties by using the INRMP.

Project 6.1.1: Continue to maintain shared database(s) in which any/all wildlife related information (including vegetation and habitat related issues), from Pest Management, Grounds Maintenance, BASH, GIS and Natural Resource offices, is integrated in a shared format.

8.3 GROUNDS MAINTENANCE / LANDSCAPE MANAGEMENT

GOAL 1: Develop a comprehensive, integrated, Grounds Maintenance - Landscape Management Plan.

Objective 1.1: Organize and develop an approach to increase collaboration and communication among all involved offices (e.g., Pest Management, BASH, GIS, and Natural Resource) with Grounds Maintenance (or private contractor) to develop a Landscape Management plan that benefits natural resources across DMAFB.

Project 1.1.1: Inventory and catalog all shrubs, trees, noxious and/or invasive weeds, base turfs, ground covers, soils, land uses, fertilizers, herbicides, and pesticides used on the base.

Project 1.1.2: Based on results of project 1.1.1., identify methods for improving overall installation appearance and reducing ground maintenance expenses while benefiting natural resources such as Sonoran Desert vegetation and wildlife.

Project 1.1.3: Convert improved grounds to semi-improved or unimproved grounds and convert semi-improved grounds to unimproved grounds. Re-vegetate with strictly native grasses, forbs, shrubs, and trees. Prioritize areas for conversion to natural plant communities and planting of native vegetation.

Project 1.1.4: Grounds Maintenance staff will coordinate and consult with DMAFB Natural Resources Element (CEAN) personnel to identify areas with special grounds maintenance requirements (e.g., protection of owl burrows, mowing to reduce habitat for the mourning dove population near the airfield, eliminating the use of certain pesticides or herbicides that may adversely affect species of conservation concern).

GOAL 2: Develop water conservation plan and reduce grounds maintenance efforts and costs.

Objective 2.1: Reduce landscape water usage and high water demand landscaped areas (i.e., turf, grasses, etc) across DMAFB thereby reducing costs and efforts expended on landscape management.

Project 2.1.1: Investigate and install passive rainwater harvesting structures throughout DMAFB. These include curb cuts/openings, installation of rainwater catchment basins and installation of various micro-basins depending on contours, topography and soils curb cuts. See the following regional references for further information:

1. Waterfall, Patricia H., 2004, University of Arizona, Harvesting Rainwater for Landscape Use (Appendix J)

2. City of Tucson, Water Harvesting Guidance Manual (Appendix K: https://www.tucsonaz.gov/tdot/water-harvesting)

Project 2.1.2: Use xeriscape landscaping techniques with native vegetation whenever feasible.

Project 2.1.3: Consider using turf only in small plots of high use and high visibility areas. Consider replacing turf with alternative ground covers that are both attractive and conserve water, such as native gravels and rocks or native drought-tolerant plants.

Project 2.1.4: Inspect existing irrigation systems, plumbing, and infrastructure for water use efficiency. Remove inefficient irrigation components and install low-flow devices whenever feasible.

8.4 ENVIRONMENTAL EDUCATION

GOAL 1: Improve education of DMAFB personnel in offices dealing with natural resources issues regarding wildlife and wildlife habitat on the installation.

Objective 1.1: Educate and inform DMAFB personnel on the importance of conservation of wildlife and associated habitat on improved, semi-improved and unimproved DMAFB lands. This will help to implement the current INRMP and to keep the Natural Resources Element of the Environmental Quality Flight informed about wildlife issues.

Project 1.1.1: Organize instructional workshops and seminars for DMAFB personnel with appropriate agencies and organizations to address various natural resource related issues. These would include, but is not limited to:

1. Arizona Game and Fish (http://www.azgfd.gov/);
2. U.S. Fish and Wildlife Service (http://www.fws.gov/);
3. University of Arizona Cooperative Extension (http://extension.arizona.edu/);
4. University of Arizona School of Natural Resources (https://snre.arizona.edu/);
5. Arizona Native Plant Society (http://aznps.com/index.html);
6. Watershed Management Group (https://watershedmg.org/);
7. Arizona Ecological Services Office (https://www.fws.gov/southwest/es/arizona/).

8.5 WATERS OF THE U.S.

GOAL 1: Improve communication among the different elements at DMAFB about the need to protect jurisdictional Waters of the U.S.

Objective 1.1: Inform all DMAFB offices whose activities could potentially impact jurisdictional Waters of the U.S on base.

Project 1.1.1: Use AF Form 332 to reduce the chance that activities affecting Waters of the U.S. can occur without environmental review and/or, if applicable, the application for approval of Section 404 and 401 permitting, i.e., the ephemeral drainages designated in Appendix E, Wetland Delineation.

8.6 WATER RESOURCES PROTECTION

GOAL 1: Assess and characterize ephemeral stock pond along Atterbury Wash.

Objective 1.1: Monitor and document potential natural resources and the importance of said resources for wildlife associated with the seasonal stock pond along Atterbury Wash on DMAFB.

Project 1.1.1: Conduct a multi-seasonal monitoring efforts to include:

1. A physical survey of the stock pond (e.g., pond dimensions, water holding capacity, water quality, substrate, and periodicity of pooled water);
2. Wildlife surveys (e.g., bats, medium to large, mammals, and amphibians).

9 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.7 Natural Resources Management Staffing and Implementation

Installation Supplement

DMAFB will use professionally trained natural resources management personnel to develop, implement and enforce the INRMP. The natural resources personnel will be properly classified as GS-0401, General Natural Resources Management and Biological Sciences. If it is not practicable to utilize DoD personnel to perform natural resources management duties, priority when obtaining services will be given to federal (USFWS) or state agencies (AZGFD) with responsibilities for the conservation and management of natural resources. DMAFB will document the effort to obtain federal or state services in writing before seeking non-governmental assistance.

9.2 Monitoring INRMP Implementation

Installation Supplement

To gauge ecosystem health, whether it is improving or declining, it is important to establish procedures for monitoring the condition of natural resources at DMAFB. These include:

1. Evaluating the success of management activities;
2. Drawing attention to areas of immediate concern;
3. Identifying unforeseen problems in implementing the INRMP and applying adaptive management when applicable;
4. Assessing changing conditions on and off the installation that could affect DMAFB's natural resources.

Monitoring programs seek to determine a change in some aspect or characteristic of a natural resource of interest over a pre-determined time frame. DMAFB will use a science-based approach to design monitoring programs to ensure implementation of the INRMP.

Design of monitoring programs involves:

1. Defining goals and objectives;
2. Designating species or habitat characteristics of management and conservation interest;
3. Choosing parameters to measure (e.g., survival, presence/absence, species richness, community structure);
4. Designating the area of interest;
5. Defining methods and periodicity of sampling;
6. Collection of data;
7. Analysis, evaluation, and interpretation of results;
8. Revising and adapting monitoring approach as necessary to reach desired condition of the resource.

9.3 Annual INRMP Review and Update Requirements

Installation Supplement

An annual review of the INRMP will be undertaken by the DMAFB Natural Resource Program Administrator in coordination with the USFWS and AZGFD. The annual review will be certified by the DMAFB Installation Commander and Base Civil Engineer, or designee, per Chapter 2.3. The annual review will verify that (1) all "must fund" projects and activities have been budgeted for and implementation is on schedule, (2) all required trained natural resources positions are filled or are in the process of being filled, (3) projects and activities for the upcoming year have been identified and included in the INRMP in Chapter 8, (4) all required coordination with the USFWS and AGFD has occurred, and (5) any significant changes to the mission requirements or natural resources of DMAFB have been identified. The DMAFB INRMP will be revised every 5 years.

10 ANNUAL WORKPLANS

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 USAF 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 Endangered Species Act (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, *Exotic and Invasive Species.* However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within the 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.

Installation Supplement

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 USAF 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 Endangered Species Act (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, *Exotic and Invasive Species.* However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within the 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.

Work plans for INRMP implementation projects have been developed. We have three recurring project that have been planned and projected for FY20-FY27. Additional projects can be developed, planned, and projected based on recommendations from AZGFD and USFWS. As projects are prioritized, approved, and funding is acquired, each project will be assigned a timeline for implementation and completion. The prioritization process will designate those projects which are "must fund" requirements and are listed in Chapter 8, as defined by AFI 32-7001, Environmental Quality Programming and Budgeting (e.g., Buffelgrass *(Pennisetum cilia re)* eradication and wildland fire control). The work plans will provide all the necessary information for building a budget within the AF framework.

Appropriate funding sources, funding priorities, and level of effort for AF conservation programs will occur over the first year of implementation of this INRMP. Funding sources include the operations and maintenance (O&M) appropriation, reimbursable conservation program accounts for forestry, agriculture, fish and wildlife and outdoor recreation management, the DoD Legacy Resource Management Program, the Strategic Environmental Research and Development Program (SERDP), and other sources such as those that may be obtained through cooperative agreement under authority of the Sikes Act.

The following tasks/work plans have been planned and programmed to support the management goals and objects of the INRMP and are "MUST FUND"" project that insures Sykes Act compliance, Arizona Game and Fish Department is our primary contractor for these tasks. Additional task can be added once concurrence is received during the annual review by the collaborating agencies (AZGFD and USFWS).

Task 1: FBNVXX0845, MGT, SPECIES, SPECIES AT RISK/CANDIDATE SPECIES - The overall purpose of this project is to continue to document species at risk/candidate species, populations characteristics and seasonal habitat use on Davis-Monthan AFB and provide best management practices to sustain military air training operations, readiness.

Task 2: FBNVXX0850, MGT, SPECIES, MIGRATORY BIRDS - The overall purpose of this project is to continue to document the migratory bird and raptor populations and seasonal habitat use on DMAFB, and provide best management practices to sustain military air training operations, readiness and reduce potential BASH issues. These best management practices will provide awareness of habitat use for nesting and major migration activities to increase mission training safety.

Task 3: FBNVXX0890, MGT, HABITAT, INVASIVE SPECIES - The overall purpose of this project is to continue to conduct surveys for invasive plant populations on DMAFB and provide best management practices to sustain military air training operations and readiness through ecosystem management Initiate/continue the eradication of annuals and Buffelgrass found during the survey to reduce potential impact on the military mission and maintain suitable habitat for wildlife, this may be accomplished by a subcontractor. Various treatment techniques will continue to be investigated, utilized, and evaluated as to the effectiveness on large land areas. The contractor will initiate and continue the evaluation of various potential re-vegetation methods in desert habitats and determine cost effectiveness. Initiate and continue the reestablishment of native ecosystems for long term plant survival and stabilize soil where invasive were removed.

Annual Task/Work Plan: FY20-FY27

FY20

FBNV200845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV200850, Mgt, Species, Migratory Birds — $50,000.

FBNV200890, Mgt, Habitat, Invasive Species — $60,000.

FY21

FBNV210845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV210850, Mgt, Species, Migratory Birds — $50,000.

FBNV210890, Mgt, Habitat, Invasive Species — $60,000.

FY22

FBNV220845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV220850, Mgt, Species, Migratory Birds — $50,000.

FBNV220890, Mgt, Habitat, Invasive Species — $60,000.

FY23

FBNV230845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV230850, Mgt, Species, Migratory Birds — $50,000.

FBNV230890, Mgt, Habitat, Invasive Species — $60,000.

FY24

FBNV240845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV240850, Mgt, Species, Migratory Birds — $50,000.

FBNV240890, Mgt, Habitat, Invasive Species — $60,000.

FY25

FBNV250845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV250850, Mgt, Species, Migratory Birds — $50,000.

FBNV250890, Mgt, Habitat, Invasive Species — $60,000.

FY26

FBNV260845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV260850, Mgt, Species, Migratory Birds — $50,000.

FBNV260890, Mgt, Habitat, Invasive Species — $60,000.

FY27

FBNV270845, Mgt, Species, Species at Risk/Candidate Species — $50,000.

FBNV270850, Mgt, Species, Migratory Birds — $50,000.

FBNV270890, Mgt, Habitat, Invasive Species — $60,000

Annual Work Plans - Work Plans should extend out to current year plus 4 additional years

urce gory	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Descri

***Natural Resources Standard Titles by PB28 Code (excluding CZT/CZC titles):**

>	MMA	T&E	MNRA	WTLD
CN	Mgt, Species	Mgt, Habitat	Compliance Public Notification	Mgt, Wetlands / FloodPlains
agency/Intraagency, ?rnment, Sikes Act	Interagency/Intraagency, Government, Sikes Act	Mgt, Species	Plan Update, Other	Monitor Wetlands
agency/Intraagency, ?rnment, Sikes Act,)	Outsourced Environmental Services, CN	Mgt, Invasive Species	Recordkeeping, Other	Interagency/Intraagency, Government, Sikes Act

dies, CN	Mgt, Nuisance Wildlife	Outreach	Outsourced Environmental Services, CN	
)lies, CN	Supplies, CN, CLEO	Interagency/Intraagency, Government, Sikes Act		
)lies, CN, CLEO	Vehicle Leasing, CN	Interagency/Intraagency, Government, Sikes Act, CLEO		
ament Purchase / itain, CN		Outsourced Environmental Services, CN		
de Leasing, CN		Supplies, CN		
de Fuel & itenance, CN		Supplies, CN, CLEO		
Wildland Fire		Equipment Purchase / Maintain, CN		
Update, INRMP		Vehicle Leasing, CN		
Update, Other		Vehicle Fuel & Maintenance, CN		
Habitat		Plan Update, Other		
Species		Environmental Services, CN		
Invasive Species				
Nuisance Wildlife				
rdkeeping, Other				
■onmental ces, CN				

11 REFERENCES

Standard References *(Applicable to all USAF installations)*

- AFMAN 32-7003, *Environmental Conservation*
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook
- Do DI 4715.03, *Natural Resources Conservation Program*
- AFI 32-1015, *Integrated Installation Planning*
- AFI 32-10112, *Installation Geospatial Information and Services (IGI&S)*

Installation Supplement

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 ACRONYMS

Standard Acronyms *(Applicable to all USAF installations)*

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

Installation Supplement

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

AAFES	Army and Air Force Exchange Service	ERP	Environmental Restoration Program
ACC	Air Combat Command	ESA	Endangered Species Act
ACES-PM	Automated Civil Engineering System Project Management	ESOHLC	Environmental, Safety, Occupational Health Leadership Committee
ADA	Arizona Department of Agriculture	FOL	Forward Operating Location
ADEQ	Arizona Department of Environmental Quality	GIS	Geographic Information System
AF	Air Force	GS	General schedule
AFB	Air Force Base	HAP	Hazardous Air Pollutants
AFCEC	Air Force Civil Engineering Center	HAZMAT	Hazardous Material Storage Facility
AFESA	Air Force Engineer Support Agency	HMP	Habitat Management Plan
AFI	Air Force Instruction	HQ	Headquarters
AFOSH	Air Force Occupational Safety and Health	ICRMP	Integrated Cultural Resource Management Plan
AFPD	Air Force Policy Directive	IMA	Individual Mission Area
AFRES	Air Force Reserve	IMAP	Individual Mission Area Plan
AGE	Aerospace Ground Equipment	INF	Intermediate-Range Nuclear Forces
AHCC	Ambulatory Health Care Center	INRMP	Integrated Natural Resources Management Plan
AICUZ	Air Installation Compatible Use Zone	IRP	Installation Restoration Program
AMARG	Aerospace Maintenance and Regeneration Group	km	Kilometer
APP	Aquifer Protection Permit	LUA	Land Use Affinities
ARPA	Archaeological Resource Protection Act	MAJCOM	Major Command

ARS	Arizona Revised Statute	MBTA	Migratory Bird Treaty Act
AST	Aboveground Storage Tank	MFH	Military Family Housing
AZGFD	Arizona Game and Fish Department	MMRP	Military Munitions Response Plan
AZPDES	Arizona Pollutant Discharge Elimination System	MS4	Municipal Separate Storm Sewer System
BASH	Bird Aircraft Strike Hazard	MSA	Munitions Storage Area
BCE	Base Civil Engineer	MSGP	Multi-Sector General Permit
BHWG	Bird/Wildlife Hazard Working Group	NAGPRA	Native American Grave Protection and Repatriation Act
BLM	Bureau of Land Management	NEPA	National Environmental Policy Act
BMP	Best Management Practice	NHPA	National Historic Preservation Act
BUOW	Burrowing Owl	NISC	National Species Invasion Council
CA	Cooperative Agreement	NPDES	National Pollutants Discharge Elimination System
CATEX	Categorical Exclusion	NRHP	National Registry of Historic Places
CDC	Child Development Center	NTHC	Nichol's Turk's head cactus
CE	Civil Engineer	O&M	Operations and Maintenance
CEAN	DMAFB Natural Resources Element, Environmental Management	ORV	Off Road Vehicle
CEIE	Civil, Environmental and Infrastructure Engineering	OSHA	Occupational Safety and Health Administration
CES	Civil Engineer Squadron	PAG	Pima Association of Governments
CEQ	Council on Environmental Quality	PM	Pest Management
CERCLA	Comprehensive Environmental Recovery and Liability Act	POC	Point Of Contact

CFPO	Cactus ferruginous pygmy-owl	POTW	Publicly-Owned Treatment Works
Cfs	Cubic foot/ second	PPC	Pima Pineapple Cactus
CIR	Color Infrared	RCP	Representative Concentration Pathway
CRM	Cultural Resource Manager	RCRA	Resource Conservation and Recovery Act
CSAR	Combat Search and Rescue	SAIA	Sikes Act Improvement Act
CWA	Clean Water Act	SERDP	Strategic Environmental Research and Development Program
DLA	Defense Logistics Age	SIU	Significant Industrial Users
DMAFB	Davis-Monthan Air Force Base	SPS	Solar Power System
DoD	Department of Defense	START	Strategic Arms Reduction Treaty
DoDD	Department of Defense Directive	SWMU	Solid Waste Management Unit
DPS	Distinct Population Segment	SWMP	Stormwater Management Plan
DRMO	Defense Reutilization Marketing Office	SWMWG	Stormwater Management Working Group
EA	Environmental Assessment	SWPPP	Stormwater Pollution Prevention Plan
EA/EISP	Environmental Assessment/ Environmental Impact Analysis Process	TIM	Technical Information Manual
ECS	Electronic Combat Squadrons	TLF	Temporary Lodging Facilities
EIAP	Environmental Impact Analysis Process	USAF	United States Air Force
EIS	Environmental Impact Statement	USDA	United States Department of Agriculture
EO	Executive Order	USFWS	United States Fish and Wildlife Service

EOD	Explosive Ordnance Disposal	USGS	United States Geological Survey
EPA	Environmental Protection Agency	UST	Underground Storage Tank
EPC	Environmental Protection Committee	VOC	Volatile organic compounds
EPCRA	Emergency Planning and Community Right-to-know Act		

13 DEFINITIONS

Standard Definitions *(Applicable to all USAF installations)*

- Natural Resources Playbook - Definitions Section

Installation Supplement

13.1 Standard Definitions (Applicable to all USAF installations)

- Natural Resources Playbook—Definitions Section

13.2 Installation Definitions

GLOSSARY OF TERMS

Biodiversity: The variety of life forms, the ecological roles they perform, and genetic variability they contain within any defined time and space.

Candidate Species: Plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Critical Habitat: The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the ESA, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the ESA, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Ecosystem: dynamic and interrelating complex of plant and animal communities and their associated nonliving (e.g. physical and chemical) environment.

Ecosystem An approach to natural resources management that focuses on the

Management: interrelationships of ecological processes linking, soils, plants, animals, minerals, climate, water, and topography. Managers view such processes as a living system that affects and responds to human activity beyond traditional commodity and amenity uses. They also acknowledge the importance of ecosystem services such as water conservation, oxygen recharge, and nutrient recycling.

Ecotone: Transition zone between 2 adjacent plant communities

Endangered Species: Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.

Floodplains: Lowland or flat areas adjoining inland and coastal waters that have a one percent or greater chance of flooding in any given year.

Game: Any species of fish or wildlife for which state and federal laws and regulations prescribe seasons and bag and creel limits.

Habitat: The location where a particular taxon of plant or animal lives and its surroundings (both living and nonliving) which includes the presence of a group of particular environmental conditions such as air, water, soil, mineral elements, moisture, temperature, and topography.

Hazardous Waste: A waste that may cause, or significantly contribute to, an increase in mortality or serious irreversible illness, or pose a substantial hazard to human health or the environment when improperly managed.

Improved Grounds: Grounds on which personnel annually plan and perform intensive maintenance activities. These are developed areas of the installation with lawns and landscape plantings requiring intensive maintenance. They usually include the cantonment, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas.

Integrated Natural Resources Management Plan: Integrated Natural Resources Management Plans (INRMPs) are the means by which the Department of Defense (DoD) is fulfilling its responsibility as a steward of public lands while maintaining full support of the military mission. The plans are mandated under the Sikes Act as amended by the Sikes Act Improvement Act (SAIA) of 1997.1. The Sikes Act requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on lands used for military mission activities.

Multiple Use: The integrated, coordinated, and compatible use of various natural resources to derive the best benefit while perpetuating and protecting those resources.

Municipal Separate Storm Sewer System (MS4): As defined in 40 CFR 122.26(b) (8), a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains): (i) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body... that discharges into waters of the United States; (ii) designed or used for collection or conveying stormwater; (iii) which is not combined sewer; and (iv) which is not part of a Publicly Owned Treatment Works.

Outdoor Recreation: Recreation relating directly to and occurring in man-made, semi-natural, and natural environments.

Semi-Improved Grounds: Grounds where personnel perform periodic maintenance primarily for operation and aesthetic reasons (such as erosion and dust control, bird control, and visual clear zones). These usually include grounds next to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; picnic areas; ammunition storage areas; antenna facilities; and golf course roughs. Semi-improved grounds areas are mowed less often than the maintained turf grass on improved grounds.

Solid Waste: Non-hazardous trash, rubbish, garbage, bulky wastes, liquids, or sludges.

Stewardship: The management of a resource base with the goal of maintaining or increasing the resource's value indefinitely into the future.

Stormwater: Stormwater runoff, snow melt runoff, surface runoff and drainage

Stormwater Management Program: A comprehensive program to manage the quality of stormwater discharges from the municipal separate storm sewer system.

Species of Concern: Informal term that refers to those species which may require some conservation actions but which are not threatened with extinction. The conservation action needed will vary depending on the health of the populations and threats to the species and its habitat.

Threatened Species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Unimproved Grounds: Undisturbed desert vegetation; grounds consisting of native vegetation, Sonoran desertscrub, Sonoran desert xeri-riparian, supporting actual and potential habitat for wildlife and protected species.

Urban Forestry: Urban Forests—planted or remnant native tree species existing within urbanized areas such as parks, tree-lined residential streets, scattered tracts of undisturbed woodlands, and cantonment areas.

Waters of the U.S.: All waters and areas subject to regulation and protection under the CWA.

Wetlands: Areas Inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.3 PREPARERS AND CONTRIBUTORS

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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.
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- 7671 q, 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 (CERCLA) 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.
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 NOAA Fisheries (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.
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 (CEQ) 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 (NPDES) 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.

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, August 4, 1983 (Revised May 29, 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 Monogement 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.
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.
AFMAN 32-7003, *Environmental Conservation*	This Manual 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.
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 January 29, 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

B WILDLAND FIRE MANAGEMENT PLAN

C BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH) PLAN

Installation Supplement

H Appendix G Bird Aircraft Strike Hazard Plan.pdf

D GOLF ENVIRONMENTAL MANAGEMENT (GEM) PLAN

E INTEGRATED CULTURAL RESOURCES MANAGEMENT PLAN (ICRMP)

F INTEGRATED PEST MANAGEMENT PLAN (IPMP)

Installation Supplement

§ Appendix F Installation Pest Management Plan.pdf

G APPENDIX A ENVIRONMENTAL ASSESSMENT

W Appendix A Environmental Assessment.pdf

H APPENDIX B REGULATIONS AFFECTING NATURAL RESOURCES MANAGEMENT AT DMAFB

W Appendix B Regulations Affecting Natural Resources Management at DMAFB.pdf

I APPENDIX C STORMWATER MANAGEMENT PLAN AND STORMWATER POLLUTION PREVENTION PLAN

W Appendix C Stormwater Management Plan.pdf

Appendix C Stormwater Pollution Prevention Plan.pdf

***J* APPENDIX D FLOODPLAIN ANALYSIS**

W Appendix D Floodplain Analysis.pdf

K APPENDIX E WETLAND DELINEATION

1^1 Appendix E Wetland Delineation.pdf

L APPENDIX F INSTALLATION PEST MANAGEMENT PLAN

W Appendix F Installation Pest Management Plan (IPM).pdf

M APPENDIX H LANDSCAPE PLANNING - CIVIL ENGINEERING STANDARDS

Appendix H Landscape Planning - Civil Engineering Standards.pdf

N APPENDIX I USFWS PIMA PINEAPPLE CACTUS SURVEY PROTOCOL

1^1 Appendix I USFWS Pima Pineapple Cactus Survey Protocol.pdf

O APPENDIX J UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION - HARVESTING RAINWATER FOR LANDSCAPE USE

n Appendix J University of Arizona Cooperative Extension - Harvesting Rainwater for Landscape Use.pdf

P APPENDIX K CITY OF TUCSON - WATER HARVESTING GUIDANCE MANUAL

CT Appendix K City of Tucson - Water Harvesting Guidance Manual.pdf

Q APPENDIX L CITY OF TUCSON - WATERCOURSE MAINTENANCE GUIDELINES

j^j, Appendix L City of Tucson - Watercourse Maintenance Guidelines.pdf

R APPENDIX M ARIZONA GAME AND FISH - BURROWING OWL PROJECT CLEARANCE PROTOCOL

CT Appendix M Arizona Game and Fish - Burrowing Owl Project Clearance Protocol.pdf

S APPENDIX G BIRD AIRCRAFT STRIKE HAZARD PLAN

CT Appendix G Bird Aircraft Strike Hazard (BASH) Plan.pdf

T APPENDIX N PIMA COUNTY SONORAN DESERT CONSERVATION PLAN - BIOLOGICAL COORIDORS AND CRITICAL HABITAT

CT Appendix N Pima County Sonoran Desert Conservation Plan - Biological Cooridors and Critical Habitat.pdf

U APPENDIX O CITY OF TUCSON HABITAT CONSERVATION PLAN

CT Appendix O City of Tucson Habitat Conservation Plan.pdf

V APPENDIX P MAP OF EMPHEMERAL STOCK POND ALONG ATTERBURY WASH-DMAFB

CT Appendix P Map of Ephemeral Stock Pond along Atterbury Wash-DMAFB.pdf

W APPENDIX Q COOPERATIVE AGREEMENT BETWEEN THE STATE OF ARIZONA AND DMAFB

CT Appendix Q Cooperative Agreement between the State of Arizona and DMAFB.pdf

X APPENDIX R CLIMATE CHANGE SUMMARIES FOR INCORPORATION INTO INSTALLATION INRMP S DMAFB

CT Appendix R Climate Change Summaries for Incorporation into Installation INRMP's DMAFB.pdf

Y APPENDIX S U.S. AIR FORCE BAT ACOUSTIC SURVEY, NATURAL RESOURCES PROGRAM, MULTIPLE INSTALLATIONS, 2016-2018

CT Appendix S U.S. Air Force Bat Acoustic Survey, Natural Resources Program, Multiple Installations, 2016-2018.pdf