U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

TYNDALL AIR FORCE BASE

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (AF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-U.S. territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, AF-wide "common text" language that address AF 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 AF-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 AF environmental Installation Support Teams (ISTs) and/or installation personnel.

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.

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DOCUMENT CONTROL

Record of Review – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, *Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to 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

[Add signature pages]

EXECUTIVE SUMMARY

The Integrated Natural Resources Management Plan

The primary objective of Air Force natural resources is to sustain, restore, and modernize natural infrastructure, in order to ensure operational capability and no net loss in the capability of AF lands to support the military mission of the installation. The Integrated Natural Resources Management Plan (INRMP) is the principal tool for managing military installation natural resources, in accordance with the Sikes Act (16 U.S.C §670 *et seq.*). INRMPs are to assist installation commanders with natural resources conservation and rehabilitation, consistent with installation use that ensures Armed Forces readiness.

This INRMP provides strategic direction for natural resources management at Tyndall Air Force Base (AFB), Florida. It provides natural resources management goals and objectives to ensure continued access to the land and airspace required to accomplish the Air Force mission while maintaining the natural resources in a healthy condition.

Tyndall AFB's INRMP provides a descriptive basis for planning and review under the National Environmental Policy Act (NEPA), and supports management of natural resources in coordination with multiple stakeholders. It identifies and prioritizes conservation goals to benefit the management of threatened and endangered (T&E) species, T&E habitat, and jurisdictional wetlands; and to integrate and prioritize wildlife, fire, ecosystem, and forest management activities. Standards outlined by the INRMP foster successful and timely integration of conservation and military activities. Avoidance and minimization measures protect resources and may reduce future operational costs. INRMP implementation helps ensure military ground operators have quality environments to utilize for training; and is promotes future mission capacity through good stewardship of natural resources and ecosystem management. Tyndall's conservation activities and outdoor recreation program promote positive relationships with the public, agencies, and organizations. New management actions are required to be evaluated through NEPA, in accordance with 40 Code of Federal Regulations Section 989 of the NEPA.

INRMP Preparation, Revision, and Annual Reviews

As required by the Sikes Act, the Tyndall INRMP was prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC), and internal and external stakeholders. The cooperative approach helps ensure natural resources management and mission activities are integrated and in agreement with state and federal mandates. The INRMP is to be revised when required, and reviewed annually.

Annual reviews are to be conducted by the installation natural resources manager (NRM), in coordination with internal stakeholders and local representatives of the FWC and USFWS. The annual review is complete when the installation commander or appropriate designee certifies the annual review as valid and current. This 2019 Annual review is required to be complete by July 6, 2019.

INRMP Principle Goals

Tyndall AFB is committed to the following five principal natural resources management goals:

- Provide natural resources management and coordination services in support of the mission.
- Restore and manage forests for mission use, habitat improvement, and protection of T&E species.

- Enable long-term sustainability of beach environments for military use by protecting T&E species and their habitats.
- Restore and protect wetland habitats to comply with federal law and protect T&E species.
- Provide a variety of uses, values, products, and services to present and future generations while maintaining sustainable ecosystems.

These goals continue Tyndall's management direction, subject to varying budget flows that alter the rate and timing of implementation.

1.0 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 United States Air Force. 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 Air Force adaptability in all environments. The Air Force has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the Air Force natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of AF 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.

1.1 Purpose and Scope

The purpose of this INRMP is to provide interdisciplinary strategic guidance for natural resources management on Tyndall Air Force Base (AFB). The INRMP outlines Tyndall AFB's plan to sustain and restore natural resources to ensure operational capability. This plan provides a means of successfully accomplishing the base mission while integrating natural resources management. Additionally, the INRMP provides guidelines for the continued multiple use and sustained yield of Tyndall AFB's biologically diverse natural environment.

To ensure that natural resources management and other mission activities are integrated and in agreement with state and federal mandates, the INRMP is prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS), the Florida Fish and Wildlife Conservation Commission (FWC), and other pertinent groups and agencies.

Annual reviews are to be conducted by the installation natural resources manager (NRM), in coordination with internal stakeholders and local representatives of the FWC and USFWS. The annual review is classified as complete when the installation commander or appropriate designee certifies the Annual Review as valid and current.

1.2 Management Philosophy

Interdisciplinary Approach

INRMP goals and objectives are developed in cooperation with state and federal agencies, military mission user groups, and other interested stakeholders to address natural resource management needs at Tyndall AFB. Once internal coordination and review of the INRMP is complete, it is provided to the USFWS and FWC for review and signature. The signature of these agencies reflects their mutual agreement on those portions of the INRMP within the scope of the agency's authority.

Applying Air Force Principles for Ecosystem Management

The principles of ecosystem management and biodiversity conservation serve as the foundation of the INRMP. The goal of ecosystem management is to preserve and enhance ecosystem integrity. Over the long-term, ecosystem management will improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies and communities. These principles further enable military mission success through sound stewardship and ensure continued access to land and airspace required to accomplish the AF mission.

Ecosystem management at Tyndall AFB includes the following AF principles:

- Maintenance or restoration of native ecosystems across their natural range where practical and consistent with the military mission.
- Maintenance or restoration of ecological processes, such as fire and other disturbance regimes, where practical and consistent with the military mission.
- Maintenance or restoration of the hydrological processes in floodplains and wetlands, when feasible.
- Collaboration with other DOD components as well as other federal, state, and local agencies, and adjoining property owners.
- Provision 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.

Supporting the Base Comprehensive Planning Process

The INRMP is a key component plan of the Base Comprehensive Plan as detailed in AFI 32- 7062, *AF Comprehensive Planning*. The INRMP identifies natural resource features that need to be considered and incorporated into the Base Comprehensive Plan regarding future installation development. The INRMP also details natural resources management activities that may need to be considered during comprehensive planning efforts.

1.3 Authority

The INRMP was developed to meet the requirements of the Sikes Act (16 United States Code [USC] 670a et seq.) as amended by the Sikes Act Improvement Act; Department of Defense Instruction (DODI) 4715.03, Natural Resources Conservation Program; Air Force Policy Directive (AFPD) 32-70, Environmental Quality (EQ); and Air Force Manual (AFM) 32-7003, Environmental Conservation.

The Sikes Act states that "consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program required by this subsection to provide for:

- The conservation and rehabilitation of natural resources on military installations;
- The sustainable multipurpose use of the resources, which shall include hunting, fishing, and non-consumptive uses and;
- Subject to safety requirements and military security, public access to military installations to facilitate the use.

Each INRMP shall, to the extent appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation, invasive and nuisance species management;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific natural resource management goals and objectives and time frames for proposed action;
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;
- Public access to the military installation that is necessary or appropriate subject to the requirements necessary to ensure safety and military security;
- Enforcement of applicable natural resource laws (including regulations);
- No net loss in the capability of military installation lands to support the military mission of the installation; and
- Such other activities as the Secretary of the military department determines appropriate.

DODI 4715.03, *Natural Resources Conservation Program*, is the overarching instruction for Department of Defense (DOD) natural resource management, and is the primary agent for implementing policy (including the Sikes Act), assigning responsibilities, and prescribing procedures for the integrated management of natural resources on DOD property. This DODI was updated on 18 March 2011 and Incorporating Change 2 on 31 August 2018.

AFPD 32-70, *Environmental Quality*, establishes policies to: responsibly manage natural and cultural resources on AF properties, clean up past environmental damage, meet current environmental standards, plan future activities to minimize impacts, and eliminate pollution from AF activities whenever possible. Under this directive, an AF EQ Program was developed. This program includes the following activities: cleanup, compliance, conservation, and pollution prevention. Additionally, this directive states that the AF will pursue adequate funding to meet environmental legal obligations.

AFM 32-7003, *Environmental Conservation*, implements AFPD 32-70 and DODI 4715.3. This instruction provides details on how to manage natural resources on AF installations to comply with applicable federal, state, and local laws and regulations. The INRMP for Tyndall AFB facilitates compliance with federal, state, and local environmental requirements. These requirements deal with analysis of potential environmental impacts, water and air quality, wetlands, endangered species, marine mammals, migratory birds, and other wildlife, forest and fire management, and public access and recreation. The relevant statutes, executive orders (EOs), and the application of various Natural Resource program components to significant laws and regulations are listed in the Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP Appendix.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
N/A Not Applicable	

1.4 Integration with Other Plans

- The INRMP is designed to integrate guidance of development on base with the Installation Development Plan and the Air Installation Compatible Use Zone (AICUZ) to comply with federal, state and local laws governing the protection of ecologically sensitive land and wildlife species. This is accomplished by close coordination of project development with the 325th Civil Engineer Squadron Environmental Element. All aspects of development projects are thoroughly reviewed for environmental impact and consultation is sought from federal and state agencies where appropriate. See section 2.4 Mission Impacts on Natural Resources for more information.

- Birds and wildlife have the potential to cause millions of dollars in damage to aircraft and the loss of human life. The 325th Fighter Wing Flight Safety (325 FW/SEF) is the office of primary responsibility for monitoring and implementation of the Bird Aircraft Strike Hazard (BASH) Plan 910 (Tyndall AFB, 2018). The participation of Tyndall Natural Resources in the BASH program is directed by AFM 32-7003, *Environmental Conservation*, and AFI 91-202/Air Combat Command Supplement 1, *The USAF Mishap Prevention Program*. The directives mandate that Tyndall Natural Resources participate in the development, review, approval, and implementation of the Tyndall BASH Plan. Additional Natural Resources responsibilities include maintaining current state and federal permits required for management of birds and wildlife to promote airfield safety. See section 7.12 and the *Tyndall AFB BASH Plan* (Tyndall AFB, 2013b).for more information.

- The INRMP and the Integrated Pest Management Plan are mutually supportive plans that address non-native invasive plant species and nuisance wildlife. See section 7.11 for more information. Tyndall's *Nuisance Species Component Plan* describes the management of non-native invasive, pest, and nuisance species.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	325 CES/CEIE 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/POC	Jared Kwitowski, Wildlife Biologist 850-527-2009 Jared.kwitowski.1@us.af.mil
State and/or local regulatory POCs (For US-bases, include agency name for Sikes Act cooperating agencies)	Sean Blomquist; USFWS Diana Pepe; FWC
Total acreage managed by installation	30,000
Total acreage of wetlands	11,704
Total acreage of forested land	13,973
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	BO 4-P-98-020, 2016-2019 BO 4-P-00-211, 2016-2019 BO 04EF3000-2020-F-0145
NR 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)	☑ Invasive species ☑ Wetlands Protection Program ☑ Grounds Maintenance Contract/SOW ☑ Forest Management Program ☑ Wildland Fire Management Program ☐ Agricultural Outleasing Program ☑ Integrated Pest Management Program ☑ Bird/Wildlife Aircraft Strike Hazard (BASH) Program ☑ Coastal Zones/Marine Resources Management Program ☑ Cultural Resources Management Program

2.1 Installation Overview

2.1.1 Location and Area

Tyndall AFB is located on 30,000 acres (12,140 hectares [ha]) in southeastern Bay County, approximately 13 miles (20 kilometers [km]) east of Panama City, Florida (Figure 1). Tyndall has no geographically separated land units under control of the installation. There are approximately 23,350 acres (9,449 ha) of unimproved land, 1,080 acres (437 ha) of semi-improved land, and 4,840 acres (1,958.7 ha) of improved land. The base is a combination of developed and natural areas located on a peninsula that is bisected by U.S. Highway 98 (Figure 2). The base is approximately 18 miles (29 km) long and 3 miles (4.8 km) wide, and is surrounded by East Bay, St. Andrew Bay, and the Gulf of Mexico (GOM) to the north, west, and south, respectively. Crooked Island West (CIW) and Crooked Island East (CIE), which form St. Andrew Sound, are barrier spits on the Gulf. In addition to airspace associated with Tyndall AFB, Tyndall also conducts air operations in range airspace shared with other AF bases and DOD branches, including areas over the GOM.

Tyndall's forested areas and beaches are particularly valued for mission activities. This unique setting in close proximity to overwater airspace provides a sea-to-land transition area, which is a vital resource for military operations. Additionally, other ground-training units utilize Tyndall's forested areas and adjacent water assets.

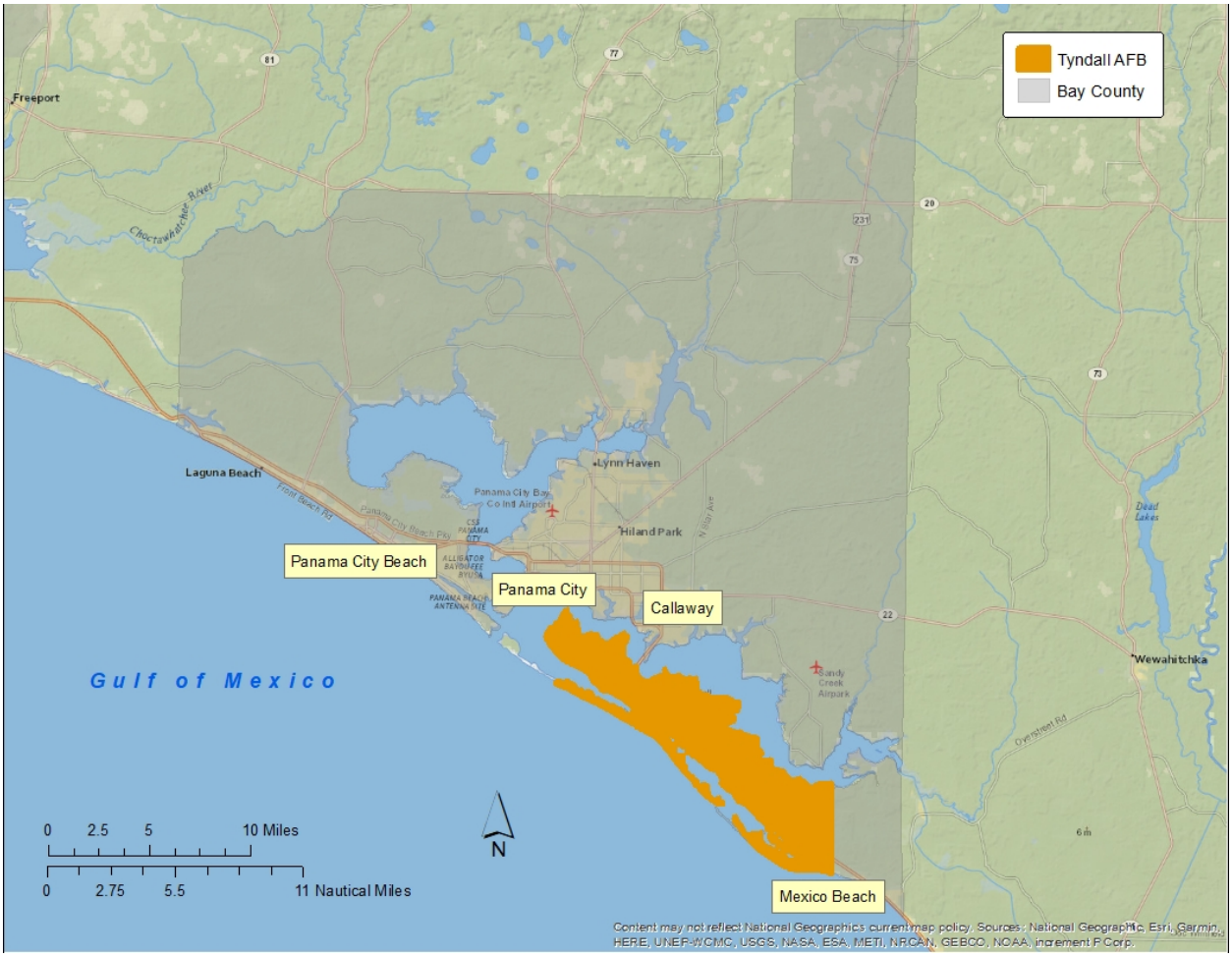

Figure 1 - General location map of Tyndall AFB, Florida.

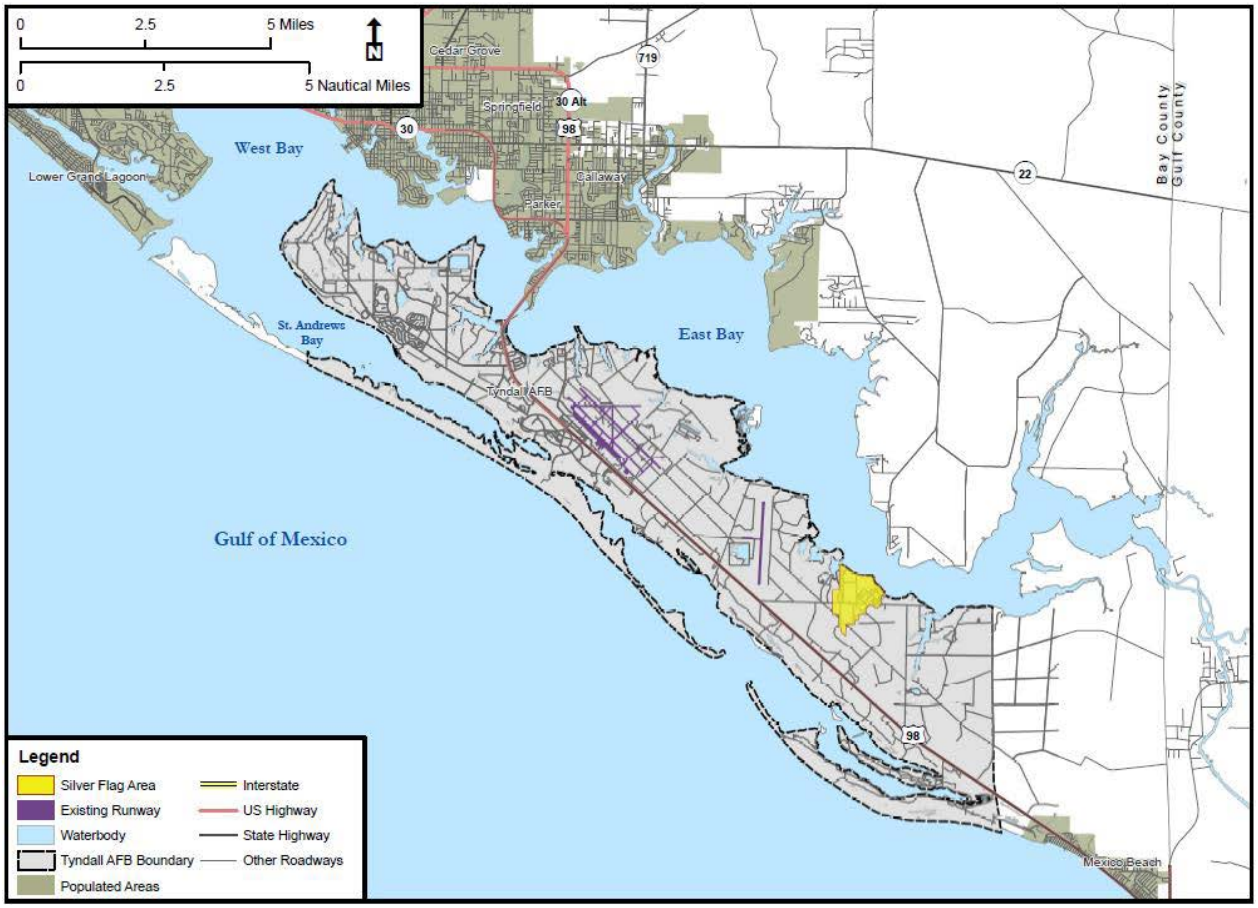

Figure 2 - Detailed location map. Tyndall AFB

Installation/GSU Location and Area Descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
Tyndall AFB	Personnel training; weapons evaluation	30,000	INRMP section 2.0	
GSUs	None			

2.1.2 Installation History

- Old Town St. Andrew (present-day Panama City) was settled in the late 1820s. Turpentine and logging were the main economic revenue in the region through the early 20th century. Tyndall Field was established in 1941 during the nation's military buildup, and during World War II, over 45,000 gunners received training at Tyndall. Highlights of Tyndall's history after the war include the following:

- **1940s**: Tyndall became the home of Air University's Air Tactical School.

- **1950s**: The base was placed under the Air Training Command and designated the USAF Pilot Instrument School to train all-weather jet interceptor pilots and air weapons controllers. In 1957, Tyndall became an Air Defense Command unit with the activation of the 73rd Air Division and the 4756th Air Defense Wing. The primary base mission became that of a weapons employment center.
- **1960s**: The USAF Air Defense Weapons Center replaced the 4756th Air Defense Wing.
- **1970s**: AF Civil Engineer Support Agency, the worldwide focal point for air base operability processes, moved to Tyndall from Washington, D.C. In 1979, Tyndall was transferred to the Tactical Air Command.
- **1980s**: The 325th Fighter Weapons Wing was activated in 1981 and began its mission with F-101, F-106, and T-33 aircraft. It was soon re-designated as the 325th Tactical Training Wing, which assumed responsibility for all F-22 maintenance training for the Tactical Air Command, and began F-22 pilot training.
- **1990s**: The Air Defense Weapons Center was deactivated, and the 1st AF and North American Aerospace Defense Command moved to Tyndall from Langley AFB. In 1991, the 325th Tactical Training Wing was re-designated as the 325th FW.
- **2000s:** The 325th FW remained the sole F-15 air superiority training wing until 2010. Training was performed by the 1st, 2nd, and 95th Fighter Squadrons until they were deactivated in 2006 and 2010 (2nd and 95th). The 337th Air Control Squadron (assigned to the 33rd FW at Eglin AFB but located at Tyndall) remains the only air battle manager training unit in the USAF. Tyndall AFB was selected as the center for training the AF's newest F-22 Raptor and received the first Raptor in 2004. The 43rd Fighter Squadron (part of the 325th FW) provides training for new, pipeline students and pilots transitioning from other airframes. A full history is available in the Integrated Cultural Resources Management Plan (ICRMP) or through the base historian's office.
- **2010s:** Tyndall's Major Command (MAJCOM) changed from Air Education Training Command (AETC) to Air Combat Command (ACC), with the last plane of combat F-22 squadron arriving in 2014. In addition, that year, the QF4 drones begin to be replaced by QF16s. On October 10, 2018, Hurricane Michael made landfall on Tyndall AFB as a Category 5 storm resulting in catastrophic damage to the infrastructure and natural resources rendering the base incapable of hosting the F-22 mission for the foreseeable future.

2.1.3 Military Missions

Prior to Hurricane Michael, the primary mission activities at Tyndall AFB were training personnel and evaluating weapons. Currently, 325 FW does not have a primary mission. However, it supports the mission for the major tenants on base. There is a proposal from the Air Force to beddown 3 squadrons of F-35A at Tyndall AFB. The reassignment of the F-22 mission from Tyndall AFB, combined with the multi-year restoration of the base allows the Air Force to optimize its 5 generation fighter fleets. The host unit, the 325 FW, is a subordinate unit to the 19th AF and the ACC. Descriptions of the major units and tenants at Tyndall AFB are provided below.

325th Fighter Wing (325 FW)

Prior to Hurricane Michael, the 325 FW conducted academic and hands-on training for F-22 Raptor pilots to fly in air superiority roles. After Hurricane Michael, all Tyndall AFB-based F-22 operations stopped, resulting in a dramatic decrease in operations. The 325 FW is supported by the following four groups:

325th Operations Group (325 OG)

Before Hurricane Michael, the 325 OG was the focal point for all F/A-22 and F-22 pilot training and air weapons director/air battle manager training. The group consisted of the 43rd. Fighter Squadron, 325th Training Support Squadron, 325th Operations Support Squadron, and the 95the Fighter Squadron. The group staff provided guidance and assistance in successfully executing the training mission and ensures quality performance and standardized procedures for pilots, air weapons directors/air battle managers, aircraft maintenance personnel, weapons load crews, and air traffic controllers. Currently, the 325 OG consists of the 325 Operation Support Squadron only. The other squadrons were permanently relocated after the storm.

325th Maintenance Group (325 MXG)

The 325 MXG provides responsive, reliable, and resourceful maintenance for the 325 FW. The 325 MXG is composed of two squadrons whose unique missions directly contribute to the overall mission accomplishment of the group.

325th Mission Support Group (325 MSG)

The primary mission of the 325 MSG is to provide excellent mission support to Tyndall AFB personnel through world-class customer service, protection, resources, and infrastructure. These support services and activities include providing civil engineering, security forces, communications, personnel, services, contracting, supply, and transportation support for 20,279 Active Duty, civilian, dependent, and retired personnel.

325th Medical Group (325 MDG)

The 325 MDG staff operates as an outpatient medical facility with family practice, pediatrics, dental, flight medicine, optometry, physical medicine, and women's health clinics. The clinics are supported by outstanding ancillary services, including radiology, with extensive capabilities like computerized tomography (CT) scanning and a clinical laboratory providing a wide variety of testing services. The group also offers a clinical pharmacy, nutritional medicine programs, and essential base support services such as public health, bioenvironmental engineering, and aerospace physiology.

Major Associate Tenants

Major associate tenants at Tyndall AFB are described in this section.

53rd Weapons Evaluation Group (53 WEG)

The 53 WEG conducts air-to-air Weapon Systems Evaluations Programs, overseeing flight operations and recovery of full-scale (QF-4 and QF-16) and subscale (BQM-34 and MQM-107) drone targets. The AF, Air National Guard, Navy, Canadian Air Defense Force units, and other foreign military forces come to Tyndall AFB to fire their missiles at realistic targets over the GOM. The 53 WEG includes the 81st Test Support Squadron, 82nd Aerial Targets Squadron, and 83rd Fighter Weapons Squadron.

Air Force Civil Engineer Center (AFCEC)

AFCEC is a field-operating agency of the AF Civil Engineer in Port San Antonio, Texas. AFCEC missions include facility investment planning, design and construction, operations support, real property management, readiness, energy support, environmental compliance and restoration, and audit assertions, acquisition and program management. In addition, through the Installation Support Teams, AFCEC has many INRMP-related responsibilities. Their primary INRMP-related task is to provide execution guidance and to oversee implementation of natural resources management programs on installations within the command.

The Environmental Directorate is responsible for managing the AF restoration, compliance, sustainability, and NEPA programs. The directorate members provide environmental technical assistance and advice to AF installations, MAJCOMs and other clients. The directorate develops execution strategies for environmental and sustainability issues, projects and programs based on best practices garnered from experience and research. The directorate is organized into four divisions: Restoration, Technical Support, Compliance, and Operations.

The Requirements and Acquisition Division (formerly the AF Research Laboratory) at Tyndall AFB manages the life-cycle of airbase systems and equipment.

Air Base Technologies Division

The Air Base Technologies Division provides science, technology, and engineering to advance fixed and deployed airbase capabilities in force protection, infrastructure, and homeland defense.

Detachment 1,823rd Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers (RED HORSE)

The mission of RED HORSE is to provide agile combat support training to active duty, Air National Guard, and AF Reserve civil engineer, services, and personnel teams in order to construct, operate, and maintain forward operating bases for deployed forces. RED HORSE recently gained approval to modify the Silver Flag Training Area on Tyndall to allow for a broader range of Explosive Ordnance Disposal training (USAF, 2013).

Listing of Tenants and NR Responsibility

Tenant Organization	NR Responsibility
AFNORTH	325th CES/Natural Resources
53rd Weapons Evaluation Group	325th CES/Natural Resources
Air Force Civil Engineer Center	325th CES/Natural Resources
Air Base Technologies Division	325th CES/Natural Resources
Detachment 1,823rd RED HORSE Squadron	325th CES/Natural Resources

2.1.4 Surrounding Communities

Bay County has a population of approximately 172,000 people. Bay County's economic base is a mixture of military, tourism, logging, services, manufacturing, construction, and commercial fishing. Tyndall AFB and the Naval Support Activity Panama City are the largest contributors to the County's economic base.

Regional Land Use

Cities and towns located near Tyndall AFB include Parker, Callaway, and Springfield (Figure 1 above). Land use in the City of Parker is primarily residential housing with commercial development along major thoroughfares. Callaway, located east of Parker, is also a residential community containing primarily single-family homes. Springfield, located north and west of Tyndall AFB, contains residential, commercial, public, and recreational land uses and has a significant industrial land use. Areas of unincorporated land located to the northeast between Tyndall AFB and Mexico Beach was predominately managed by the former St. Joseph Paper Company, primarily for timber cultivation. In 2008, St. Joe Paper Company became the St. Joe Company, with the primary interest in developing the real estate holdings. In 2013, the majority of these holdings were sold to A g Reserves Incorporated. The WestRock Company owns and operates a pulp and paper mill in Callaway, Florida.

Hurricane Michael was one of the most intense hurricanes to make landfall in the United States, leaving damage across an 80-mile wide swath that encompassed 11 counties in the Florida panhandle. Regionally, timber damage ranges from catastrophic (95% loss) to severe (75% loss) and moderate (15% loss), totaling an estimated 2.8 million acres (1,133,120 ha) impacted and an estimated 1.3 billion in lost timber values (Florida Emergency Hurricane State and Private Forestry Programs 2018).

Despite impacts to forest resources sustained during Hurricane Michael, management of forests for paper production is expected to remain an important economic consideration.

In addition to planned future residential and commercial growth and accompanying encroachments, post-hurricane forest conversions to development or other agricultural uses will occur in areas around Tyndall AFB. Tyndall is coordinating with county and regional planning bodies to ensure development is compatible with the military missions of the AFB. The potential for incompatible development is greatest in the southeast portion of Parker near DuPont Bridge; this area is affected by noise from base air operations.

2.1.5 Local and Regional Natural Areas

While Tyndall AFB encompasses approximately 30,000 acres (12,141 ha), it is situated in an area rich with other public conservation lands and easements (Figure 3). Many of these surrounding areas contain habitats similar to what is found on the installation, including sandhills, flatwoods, ephemeral wetlands, bays, and coastal habitats. These areas include:

- St. Andrew State Park
- Lathrop Bayou Tract
- T. H. Stone Memorial St. Joseph Peninsula State Park
- Panama City Airport Conservation Easement
- St. Joseph Bay State Buffer Preserve
- Econfina Creek Water Management Area
- Apalachicola National Forest (and other contiguous conservation lands)

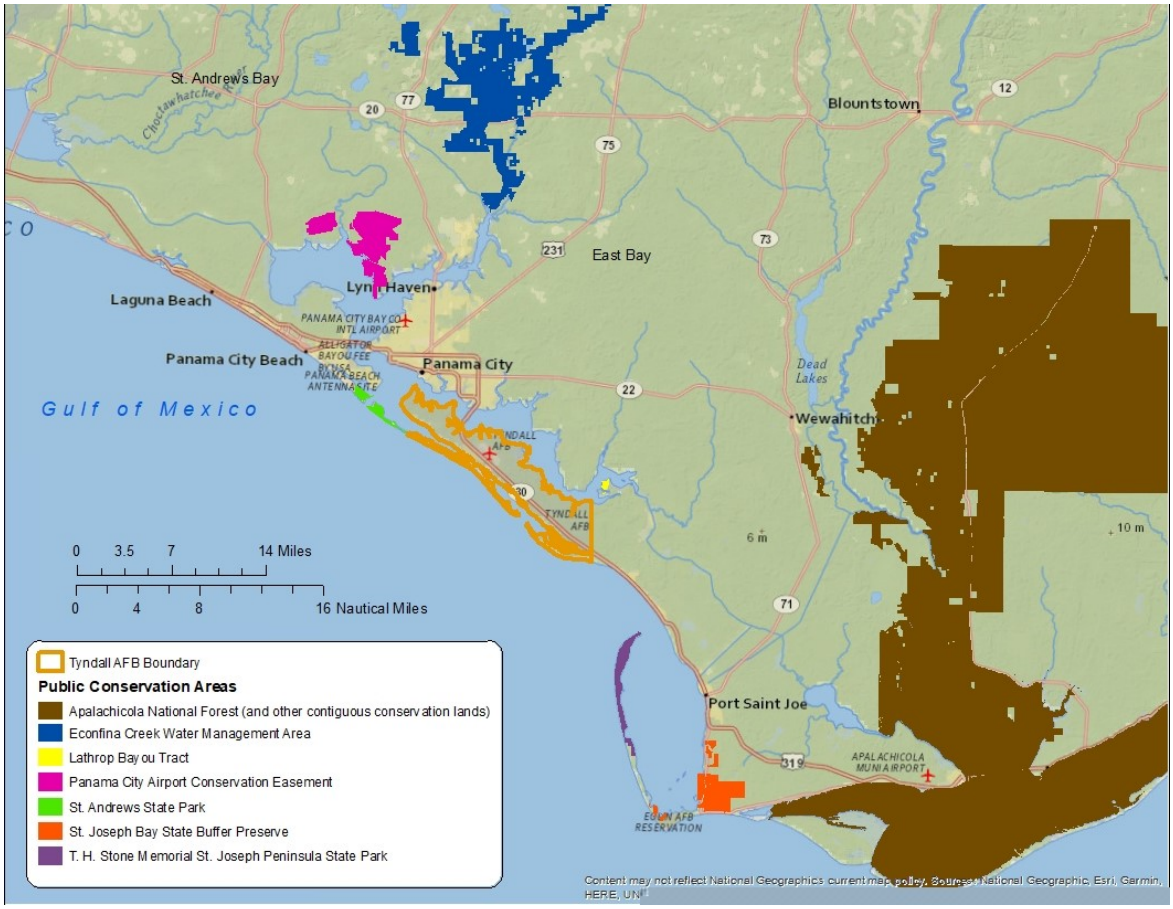

Figure 3 - Tyndall AFB regional significance map

2.2 Physical Environment

2.2.1 Climate

Tyndall AFB has a subtropical climate characterized by long, humid and warm summers and mild winters with the Gulf of Mexico moderating both summer and winter temperatures. Temperatures rarely drop below 40 degrees Fahrenheit (^{o}F) in the winter or rise above 90^{o}F during the summer (Table 1). The rainy season occurs from June through September (Figure 4), with average annual precipitation of 58 inches. Prevailing winds are from the southeast. The mild climactic conditions in this region contribute to a long growing season, which averages 285 days per year. The installation is prone to severe tropical storms and hurricanes that produce extremely high winds, heavy rainfall, and tidal surges. On October 10, 2018, Hurricane Michael made landfall as a category 5 hurricane causing catastrophic damage to installation infrastructure and natural resources of Tyndall AFB.

Table 1 - Average high temperatures, average low temperatures, and average precipitation amounts for Panama City, Florida. Data for time period 1980-2010. Source US Climate Data, 2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average High ºF	63	66	72	78	84	89	90	90	88	81	73	65
Average Low ºF	42	46	51	57	65	73	75	75	71	60	51	44
Average Precipitation Inches	4.89	5.11	5.68	3.67	3.08	6.18	7.39	6.96	6.03	3.60	4.47	4.02

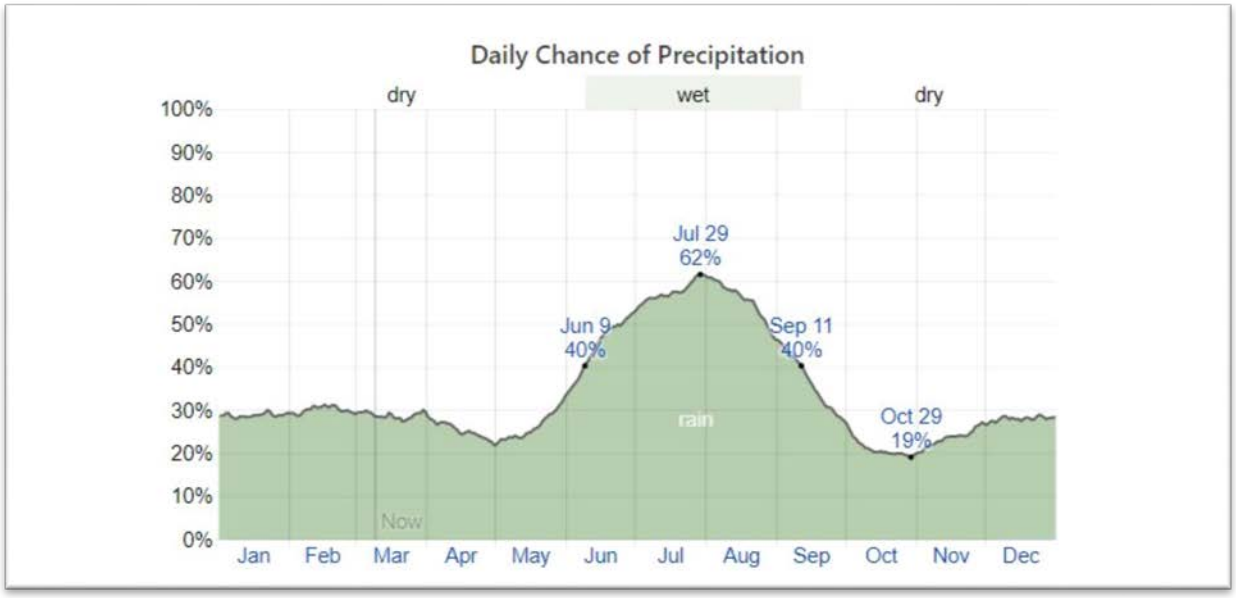

Figure 4 - Daily chance of precipitation for the Tyndall AFB area.

Climate projections for Tyndall AFB are presented in Table 2. The results suggest minimum and maximum temperatures will increase over time under two emissions scenarios, a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these climate change scenarios on Tyndall'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 2.0 ºF (1.1 ºC) over historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 2.6 ºF (1.4 ºC), and RCP 8.5 warming by 3.3 ºF (1.8 ºC) 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, RCP 4.5 scenario projects a moderate increase in PRECIP of 17% while RCP 8.5 shows an increase of 11%. For

2050 RCP 4.5 projects a moderate increase in PRECIP of 17% while RCP 8.5 shows a smaller increase of 12%.

Table 2 - Projected climate data at Tyndall AFB,

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	62.4	71.7	71.2	67.4	68
TMIN (°F)	58.1	60.4	60.9	60.1	61.6
TMAX (°F)	78.5	80.5	80.8	80.5	81.5
TAVE (°F)	68.2	70.3	70.9	70.3	71.6
GDD (°F)	6925	7556	7687	7518	7879
HOTDAYS	56.3	89.1	95.9	89.5	106.7
WETDAYS	3.5	2.2	2.2	1.8	2.6
Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # 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 3**). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison.

Table 3 - Design storm precipitation.

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	1.3	1.8	1.1	1.3	1.3
	Day 2	3.0	3.2	2.6	2.4	3.2
	Day 3	1.6	1.4	1.5	1.5	1.9
	Total	5.9	6.5	5.2	5.3	6.4
Percent change from baseline			10.3%	-10.6%	-9.6%	8.5%

2.2.2 Landforms

Tyndall AFB occupies portions of two physiographic subdivisions (Gulf Coastal Lowlands and Flatwoods Forests) of the East Gulf Coastal Plain physiographic province, a former sea. The Gulf Coastal Lowlands are characterized by lagoons, barrier islands, coastal swamps, and marshes. Within Tyndall AFB, the coastal setting includes barrier islands, beaches, sand dunes, bayous, and tidal marshes. More interior landscape settings include well-drained, gently sloping uplands, poorly drained flatwoods, and permanent and ephemeral ponds and wetlands. The peninsula has a maximum elevation of approximately 30 feet (9.14 meters [m]) above mean sea level and the established airfield elevation is 18 feet (5.48 m) above mean sea level.

2.2.3 Geology and Soils

Geology

The quaternary sediments found within the Florida panhandle are described as undifferentiated Pleistocene-Holocene sediments comprised of fine to coarse-grained sands, silty sands, and silty clay (Scott 2001). In areas near Tyndall AFB, the uppermost deposits are moderately permeable with varying amounts of interstitial silt and clay and occasional hardpan layers. Deeper layers consist of the Intracoastal Formation, a very sandy, microfossil-bearing, poorly consolidated limestone interlaced with silica-rich fine-grained deposits. Soil pH in the Florida coastal region is acidic. Although sinkholes are common in Florida, none have been historically noted at Tyndall.

Soils

Soils at Tyndall AFB are formed from sandy marine sediments and are predominately sandy, acidic, poorly drained, have low shrink-swell potential, and are relatively close to the underlying water table. According to data produced by the United States Department of Agriculture (USDA), 20 different soil types are present on Tyndall AFB (Table 4 and Figure 5). General soil type categories include Sand, Fine Sand, Loamy Sand, and Muck (Figure 6).

Table 4 - Soil series on Tyndall AFB. Source: Natural Resources Conservation Service ((NRCS), 2020)

Soil Series	Attributes	Associated Natural Habitats	Depth to Water Table
Allanton Sand	Very deep, poorly and very poorly drained; Runoff is slow; Permeability is moderate but impeded by high water table, prone to ponding; Strongly acidic;	Depressional areas and drainageways in Flatwoods	0 to 6 inches (15.2 cm)
Arents	Manmade: mixture of various soil series (from earth moving operations such as dredging and filling). Natural: very deep, somewhat poorly drained, have a very low available water capacity, variable permeability, negligible surface runoff, and are not prone to flooding or ponding.	-----	8 to 36 inches (20.3 cm to 91.4 cm)

Bayvi Loam	Very deep; Very poorly drained; Friable; Low available water capacity, slow runoff, rapid permeability (but internal drainage is impeded by the high water table), very high surface runoff, and are very prone to flooding (especially during high tides)		Tidal marshes	0 to 6 inches (15.2 cm)
Centenary Sand	Very deep; well drained or somewhat excessively drained; Moderately permeable with negligible to very low runoff; Strongly acidic		Uplands/Sandhills	
Chipley Sand	Very deep; Somewhat poorly drained; Very rapid or rapidly permeable; Light gray, dark gray, yellowish brown/brownish yellow		Uplands/Sandhills	
Diregо Muck	Very deep; Very poorly drained; Rapidly permeable but impeded by high water table; Flooded daily by high tides; Slightly acidic;		Tidal marshes	
Foxworth Sands	Very deep; moderately to somewhat excessively drained; Rapid to very rapidly permeable; Very strongly to slightly acidic		Uplands/Flatwoods and Sandhills	30 to 72 inches (76.2 cm to 1.8 m)
Fripp-Corolla Complex	Fripp	Very deep; Excessively drained; Rapidly permeable; Very slow runoff; Slightly acidic	Steep dunes adjoining beaches and coastal waterways	
	Corolla	Moderately well and somewhat poorly drained; Medium acidic through moderately alkaline; Gray, dark grayish brown, light brownish gray, very pale brown	Interdunal swales, coastal depressions and sloughs	
Hurricane Sands	Very deep; Very poorly drained; Slow permeability with rapid runoff; Moderately to very strongly acidic; Not prone to ponding or flooding,		Uplands/Flatwoods and Sandhills	24 to 42 inches (0.6 m to 1.06 m)

	but are very susceptible to wind erosion			
Kureb Sands	Very deep; Excessively drained; Slow runoff with rapid permeability; slightly acidic		Upland/Sandhills	> 72 inches (1.8 m)
Lakeland Sand	Very deep; Excessively drained; Rapidly to very rapidly permeable with slow runoff; Strongly acidic		Upland/Sandhills	>80 inches (2 m)
Leon Sand	Very deep; Poorly drained; Rapidly permeable on surface, high surface ruonoff not prone to ponding; Susceptible to wind erosion; Strongly acidic		Uplands/Flatwoods	6 to 18 inches (15.2 cm to 45.7 cm)
Mandarin Sand	Very deep, somewhat poorly drained, have a low available water capacity, rapid permeability on the surface, very low surface runoff, are not prone to ponding or flooding, but are very susceptible to wind erosion ; Very strongly acidic		Uplands/Flatwoods	18 to 42 inches (0.45 m to 1.06 m)
Osier Fine Sand	Very deep, poorly drained, have a low available water capacity, rapid permeability (but internal drainage is impeded by the high water table), negligible surface runoff, are not prone to flooding, but are prone to ponding, and are very susceptible to wind erosion; Extremely acidic		Floodplains and depressions in flatwoods	0 to 6 inches (15.2 cm)
Pamlico-Dorovan Complex	Pamlico	Very poorly drained; Ponded or very slow runoff; Flooding is rare to frequent; Moderate to moderately rapid permeability in organic layers and slow to very rapid in mineral layers; Extremely acidic	Floodplains and Depressional areas	
	Dorovan	Very deep; very poorly drained; moderately permeable with slow runoff and	Floodplains, Hardwood swamps, and Depressions	

		ponded water on surface in depressions; Strongly or very strongly acidic		
Pickney Fine Sand	Very deep, very poorly drained, have a moderate available water capacity, rapid permeability on the surface (but internal drainage is impeded by the high water table), negligible surface runoff, frequently ponded and occasionally prone to flooding, very susceptible to wind erosion; Very acidic		Floodplains and Depressions	0 to 6 inches (15.2 cm)
Pits	Excavated areas		-----	-----
Pottsburg Wet Sands	Very deep, poorly drained, have a low available water capacity, rapid permeability on the surface, negligible surface runoff, are not prone to ponding or flooding, and are very susceptible to wind erosion; Very strongly acidic		Upland/Flatwoods	0 to 6 inches (15.2 cm)
Resota Fine Sand	Very deep, moderately well drained, have a very low available water capacity, very rapid permeability on the surface, negligible surface runoff, are not prone to ponding or flooding, and are very susceptible to wind erosion; Very acidic		Upland/Sandhill/Scrub	42 to 60 inches (1.06 m to 1.52 m)
Rutledge Sand	Very deep, very poorly drained, have a low available water capacity, rapid permeability on the surface (but internal drainage is impeded by the high water table), negligible surface runoff, are not prone to flooding but frequently pond, and are very susceptible to wind erosion; Strongly acidic		Floodplains and stream terraces	0 to 6 inches (15.2 cm)

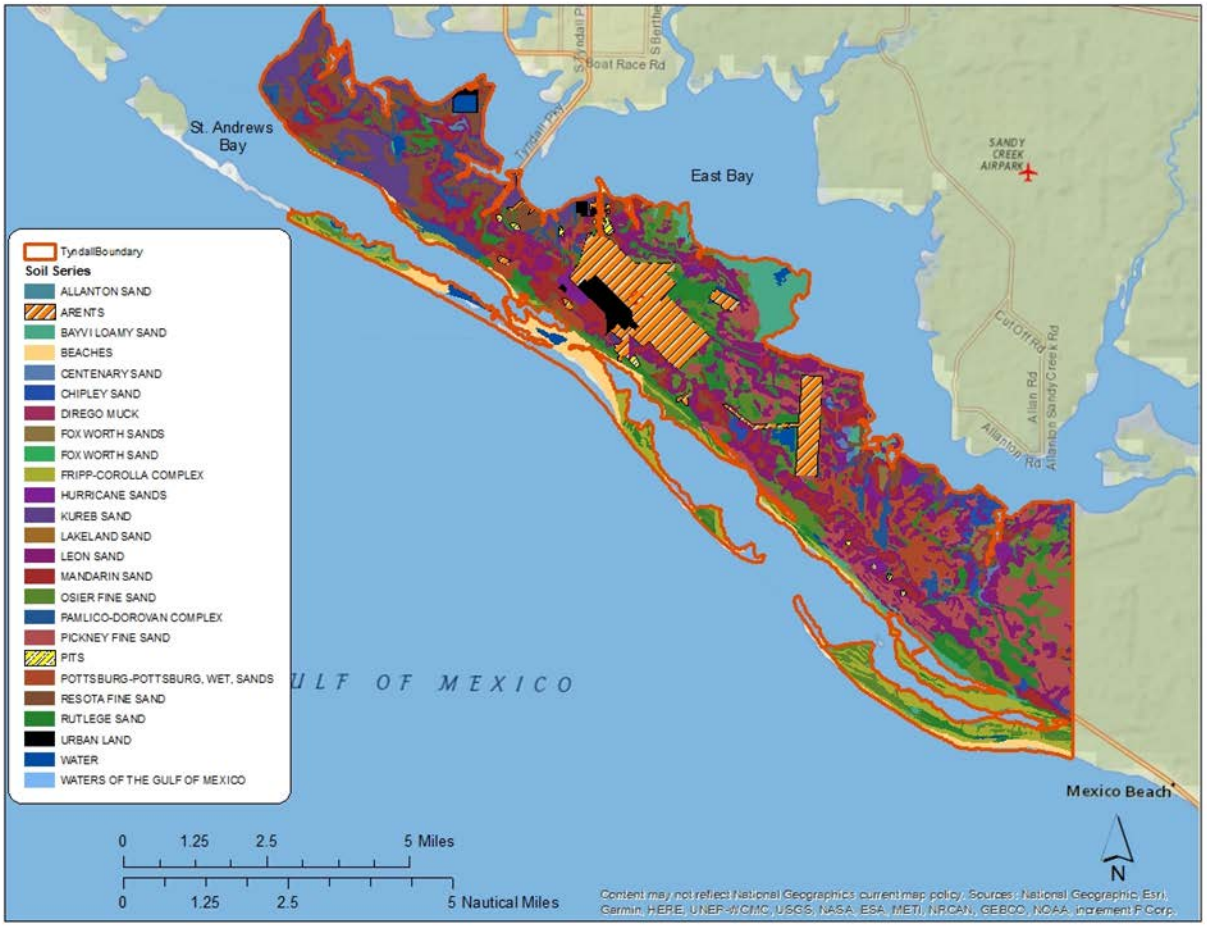

Figure 5 - Detailed soil series map of Tyndall AFB. Source: NRCS Soil Survey Geographic Database (SSURGO)

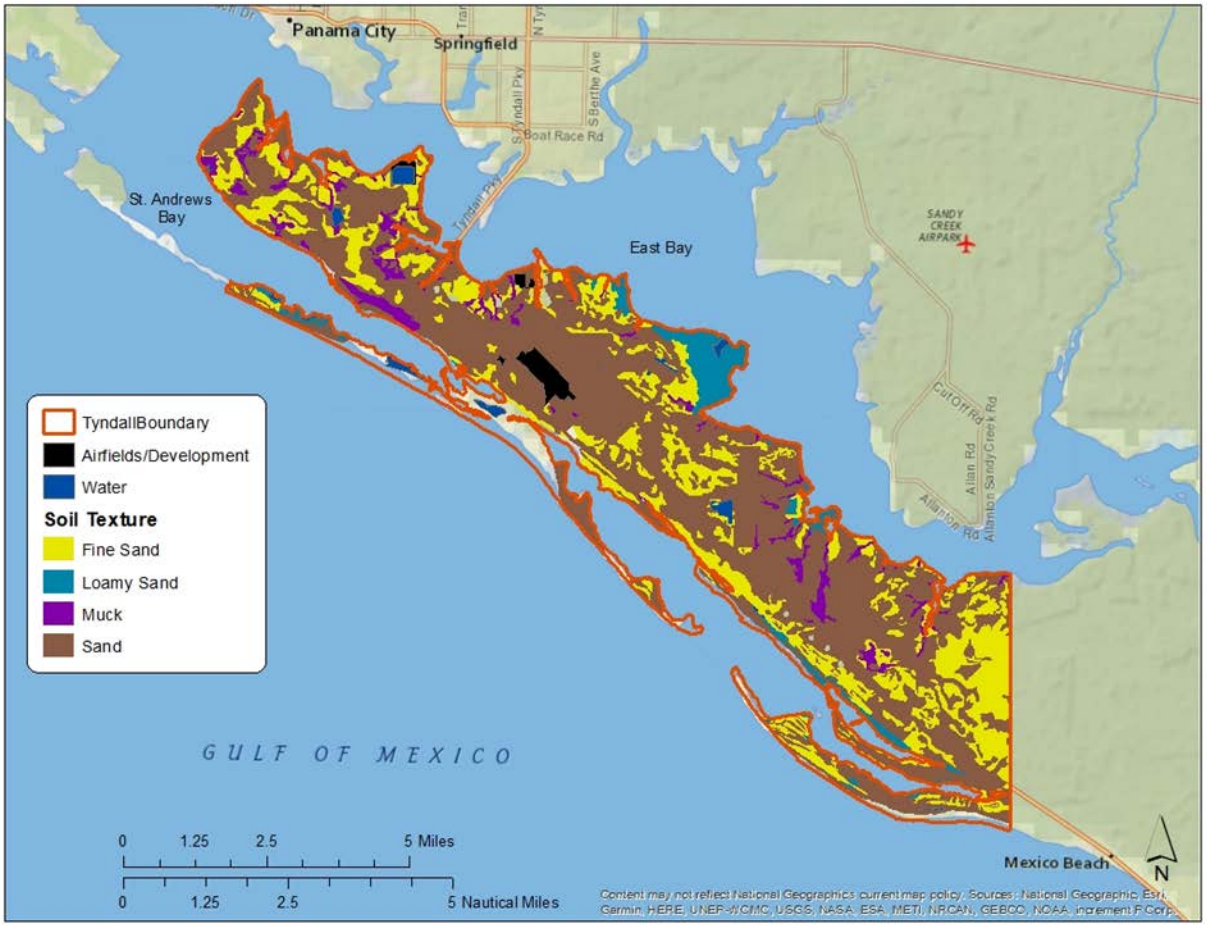

Figure 6 - General soil texture map of Tyndall AFB. Source: NRCS SSURGO

2.2.4 Hydrology

Groundwater

The surficial aquifer at Tyndall AFB ranges in thickness from approximately 50 to 100 feet (15 to 30 m) below ground surface and is not utilized as a potable source (Tyndall AFB 2011). The Florida Aquifer is approximately 250 to 350 feet (76 to 107 m) below the surface. Some areas of Tyndall AFB are served by permitted wells: the water taken from these wells is filtered and chlorinated prior to use.

Surface Waters

Tyndall AFB is located entirely within the St. Andrew Bay Watershed. Approximately 40% of the installation is considered wetlands in the form of marshes, swamps, bogs, or similar habitats (Figure 7). Floodplains are generally flat, lowland areas bordering inland and coastal waters that are subject to a one percent or greater chance of flooding in any given year (100-year floodplain). In inland environments, floodplains are typically the result of freshwater precipitation and/or runoff, and are generally of long-duration, whereas coastal floodplains are often the result of short-duration freshwater precipitation and/or runoff as well as intense storm surges. Figure 8 depicts storm surge areas. Major surface water features within this watershed include the Gulf of Mexico, St. Andrew Bay (including West, East, and North bays),

St. Joseph Bay, Deer Point Lake Reservoir, and St. Andrew Sound. Several freshwater lakes, some of which are artificial (created via excavation or impoundment) and others such as the coastal dune lakes developed naturally with coastal and land processes. There are no named rivers on Tyndall AFB, but several unnamed sinuous watercourses branch inland from major bayous. In addition to several named bayous, other notable waterbodies occurring on or in close proximity to Tyndall AFB include:

- Felix Lake
- Sandy Creek
- Wild Goose Lagoon
- Grand Lagoon

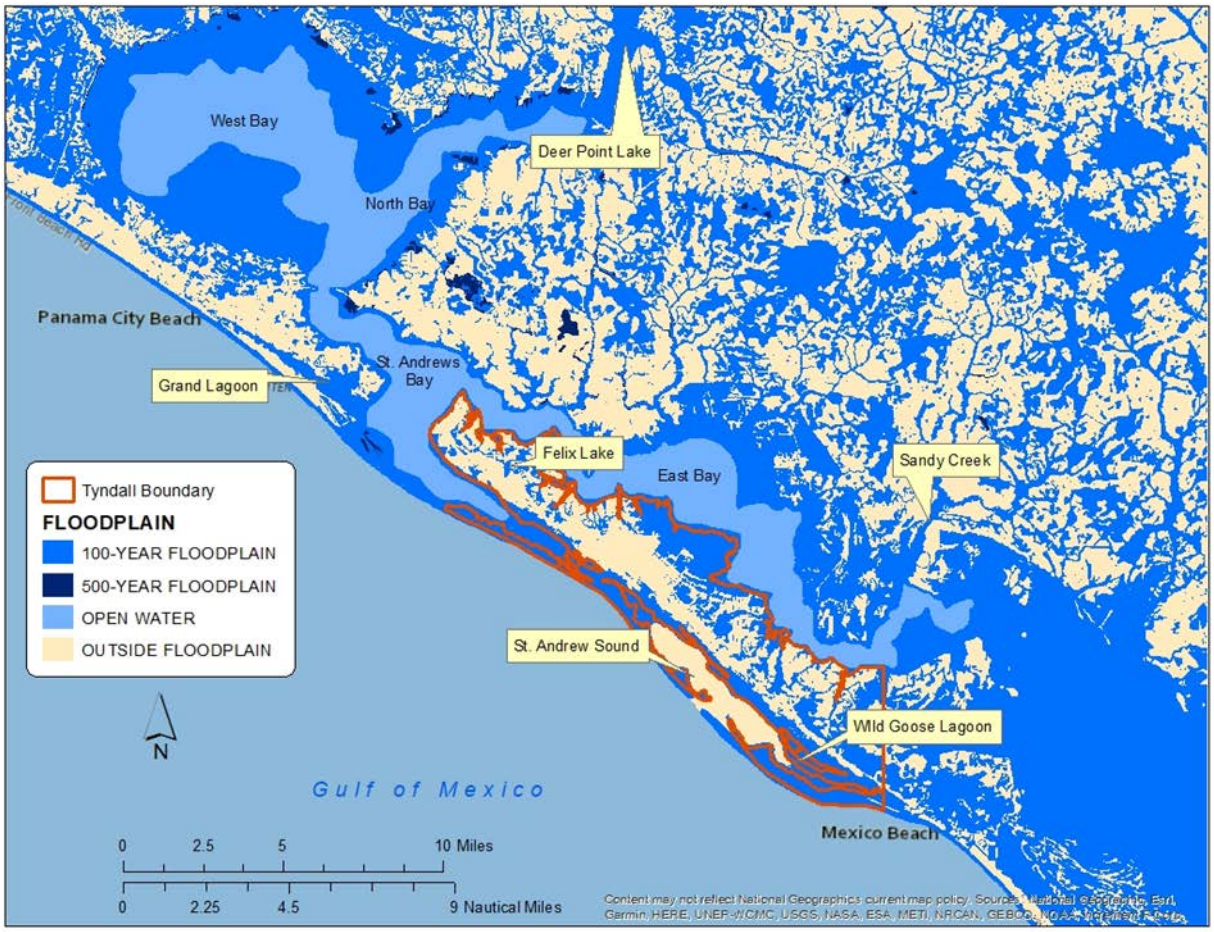

Figure 7 - Floodplains (100 and 500-year) and surface waters of Tyndall AFB. Note: The 100-year floodplain does not account for tidal surges.

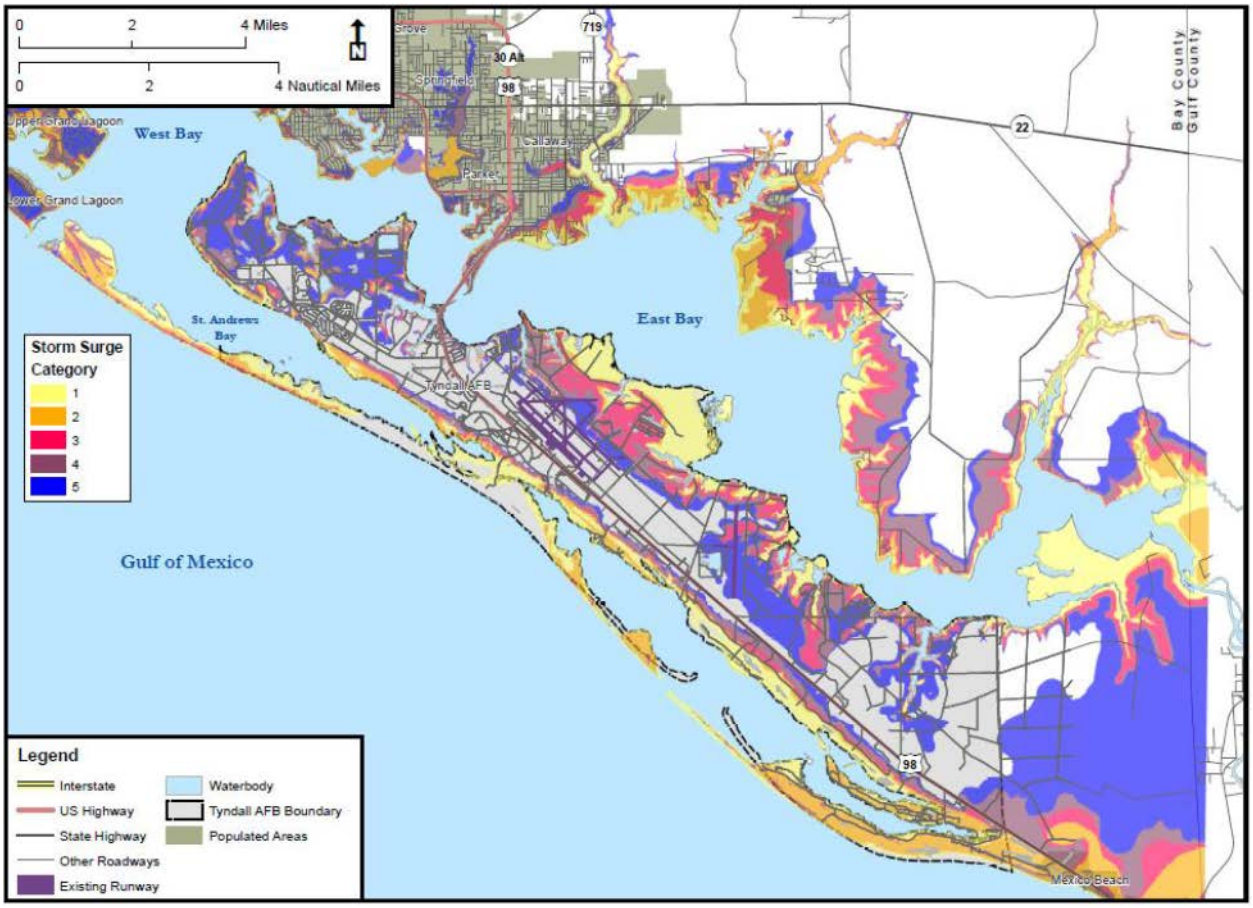

Figure 8 - Storm surge areas of Tyndall AFB

Many of the shorelines (bay and coastal) of Tyndall AFB are within the 100-year floodplain. As such, Tyndall AFB is vulnerable to flooding from torrential rainfall and tidal surges associated with tropical storms and hurricanes. In general, in areas north of U.S. Highway 98 within Tyndall AFB, surface waters drain to the north. In areas south of U.S. Highway 98 within Tyndall AFB, surface waters drain to the south.

Stream Channel Modeling

Modeling of stream channel overflow (or flood modeling) was not conducted for Tyndall AFB because surface water features are not within the scope of the stream channel modeling constraints. The scope of flood modeling was limited to stream channel networks and did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Coastal Zone Modeling

Exposure to sea level rise (SLR) and storm surges (SS) was assessed using a Department of Defense (DoD) site specific scenario database. Details on the development and use of this database are described in Hall et al. (2016). Extreme water level scenarios were based on regional frequency analysis estimates of 20-year and 100-year storm surges. Coastal flooding projections were modeled for RCP 4.5 and RCP 8.5 emission scenarios in 2035 and 2065 in accordance with the DoD scenario database. SLR inundation estimates the

new permanent coastline for each scenario and timeframe. SS inundation estimates short term flooding associated with an extreme water level event that is expected to recede after the storm.

Table 5 summarizes projected coastal inundation in acres for each scenario. SLR is projected to decrease installation area by between 6.5% (RCP 4.5 in 2035) and 9.6% (RCP 8.5 in 2065).

The spatial extent of projected flooding due to SLR and SS is depicted in a series of maps included in Appendix C. SLR impacts are expected along the eastern shoreline or East Bay and small portions of land on the western portion of the installation. Existing coastal ecosystems and wetlands are the most vulnerable to SLR inundation.

Projections for a 20-year SS, which have a 5% probability of occurring in any given year, estimate possible inundation of between 8,448 acres (3,419 ha) (28% of the installation area) for the RCP 4.5 scenario in 2035 to 9,771 acres (3,954 ha) (34% of the installation area) for the RCP 8.5 scenario in 2065. Projections for a 100-year SS, which have a 1% probability of occurring in any given year, estimate possible inundation up to 12,860 acres (5,204 ha) (43% of the installation area) for the RCP 8.5 scenario in 2065.

Table 5 - Projected SLR and SS inundation at Tyndall AFB.

Climate Scenario		2035		2065	
		Projected inundation (acres)	Percent of installation area inundated	Projected inundation (acres)	Percent of installation area inundated
RCP 4.5	SLR	1,949 (789 ha)	6.5%	2,222 (899 ha)	7.4%
	20-yr SS	8,448 (3,419 ha)	28.3%	8,907 (3,605 ha)	29.8%
	100-yr SS	11,715 (4,741 ha)	39.3%	12,082 (4,899 ha)	40.5%
RCP 8.5	SLR	2,222 (899 ha)	7.4%	2,854 (1,155 ha)	9.6%
	20-yr SS	8,907 (3,605 ha)	29.8%	9,772 (3,955 ha)	32.7%
	100-yr SS	12,082 (4,899 ha)	40.5%	12,861 (5,205 ha)	43.1%

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

The National Hierarchical Framework of Ecological Units is a mapping classification based on natural associations of ecological factors (Cleland et al. 1997). Utilizing this classification system, Tyndall AFB classifications are nested within the Humid Temperate Domain, Subtropical Division, and the Outer Coastal Plain Mixed Forest Province (Bailey 2014). Ecosystems in this domain are subject to the seasonal fluctuations in precipitation and temperature, and the length of the winter season, which results in vegetation such as prairie, broadleaf deciduous forest, and evergreen coniferous forests (Bailey 2014). These areas

also experience high humidity, absence of very cold winters, ample rainfall (heaviest in summer months), severe thunderstorms (frequent in summer months), possibility of tropical hurricanes, and moderately wide-ranging temperatures (Bailey 2014).

Situated in the Florida panhandle, Tyndall AFB is within one of the nation's leading biodiversity hotspots, with upwards of 50 imperiled species known to occur in the region, many of which depend on longleaf pine forests (Stein et al. 2000). Figure 9 depicts these biodiversity hotspots, which are a measure of species richness and rarity (Stein et al. 2000). Additionally, Figure 9 depicts the rarity-weighted richness for critically imperiled and imperiled species in the United States showing the Florida panhandle region in and around Tyndall AFB as having moderate to high index values (NatureServe 2020).

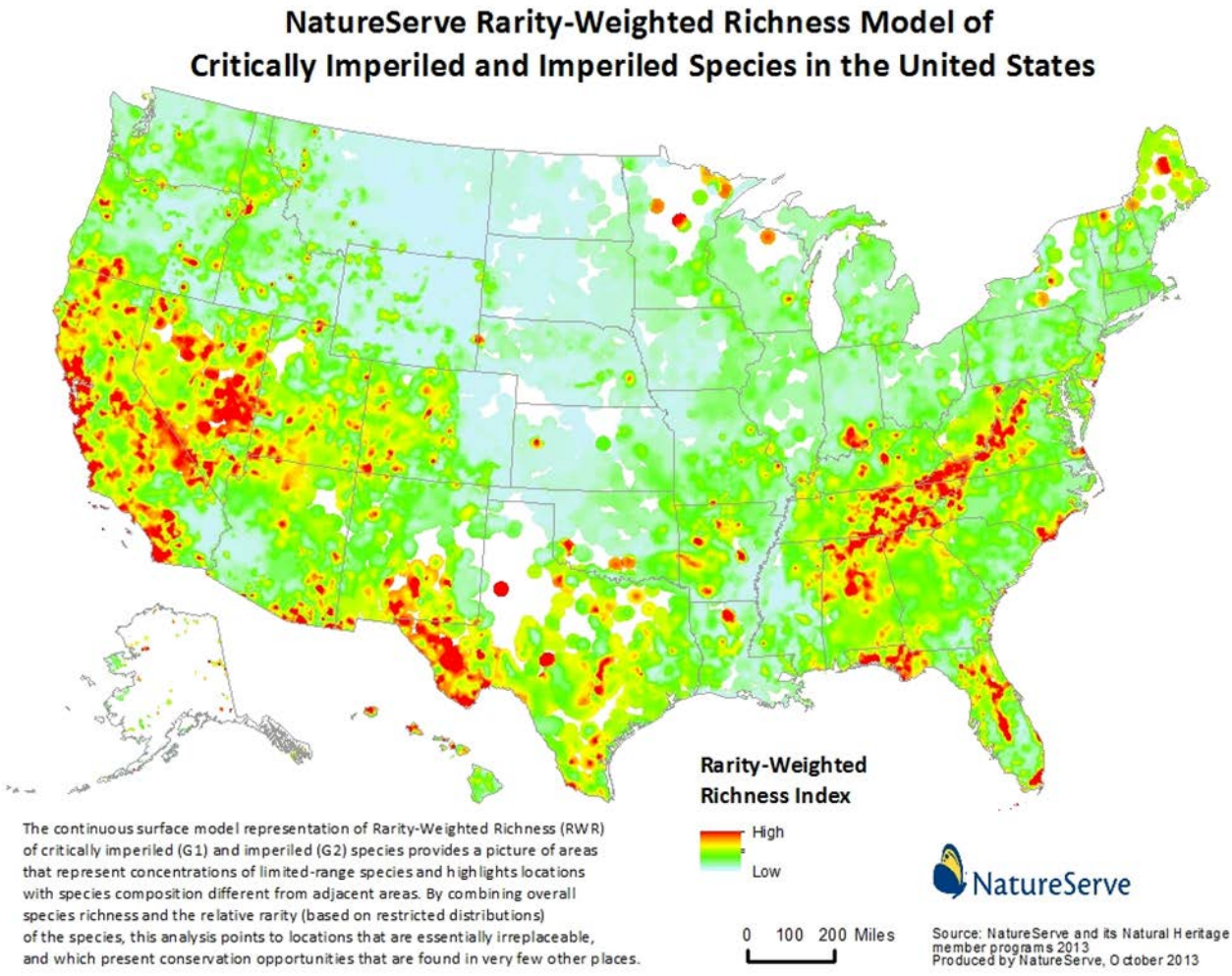

Figure 9 - Rarity-Weighted Richness Model of Critically Imperiled and Imperiled Species in the United States. Source: NatureServe, 2020.

2.3.2 Vegetation

2.3.2.1 Historic Vegetative Cover

At the time of European settlement, Tyndall AFB was composed of intact coastal ecosystems as well as upland longleaf pine (*Pinus palustris*) ecosystems. The longleaf pine ecosystem is a fire-dependent system maintained by frequent, low-intensity fires to maintain the characteristic open canopy, sparse shrub midstory, and floristically diverse herbaceous understory. Prior to European settlement, the longleaf pine ecosystem was maintained by natural fires resulting from lightning strikes and fires intentionally set by Native Americans. With European settlement, use of forest resources increased to include naval stores and timber harvesting and by the mid-1800s, these industries were important economic drivers in the region. As such, many of the forests were burned to facilitate access to turpentine trees. The early 1900s saw the peak in the exploitation of longleaf forests and by the 1920s, most of the virgin timber was decimated and the naval stores industries were waning (FNAI 2005).

Prior to AF ownership in the 1940's, the majority of Tyndall AFB was forested with longleaf pine and then clearcut across the installation. Reforestation of Tyndall AFB began in the early 1960's with the focus on planting commercial slash pine (*Pinus elliottii*) and sand pine (*Pinus clausa*) plantations to generate revenue for the Tyndall AFB Forestry Program. In 2006, Tyndall shifted from commercial forestry practices (timber production) to an ecological forestry program that emphasizes restoration of pre-settlement vegetation conditions and natural processes through selective thinning, natural and artificial regeneration of native species, and prescribed fire. The shift away from commercial forestry practices will promote restoration of the structure, community composition, and function of the longleaf pine ecosystem which is a regional conservation priority due to its vast destruction and importance as important habitat for a large number of Threatened and Endangered species (T&E species).

On October 10, 2018, Hurricane Michael made landfall on Tyndall AFB as a Category 5 hurricane with maximum sustained winds of 160 mph, causing catastrophic damage to Tyndall AFB and surrounding areas. In addition to significant loss and damage to base infrastructure, natural resources were severely impacted. A total of 12,000 acres (4,856 ha) of pine forest sustained severe (5,000 acres (2,023 ha)) or catastrophic (7,000 acres (2,833 ha)) wind damage. Clean up operations on nearly 10,000 acres was completed in March 2020 and involved traditional timber salvage in the early stages, shifting to cutting, chipping, and hauling tree debris from the installation in the later stages. Forest stand prescriptions are being developed in 2020 with the intention of reforesting 9,000-10,000 acres (3,642-4,047 ha) with containerized longleaf pine seedlings between 2020 and 2025 and using prescribed fire to promote restoration of the herbaceous ground cover.

2.3.2.2 Current Vegetative Cover

The Florida Fish and Wildlife Conservation Commission Cooperative Land Cover, Version 3.3 (CLC) habitat mapping data identifies 30 natural community types and 10 altered community types (Table 6). The dominant upland natural communities within Tyndall AFB include Tree Plantations, Coastal Scrub, Coastal Uplands, Mesic Flatwoods and Wet Flatwoods, which combined, account for 58% of the landcover on the installation. Dominant wetland natural communities include Salt Marshes, Prairies and Bogs, Freshwater Forested Wetlands, and Marshes, accounting for 14% of the landcover within Tyndall AFB. Figure 10 depicts the arrangement of natural communities and altered land types on the installation.

Table 6 - Natural and altered community types identified within Tyndall AFB.

Natural Community Type	**Acreage**	**Percent Coverage**
Coastal Scrub	2,586 (1,047 ha)	9%
Coastal Uplands	1,214 (491 ha)	4%
Cypress	3 (1 ha)	0%
Estuarine	333 (135 ha)	1%
Freshwater Forested Wetlands	1,071 (433 ha)	4%
Freshwater Non-Forested Wetlands	2 (1 ha)	0%
High Pine Scrub	308 (125 ha)	1%
Isolated Freshwater Marsh	2 (1 ha)	0%
Lacustrine	35 (14 ha)	0%
Marine	182 (74 ha)	1%
Maritime Hammock	25 (10 ha)	0%
Marshes	536 (217 ha)	2%
Mesic Flatwoods	968 (392 ha)	3%
Mesic Hammock	13 (5 ha)	0%
Mixed Hardwood-Coniferous	615 (249 ha)	2%
Natural Lakes and Ponds	62 (25 ha)	0%
Natural Rivers and Streams	34 (14 ha)	0%
Non-Vegetated Wetlands	71 (29 ha)	0%
Other Hardwood Wetlands	14 (6 ha)	0%
Prairies and Bogs	910 (368 ha)	3%
Riverine	10 (4 ha)	0%
Salt Marsh	1,365 (552 ha)	5%
Sand Beach (Dry)	660 (267 ha)	2%
Scrub	5 (2 ha)	0%
Scrubby Flatwoods	113 (46 ha)	0%
Shrub and Brushland	385 (156 ha)	1%
Tidal Flat	388 (157 ha)	1%
Upland Hardwood Forest	25 (10 ha)	0%
Wet Flatwoods	4,407 (1,783 ha)	15%
Subtotal	*16,342* (6,613 ha)	*82%*
Altered Community Types	**Acreage**	**Percent Coverage**
Bare Soil/Cleared Areas	21 (8 ha)	0%
Communication	12 (5 ha)	0%
Cropland/Pasture	10 (4 ha)	0%
Cultural Estuarine	33 (13 ha)	0%
Cultural Lacustrine	236 (96 ha)	1%
High Intensity Urban	1,088 (440 ha)	4%
Low Intensity Urban	445 (180 ha)	1%
Rural	720 (291 ha)	2%
Transportation	2,846 (1,152 ha)	10%
Tree Plantation	7,993 (3,235 ha)	27%
Utilities	70 (28 ha)	0%

Subtotal	***13,474*** (5,453 ha)	***18%***
TOTAL	**29,815.70**	**100%**

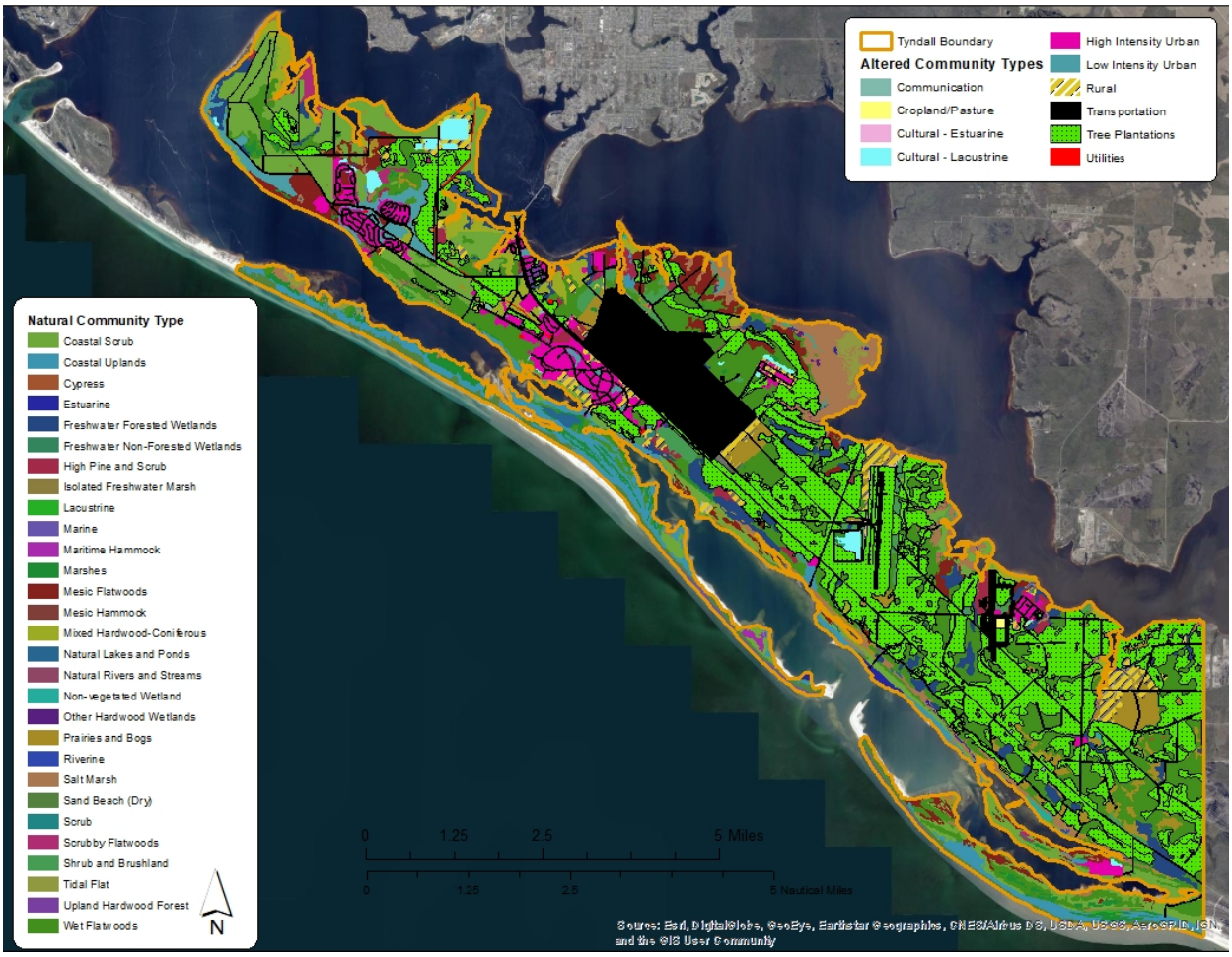

Figure 10 - Tyndall AFB Natural Community Map. Source: FWC Cooperative Land Cove, Version 3.3

Natural Community Descriptions

To the extent possible, the dominant natural communities found on Tyndall AFB are described using the CLC and Florida Natural Areas Inventory (FNAI 2010) descriptions and terminology.

***Tree Plantations*:** Approximately 7,992 acres (3234 ha) are delineated as tree plantations on Tyndall AFB. These areas had been altered by commercial timber practices starting in the 1960's and dominated by slash pine and sand pine. Plantations were not managed by frequent fire resulting in an unnaturally dense shrub layer and suppressed groundcover. The tree plantations within the installation are found primarily on former flatwoods (wet, mesic, and/or scrubby) that historically would have supported longleaf pine. Prior to Hurricane Michael, longleaf pine restoration was being conducted using a gradual, two-phased row gap thinning approach in existing slash pine plantations that was projected to take 35 years. The severe wind

damage from the storm required a massive clearcutting operation to remove downed trees and debris from 10,000 acres (3,642-4,047 ha). Forest stand prescriptions are being developed in 2020 with the intention of reforesting 9,000-10,000 acres (3,642-4,047 ha) with containerized longleaf pine seedlings between 2020 and 2025 and using prescribed fire to promote restoration of the herbaceous ground cover.

***Wet/Mesic/Scrubby Flatwoods*:** Flatwoods communities in general have a stratified appearance and are characterized by an open canopy of scattered pine trees with a shrubby understory that typically includes saw palmetto (*Serenoa repens*) and ericaceous shrubs including high bush blueberry (*Vaccinium corymbosum*), dwarf huckleberry (*Gaylussacia dumosa*), swamp titi (*Cyrilla racemiflora*), and fetterbush (*Lyonia lucida*). These areas typically include diverse groundcover assemblages dominated by wiregrass (*Aristida stricta*), other native warm season grasses, sedges, and suite of other herbaceous species. Fire plays a critical role in maintaining the structure of flatwoods communities. Historical fire return intervals ranged from 1 to 3 years in wet flatwoods, 2 to 4 years in mesic flatwoods, and 5 to 15 years in scrubby flatwoods. Historic land uses and prolonged fire exclusion on Tyndall AFB resulted in an unnaturally dense shrub midstory and suppression of the native herbaceous understory. Despite management deficiencies and subsequent community alterations, rare plants do occur within the flatwoods communities across the installation. These plants include Chapman's crownbeard (*Verbesina chapmanii*), Southern red lily (*Lilium catesbaei*), Godfrey's butterwort (*Pinguicula ionantha*), Apalachicola dragonhead (*Physostegia godfreyi*), bog tupelo (*Nyssa ursina*), and Henry's spiderlily (*Hymenocallis henryae*). Flatwoods within Tyndall AFB were heavily impacted by Hurricane Michael with significant loss of overstory pine that will be reforested with longleaf pine from 2020-2025.

Freshwater Forested Wetlands: On Tyndall AFB, freshwater forested wetlands include floodplain swamps that are common on the eastern end of the main peninsula. These communities typically occur on flooded soils along stream channels. Within this community, dominant trees include pond cypress, Ogeechee tupelo (*Nyssa ogeche*), and swamp tupelo (*Nyssa sylvatica var. biflora*), but some sites also include swamp titi (*Cyrilla racemiflora*), wax myrtle (*Myrica cerifera*), dahoon holly (*Ilex cassine*), myrtle-leaved holly (*Ilex myrtifolia*), large gallberry (*Ilex coriacea*), sweetbay (*Magnolia virginiana*), and swamp bay (*Persea palustris*) (FNAI 2010). Other species present include lizard's tail (*Saururus cernuus*), royal fern (*Osmunda regalis*), laurel greenbrier (*Smilax laurifolia*), sphagnum moss (*Sphagnum* spp.), and switchcane (*Arundinaria tecta*). The most important physical factor associated with the shaping of these wetland communities is the hydroperiod and as such is not fire dependent; however, fires may occur during times of drought.

Coastal Uplands/Swales/Lakes: Coastal upland communities are restricted to barrier islands and near shore areas, may be woody or herbaceous, and are mesic or xeric in nature. Coastal upland communities identified along Tyndall's GOM coastline include beach dunes and coastal grasslands. Beach dunes are an herbaceous community that typically includes sea oats (*Uniola paniculata*), Gulf blue stem (*Schizachyrium maritimum*), bitter panicgrass (*Panicum amarum*), sea rocket (*Cakile* spp.), sea purslane (*Sesuvium* spp.), beach morning glory (*Ipomoea imperati*), and beach pennywort (*Hydrocotyle bonariensis*). Fire is naturally rare, as beach dunes are maintained via natural processes such as wind, wave action, and salt spray.

Coastal grasslands are an herbaceous community that often transitional areas between the active beach and beach dunes or between more inland communities such as coastal strands and hammocks. Plants typical of coastal grasslands include Gulf bluestem, other bluestem grass species (*Andropogon* spp.; *Schizachyrium*

spp.), sea oats, Muhly grass (*Muhlenbergia* spp.), wax myrtle (*Myrica cerifera*), bush goldenrod (*Chrysoma pauciflosculosa*), Godfrey's golden aster (*Chrysopsis godfreyi*), and sand squares (*Paronychia erecta*). On Tyndall AFB, these communities are situated between primary dunes on the Gulf side and secondary dunes. Fire is naturally rare, as coastal grassland communities are maintained via dynamic coastal processes such as wind, wave action, and salt spray.

Coastal interdunal swales are found on Tyndall in wet depressions between dunes. Interdunal swale communities are dominated by herbaceous species such as umbrella sedge (*Fuirena* spp.), rushes (*Juncus* spp.), hatpins (*Eriocaulon* spp.), and milkworts (*Polygala* spp.).

Coastal dune lakes are typically shallow, irregularly shaped depressions embedded within other coastal communities. These lakes are generally permanent, lentic waterbodies with highly variable salinities. Vegetation within these communities is generally restricted to the shoreline and may range from herbaceous to shrubby depending on fire frequencies associated with adjacent communities. Within Tyndall AFB, coastal dune lakes occur on CIW, CIE, and Raffield Peninsula. Yvonne Lake, Hurricane Lake and Big Alligator Lake are examples of permanent coastal dune lakes at Tyndall.

Salt Marsh: Salt marsh communities are herbaceous systems situated in areas where they are influenced by tides and seawater but protected from large waves. Vegetation within salt marsh communities occurs in distinct zones where one species will typically dominate. Characteristic vegetation frequently includes black needle rush (*Juncus roemerianus*), cordgrass (*Spartina* spp.) and grassworts (*Lilaeopsis* spp.). Other important species include sawgrass (*Cladium jamaicense*), salt grass (*Distichlis spicata*), Gulf cordgrass (*Spartina spartinae*), groundsel tree (*Baccharis halminifolia*), marsh elder (*Iva frutescens*), and cattails (*Typha* spp.). Salt marsh communities on Tyndall occur along the edges of bayous at Goose and Cedar Points and in low energy areas along the shoreline on the bay side of the barrier islands.

Prairies and Bogs: Wet prairies and bogs are important for many species of rare and listed plants and wildlife. The best way to maintain wet prairies and bogs is with low intensity, frequent prescribed fire on a 2-3 year fire return interval. Wet prairie communities occurring on Tyndall are herbaceous communities situated in seasonally inundated areas between lower lying areas. These communities are typically dominated by wiregrass, beaksedges (*Rhynchospora* spp.), meadow beauty species (*Rhexia* spp.), hatpins, pitcher plants (*Sarracenia* spp.), sundews (*Drosera* spp.), foxtail club moss (*Lycopodiella alopecuroides*), and yellow-eyed grasses (*Xyris* spp.). In well-managed wet prairies, shrubs are sparse and include St. John's-wort (*Hypericum* spp.), swamp titi, black titi (*Cliftonia monophylla*), gallberry, large gallberry, and swamp tupelo (*Nyssa sylvatica* var. *biflora*).

Climate Change and Vegetative Communities

Within forested systems, there is a temperature below which the equilibrium state of the forest appears constant, but above which the equilibrium forest cover declines steadily. This threshold represents a point where some degree of loss of the forest is inevitable. As the threshold is exceeded, there is a gradual increase in the committed dieback, with changes that are more progressive than sudden. Forest vegetation at Tyndall AFB may experience some degree of dieback before impacts are observed. For example, if climate was stabilized at 2050, a significant dieback could still occur over the next 100-200 years.

Wetlands and marshes, are naturally resilient, provide linear ecosystem connectivity, link aquatic and terrestrial ecosystems, and create thermal refugia for wildlife – all characteristics that can contribute to

ecological adaptation to climate change. The wetland ecosystems at Tyndall AB could be vulnerable to projected temperature and precipitation increases. Wetland systems are vulnerable to changes in quantity (increased temperature results in higher evaporation rates and lower freshwater input) and quality of their water supply, and it is anticipated climate change could have a pronounced effect on wetlands through alterations in hydrological regimes (Erwin 2009).

Saltwater marshes and swamps serve many crucial functions, including water filtration, prevention of coastal erosion, coastal protection from storms, carbon storage, food, and livelihood provision, and biodiversity protection, among others. These valuable ecosystems are vulnerable to degradation by land use change, exploitation, coastal development and climate change. Climate change impacts on coastal ecosystems are likely to occur through processes including SLR, changing ocean currents, increased storm events, increased temperature, changes in precipitation and increased emissions (Ellison 2015).

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. Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability could increase erosion rates.

A qualitative analysis of vegetation cover type maps in MC2 Dynamic Global Vegetation Model showed that vegetation type at Tyndall AFB has been of the Subtropical Mixed Forest type (Bachelet 2015). Under projected climate change scenarios, by 2050 the vegetation community at Tyndall AFB will likely continue to be Subtropical Mixed Forest type, but some species diversity could be lost because of variable environmental conditions.

2.3.2.3 Turf and Landscaped Areas

As a component of the Master Plan and Installation Facilities Standards, a Landscape Master Plan is being developed. The objective is to provide design guidance to the rebuild efforts to the Architects and Engineering packages, ensure a consistent application of landscape solutions, define the approved planting pallet, revegetate to mitigate hurricane damage, define the performance standards for landscape communities, integrate with the INRMP strategies and provide nature based infrastructure solutions. The maintenance strategies will distinguish between managed, maintained and manicured land areas and will provide the design intent for each of those maintenance zones. It will provide clear guidance, restrictions and approved planting strategies for the geographic districts at the base such as the Flightline District, Support District and other functional areas. The goal is to migrate historically mowed and highly maintained areas into more native, naturalistic vegetated land areas that are more resilient, sustainable and provide multiple benefits as green infrastructure.

2.3.3 Fish and Wildlife

The natural systems on Tyndall AFB support a rich diversity of game and non-game fish and wildlife including many rare and sensitive species (Table 7). As much of the acreage within Tyndall AFB is undeveloped, these habitats and reliant wildlife are representative of the surrounding area. Common game species found on the installation include white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and eastern gray squirrel (*Sciurus carolinensis*). Tyndall AFB also supports a wide variety of

non-game mammals, shorebirds, neotropical migrant birds, reptiles, and amphibians. The geographic location of Tyndall AFB supports warm water (70°F or higher) freshwater fisheries program including largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*) and other *Lepomis* species.

The mixed seagrass beds, sand flats, and muddy bottom habitat in the waters surrounding Tyndall AFB (Crooked Island Sound and St. Andrews Bay) are significant areas for young sharks and in-water habitat for threatened and endangered sea turtles. Surveys in these waters have identified Atlantic sharpnose (*Rhizoprionodon terraenovae*) and bonnethead (*Sphyrna tiburo*) sharks as the dominant species encountered (Bethea et al. 2014). Additional species included blacktip (*Carcharhinus limbatus*), scalloped hammerhead (*S. lewini*), spinner (*C. brevipinna*), blacknose (*C. acrontous*), and finetooth sharks (*C. isodon*). Only found in small numbers were Florida smoothhound (*Mustelus norrisi*), bull (*C. leucas*), great hammerhead (*S.mokarran*), and sandbar (*C. plumbeus)* sharks. Threatened and endangered species are discussed in the Threatened and Endangered Species and Species of Concern section.

Table 7 - Representative Fish and Wildlife Species Found on Tyndall AFB. Note: This is a reference summary and not a comprehensive species occurrence list.

Common Name	Scientific Name
Belted Kingfisher	*Megaceryle alcyon*
Black Racer	*Coluber constrictor*
Cotton Mouse	*Peromyscus gossypinus*
Cotton Mouth Snake	*Agkistridon piscivorus*
Cotton Rat	*Sigmodon hispidus*
Eastern Mole	*Scalopus aquaticus*
Eastern Red Bat	*Lasiurus borealis*
Five-lined Skink	*Eumeces fasciatus*
Flycatchers	*Tyrannidae spp.*
Ghost Crab	*Ocypode quadratus*
Gray Fox	*Urocyon cinereoargenteus*
Red Fox	*Vulpes vulpes*
Garter Snake	*Thamnophis sirtalis*
Great Blue Heron	*Ardea herodias*
Great Horned Owl	*Bubo virginianus*
Green Anole	*Anolis carolinensis*
Gulf Crab	*Calinectes smilis*
Largemouth Bass	*Micropterus salmoides*
Least Shrew	*Cryptodus parva*
Long-nosed Killifish	*Fundulus similis*
Northern Bobwhite	*Colinus virginianus*
Opossum	*Didelphis virginiana*
Oyster	*Crassostrea virginica*
Periwinkles	*Littorina irrorata*
Red-shouldered Hawk	*Buteo lineatus*
Red-winged Blackbird	*Agelaius phoenicius*
Salt Marsh Rabbit	*Sylvilagus aquaticus*
Sheepshead Minnow	*Cyprinodon variegatus*
Six-lined Racerunner	*Cnemidophorus sexlineatus*

Slender Glass Lizard	*Ophisaurus attenuatus*
White-tailed Deer	*Odocoileus virginianus*

Climate Change and Fish and Wildlife

Fish and wildlife species at Tyndall AFB could be affected by habitat loss from climate change. Projected inundation from SLR is likely to increase erosion of the barrier islands and bay shoreline habitats. A large percentage of scrub habitat is projected to be inundated at Tyndall AFB, which would displace a number of small mammals, reptiles, and birds. In addition, storm surge is projected to periodically inundate almost half of the installation, making it difficult for species with low dispersal abilities to migrate landward. Birds are able to evacuate during major storm events and return when conditions have subsided, but other animals such as mammals and reptiles may not be able to escape and could be permanently displaced, potentially eliminating or reducing certain species on Tyndall AFB.

Invasive plant species such as Japanese climbing fern (*Lygodium japonicum*) and Chinese tallow tree (*Triadica cerifera*), as well as cogon grass (*Imperata cylindrica*) are likely to benefit from changing climate and become more prevalent on Tyndall AFB (Bradley et al. 2010). Coupled with the potential for more frequent and higher intensity fires, invasive plants will have greater opportunities to establish themselves in open niches. A change in the plant community composition could have a negative impact on wildlife species that have historically depended on specific native plant species for their survival (Dukes and Mooney 1999). Invasive wildlife species may also expand onto Tyndall AFB. Newly arriving invasive species often have the ability to outcompete native species that are already experiencing reduced fitness due to shifting environmental conditions (Hellmann et al. 2008).

2.3.4 Threatened and Endangered Species and Species of Concern

The wide range of natural communities ranging from coastal systems to upland forests on Tyndall AFB and surrounding areas support a number of federal and state protected species (Figure 11). Federally protected species under the ESA include those currently listed as Endangered or Threatened, as well as Candidate and Petitioned species. Candidate species are those species for which the USFWS has sufficient information to propose them as Endangered or Threatened under the ESA, but for which development of a listing regulation is precluded by other higher priority actions. Petitioned species refer to those species that have been petitioned for listing under the ESA and for which the USFWS has found substantial information indicating that listing may be warranted.

Migratory birds and marine mammals are federally protected under the Migratory Bird Treaty Act (MBTA) and Marine Mammal Protection Act (MMPA), respectively. State status categories include Endangered and Threatened species and Species of Special Concern (SSC). SSC is defined as a species that warrants special protection, recognition, or consideration because of significant vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation which may result in it becoming a threatened species. The bald eagle and Florida black bear are protected the Bald and Golden Eagle Protection Act (BGEPA) and the Florida Black Bear Conservation Rule (FBBCR), respectively. The number of federal, state, and other protected species known to occur on Tyndall AFB is provided in Table 8.

Table 8 - Rare and Listed Species by Regulatory Mechanism at Tyndall AFB.

	Plants	**Animals**
Federally-listed T&E species (including Gulf species)	2	13

Federal Proposed T&E species	0	1
Federal Candidate species	0	1
Federally Petitioned species	6	3
State listed T&E species (FWC & Florida Department of Agriculture and Consumer Services (FDACS))	24	10
Species protected by other regulatory mechanisms (MMPA, BGEPA, FBBCR)	0	22
TOTAL	32	40

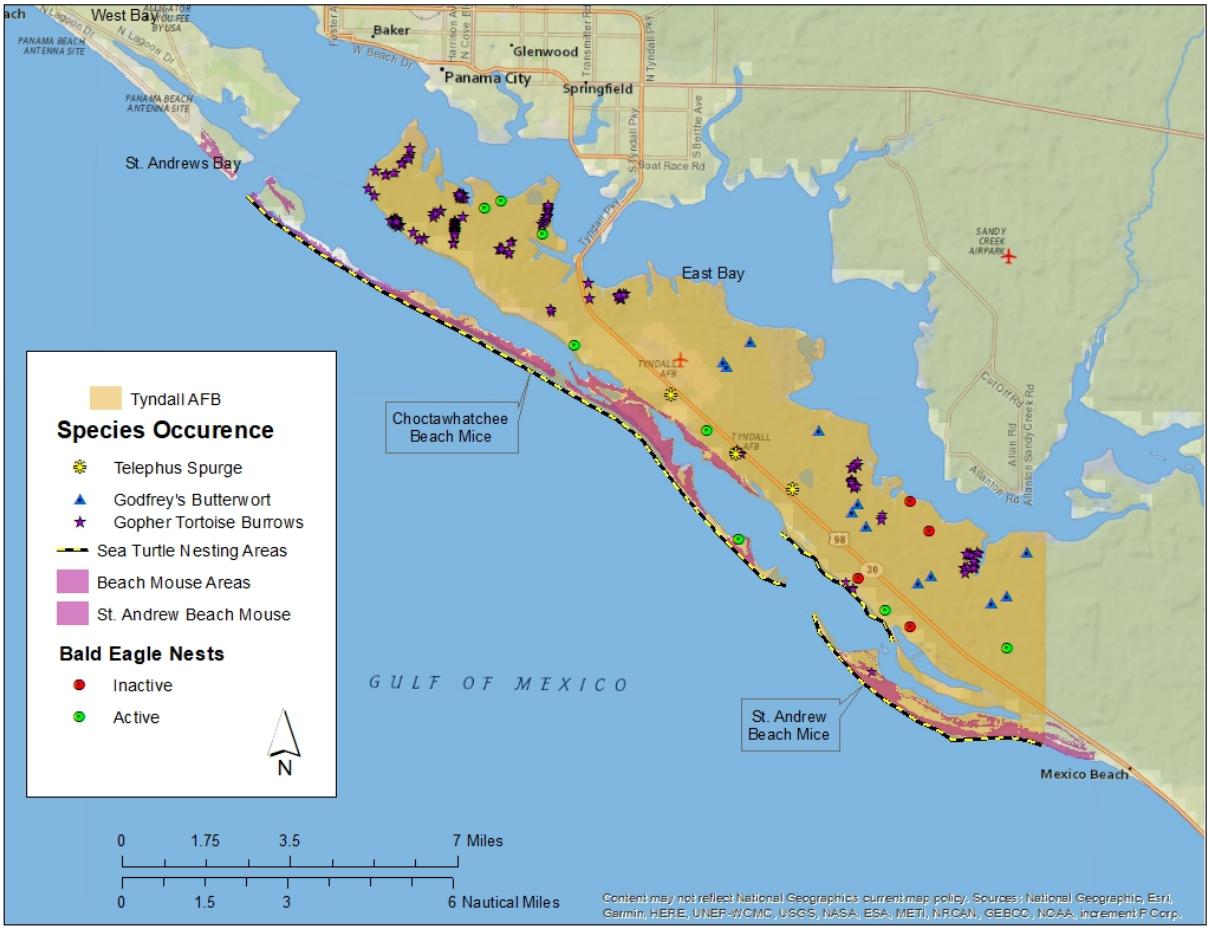

Figure 11 - State and federal threatened and endangered species map

The FWC is a constitutional agency, and its authority to regulate and manage most wildlife comes from the Florida constitution. All federally listed species that occur in Florida are included on Florida's list as designated Endangered or federally designated Threatened species. Additionally, FWC has a state listing process to identify those species which are not federally listed but at risk of extinction. These species are State-designated Threatened. As of January 2017, all State-designated species have current biological status reviews and updated listing statuses (FWC 2017).

State-listed plants, which are designated Endangered, Threatened, and Commercially Exploited, are administered and maintained by the Florida Department of Agriculture and Consumer Services (FDACS).

Per Chapter 5B-40, F.A.C., FDACS maintains a list of regulated plants in Florida, including those that are federally listed.

Survey, monitoring, and/or management programs are in place for the majority of the 15 federal protected species occurring on Tyndall AFB (Table 9) as well as some Candidate and Petitioned species, shorebirds, migratory birds, and some state-listed species. With the exception of the American alligator, all federally listed species known to occur on Tyndall AFB have federal recovery plans in place. In addition to these species, there are 25 federally protected marine mammal species/species groups with potential occurrence within the Eglin Gulf Test and Training Rage areas utilized by Tyndall AFB.

Two recent Center for Biological Diversity (CBD) petitions to the USFWS prompted the consideration of over 50 amphibian and reptile species and almost 400 freshwater species in the southeastern United Sates for protection under the ESA (CBD 2010, CBD 2012). Several of these petitioned species are known to occur on Tyndall AFB, or have the potential to occur based on habitat requirements (Table 10). In an effort to potentially mitigate federal listing of additional species, Tyndall is working to minimize threats to petitioned species occurring on the installation.

Table 9 - Protected species associated with Tyndall AFB.

Common Name	**Scientific Name**	**Federal Status**	**State Status**
Plants			
Apalachicola aster	*Eurybia spinulosa*		E
Apalachicola dragonhead	*Physostegia godfreyi*		T
Chapman's crownbeard	*Verbesina chapmanii*		T
Chapman's butterwort	*Pinguicula planifolia*		T
Dew thread sundew	*Drosera filiformis*		E
Giant water dropwort	*Oxypolis greenmanii*		E
Godfrey's butterwort	*Pinguicula ionantha*	T	E
Godfrey's golden aster	*Chrysopsis godfreyi*		E
Gulf coast lupine	*Lupinus westianus*		T
Harper's yellow-eyed grass	*Xyris scabrifolia*		T
Karst pond yellow-eyed grass	*Xyris longisepala*		E
Large-leaved jointweed	*Polygonella macrophylla*		T
Purple pitcher plant	*Sarracenia rosea*		T
Parrot pitcher plant	*Sarracenia psittacina*		T
Quillwort yellow-eyed grass	*Xyris isoetifolia*		E
Small spreading pogonia	*Cleistes bifaria*		E
Snakemouth orchid	*Pogonia ophioglossoides*		T
Southern milkweed	*Asclepias viridula*		T
Southern red lily	*Lilium catesbaei*		T
Spoon-leafed sundew	*Drosera intermedia*		T
Telephus spurge	*Euphorbia telephioides*	T	E
Thick-leaved water willow	*Justicia crassifolia*		E
White-flowered wild petunia	*Ruellia noctiflora*		E
Wiregrass gentian	*Gentiana pennelliana*		E
Yellow-flowered butterwort	*Pinguicula lutea*		T
Birds			
American oystercatcher	*Haematopus palliates*		T

Common Name	Scientific Name	Federal Status	State Status
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	
Black rail	*Laterallus jamaicensis*	P	
Black skimmer	*Rhychops niger*		T
Least tern	*Sterna antillarum*		T
Little blue heron	*Egretta caerulea*		T
Marian's marsh wren	*Cistohorus palustris marianae*		T
Piping plover	*Charadrius melodus*	T/CH	FT
Red-cockaded woodpecker*	*Picoides borealis*	E	FE
Rufa Red knot	*Calidris canutus rufa*	T	FT
Reddish egret	*Egretta rufescens*		T
Snowy plover	*Charadrius alexandrinus*		T
Southeastern American kestrel	*Falco sparverius paulus*		T
Tricolor heron	*Egretta tricolor*		T
Reptiles			
American alligator	*Alligator mississippiensis*	T (S/A)	T (S/A)
Eastern indigo snake*	*Drymarchon corais couperi*	T	FT
Florida pine snake*	*Pituophis melanoleucus mugitus*		T
Gopher tortoise	*Gopherus polyphemus*	C	T
Green sea turtle	*Chelonian mydas*	T	FT
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	FE
Leatherback sea turtle	*Dermochelys coriacea*	E	FE
Loggerhead sea turtle	*Caretta caretta*	T	FT
Land Mammals			
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	E/CH	FE
Florida black bear	*Ursus americanus floridanus*		FBBCR
St. Andrew beach mouse	*Peromyscus polionotus*	E/CH	FE
Marine Mammals			
Florida manatee	*Trichechus manatus latirostris*	E	FE
Atlantic spotted dolphin	*Stenella frontalis*	MMPA	
Beaked whales	*Mesoplodon spp.*	MMPA	
Bottlenose dolphin	*Tursiops truncatus*	MMPA	
Bryde's whale	*Balaenoptera edeni*	MMPA	
Clymene dolphin	*Stenella clymene*	MMPA	
Dwarf/pygmy sperm whale	*Kogia spp.*	MMPA	
False killer whale	*Pseudorca crassidens*	MMPA	
Fraser's dolphin	*Lagenodelphis hosei*	MMPA	
Killer whale	*Orcinus*	MMPA	
Melon-headed whale	*Peponocephala electra*	MMPA	
Pantropical spotted dolphin	*Stenella attenuata*	MMPA	
Pygmy killer whale	*Feresa attenuate*	MMPA	
Risso's dolphin	*Grampus griseus*	MMPA	
Rough-toothed dolphin	*Steno bredanensis*	MMPA	
Short-finned pilot whale	*Globicephalus spp.*	MMPA	
Spinner dolphin	*Stenella longirostris*	MMPA	
Sperm whale	*Physeter macrocephalus*	E/MMP	FE
Striped dolphin	*Stenella coeruleoalba*	MMPA	
Fish			

Common Name	Scientific Name	Federal Status	State Status
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T/CH	FT
Smalltooth sawfish	*Pristis pectinate*	E	FE

BGEPA = Bald and Golden Eagle Protection Act; C = Candidate species; CH = Critical Habitat has been designated; E = Endangered; FBBCR = Florida Black Bear Conservation Rule; MMPA = Marine Mammal Protection Act; P = Proposed; S/A = Similarity of Appearance; T = Threatened
*Not documented on Tyndall AFB though the species is known to occur in the region and/or appropriate habitat exists on Tyndall.

Table 10 – USFWS Petitioned species known to occur or potentially found on Tyndall AFB.

Common Name	Scientific Name	Classification
Alligator snapping turtle*	*Macroclemys temminckii*	Reptile
Eastern Diamondback Rattlesnake	*Crotalus adamanteus*	Reptile
Bear tupelo	*Nyssa ursina*	Plant
Blackbract pipewort*	*Eriocaulon nigrobracteatum*	Plant
Hairy-peduncled beakrush*	*Rhynchospora crinipes*	Plant
Henry's spider lily	*Hymenocallis henryae*	Plant
Kral's yellow-eyed-grass	*Xyris longisepala*	Plant
Panhandle meadow-beauty*	*Rhexia salicifolia*	Plant
Small-flower meadow-beauty*	*Rhexia parviflora*	Plant
Smooth-barked St. John's-wort*	*Hypericum lissophloeus*	Plant
West's Flax*	*Linum westii*	Plant
Purple Skimmer*	*Libellula jesseana*	Invertebrate
Say's Spiketail*	*Cordulegaster sayi*	Invertebrate
Coastal flatwoods crayfish	*Procambarus apalachicolae*	Invertebrate

*Not documented on Tyndall AFB

Climate Change and Threatened and Endangered Species and Species of Concern

Habitat alteration and disruption to food availability are two major climate-related threats to all species at Tyndall AFB. Habitat requirements, such as need for refugia, for some species may change as they employ behavioral adaptations. Prey populations or forage abundance may also be affected by changes in temperature and precipitation. Seasonal cues for prey or forage emergence may change resulting in a mismatch between food availability and food needs 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. SLR and SS inundation threatens habitat and life stages of shorebirds and semi-aquatic species dependent on coastal areas.

The Natural Resources Program Management Section of the INRMP and will be covered in detail in Species descriptions and management activities for listed species are discussed in the *Threatened and Endangered Species Component Plan.*

2.3.5 Wetlands and Floodplains

Wetlands are transitional areas between terrestrial and aquatic systems where the water table is at or near the surface, or the land is covered by shallow water (Cowardin et al. 1979). Abiotic and biotic environmental factors such as geomorphology, hydrology, water chemistry, soil characteristics, and vegetation contribute to the diversity of wetland community types. Local hydrology and soil saturation largely affect soil formation and development, as well as the plant and animal communities found in wetland areas (USEPA 1995). Wetlands are often categorized according to the frequency and duration of flooding and location in

relation to upland areas and water bodies. Wetland hydrology is considered one of the most important factors in establishing and maintaining wetland processes and is critical to groundwater recharge, floodwater storage, nutrient cycling, and wildlife habitat functions of wetland systems.

Wetlands are among the most productive ecosystems in the world, providing food and shelter for a diversity of species. Wetlands also provide a host of ecologically important functions such as groundwater recharge, flood control, shoreline protection, and watershed protection. The National Wetlands inventory classification (Cowardin et al. 1979) describes wetland habitats based on factors such as hydrologic and geomorphic features and chemical and biological characteristics. The five categories of wetlands in this classification system are:

- **Marine –** Open ocean overlying the continental shelf and coastline exposed to waves and currents of the open ocean shoreward to (1) extreme high water of spring tides, (2) seaward limit of wetland emergent, trees, or shrubs, or (3) the seaward limit of the Estuarine System other than vegetation. Salinities exceed 30 parts per thousand.
- **Estuarine –** Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean water at least occasionally diluted by freshwater inputs from the land. The upstream and landward limit is where ocean derived salts measure less than 0.5 parts per thousand during the period of average annual low flow. The seaward limit is (1) an imaginary line closing the mouth of a river, bay, or sound, and (2) the seaward limit of wetland emergent, shrubs, or trees when not included in (1).
- **Riverine –** All wetlands and deepwater habitats contained within a channel except those wetlands (1) dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens, or dammed river channel, (2) which have habitats with ocean-derived salinities in excess of 0.5 parts per thousand.
- **Lacustrine –** Wetlands and deepwater habitats (1) situated in a topographic depression or dammed driver channel, (2) lacking trees, shrubs, persistent emergent, emergent mosses, or lichens with greater than 30 percent aerial coverage, and (3) whose total area exceeds 20 acres (8 ha), or area less than 20 acres (8 ha) if the boundary is active wave-formed or bedrock or if water depth in the deepest part of the basin exceeds 6.6 feet (2m) at low water. Ocean-derived salinities are always less than 0.5 parts per thousand.
- **Palustrine –** All nontidal wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens, and all such tidal wetlands where ocean derived salinities are below 0.5 parts per thousand. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 20 acres (8 ha.), (2) lacking an active wave-formed or bedrock boundary, (3) water depth in the deepest part of the basin less than 6.6 feet (2m) at low water, and (4) ocean-derived salinities less than 0.5 parts per thousand.

Wetlands comprise nearly 40% of the area within Tyndall AFB and include examples from all five categories listed above, with palustrine wetlands being predominant. Figure 12 depicts the wetland types on Tyndall AFB and Figure 13 depicts the 100-year floodplain in areas in and around Tyndall AFB.

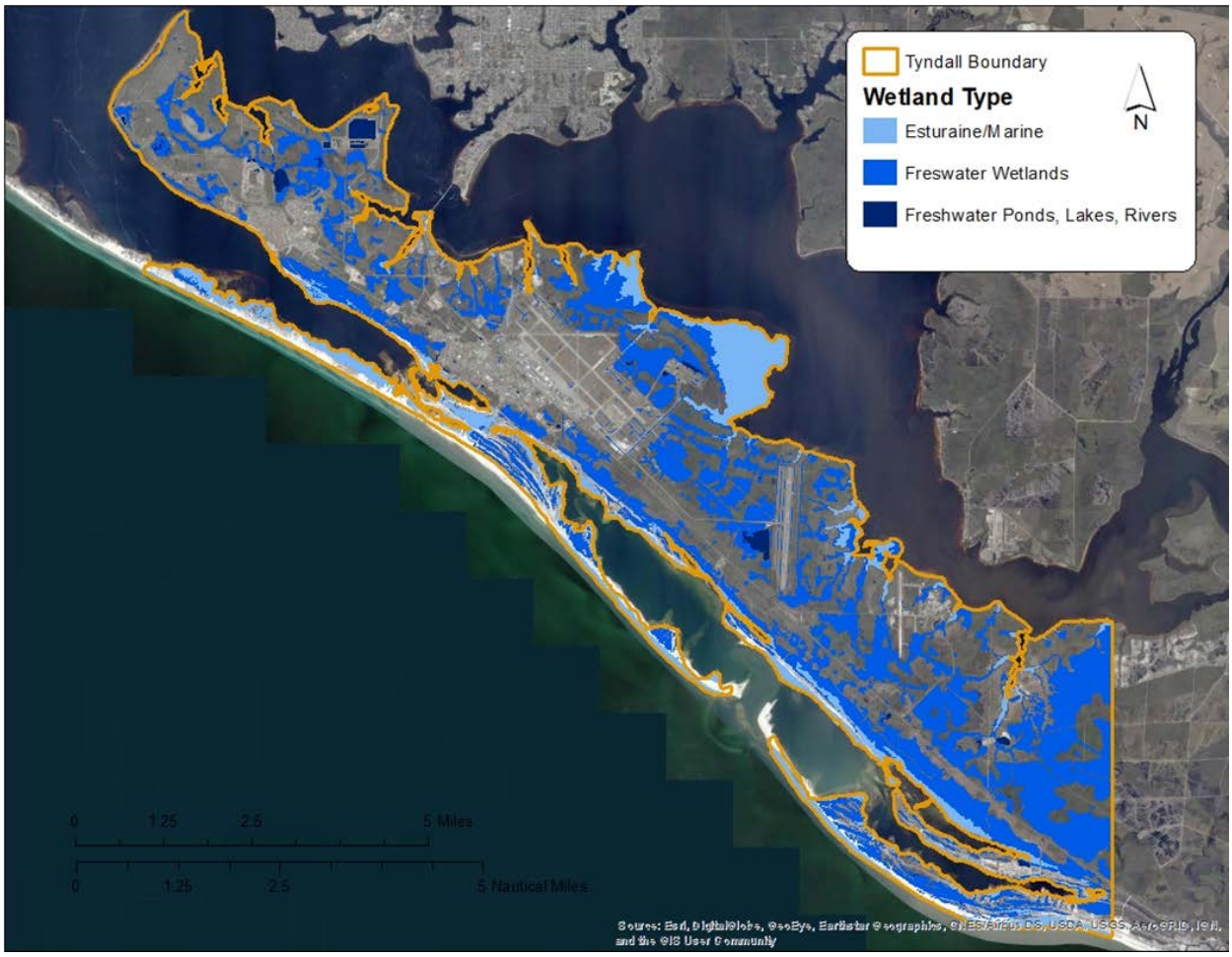

Figure 12 - Freshwater, estuarine, and marine wetland environments found on Tyndall AFB.

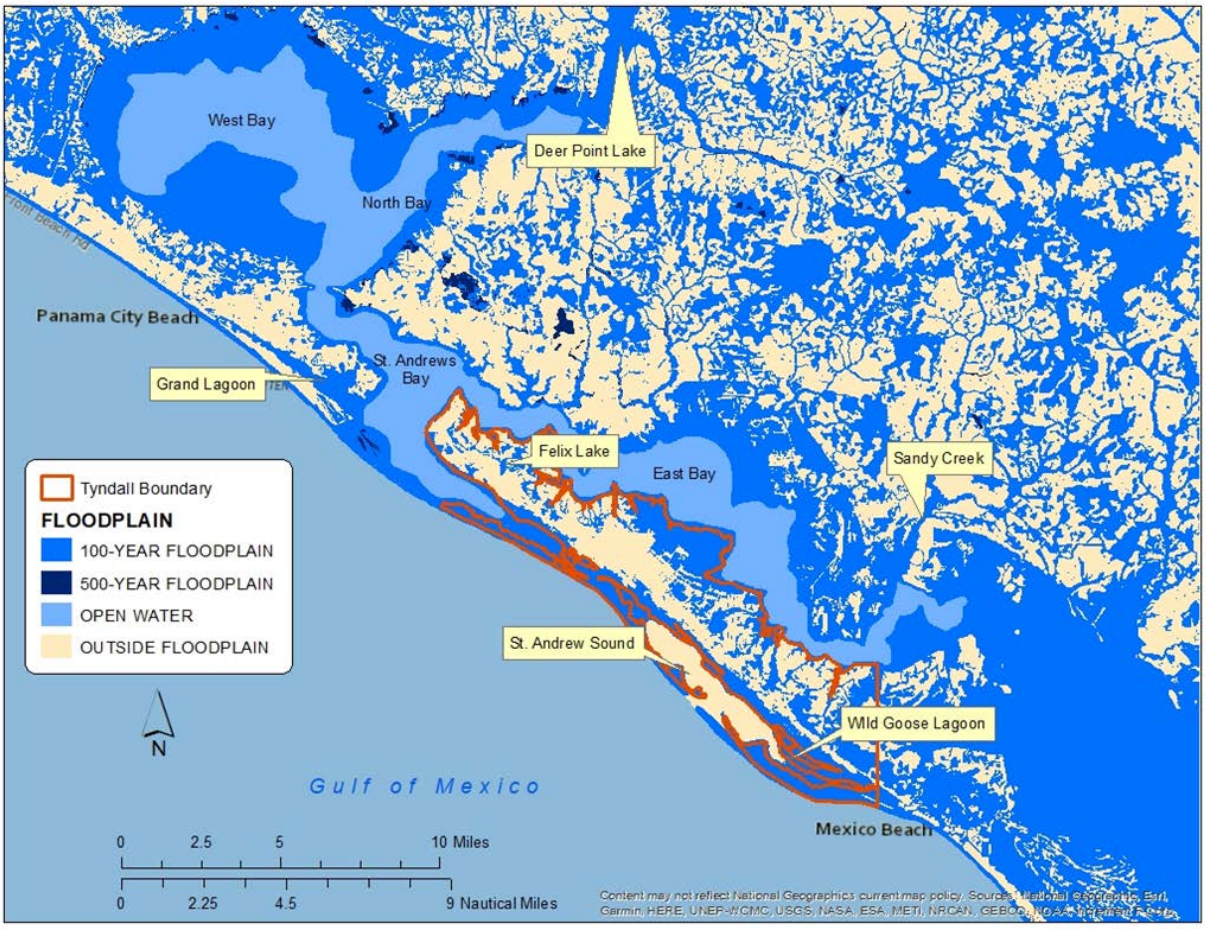

Figure 13 - 100-year floodplain map for areas in and around Tyndall AFB.

2.3.6 Other Natural Resource Information

Ecosystem Services

The natural environments on Tyndall provide numerous ecosystem services. It is difficult to assign a monetary value to the majority of these services, and therefore many times they are not adequately valued against other competing demands that provide a clear economic benefit. For the cost of a general recreation permit, members of the public can enjoy a multitude of recreational activities, including hiking, biking, and canoeing. Hunting and fishing opportunities provide both recreational and provisioning services. The same forests and waters used by recreationists also provide supporting services such as nutrient cycling, water filtration, and air purification. The activities detailed in this INRMP strive to maintain and improve these valuable ecosystem services.

Special Interest Natural Areas

Six areas were identified on Tyndall AFB by FNAI in 1994 as Special Interest Natural Areas (FNAI 1994):

- Barrier Islands and Peninsulas
- Cedar Point Flatwoods
- Drone Launch Wet Prairie
- Farmdale Bayou Wet Flatwoods
- Goose Point Tidal Marsh
- Strange Point/Alligator Bayou

These areas either presently support or have high potential to support endangered, threatened, or rare species, and most sites have largely remained in a natural condition. The focus of management in these areas will be the maintenance of natural processes such as prescribed fire and the abatement of invasive species to promote native species compositions and assemblages. Tyndall Natural Resources will develop guidelines and an internal process to evaluate management actions within these areas.

Hurricane Michael Impacts and Recovery

On October 10, 2018, Hurricane Michael made landfall on Tyndall AFB as a Category 5 hurricane with maximum sustained winds of 160 mph, causing catastrophic damage to Tyndall AFB and surrounding areas. In addition to significant loss and damage to base infrastructure, natural resources were also severely impacted. A total of 12,000 acres (4,856 ha)of pine forest sustained severe (5,000 acres (2,023 ha)) or catastrophic (7,000 acres (2,833 ha)) wind damage. Clean up operations on nearly 10,000 acres (4,047 ha) was completed in March 2020 and involved traditional timber salvage in the early stages shifting to cutting, chipping, and hauling tree debris off the installation. Cleared areas will be restored back to longleaf pine by 2025 (See *Forest Management Component Plan*).

Stochastic events, including hurricanes, create significant T&E species management challenges, particularly in coastal habitats. While coastal systems are dynamic in nature and barrier islands shift in size and arrangement overtime, these areas are important in providing Tyndall AFB some measure of natural protection against wave action and storm surges associated with major storm events. Important coastal habitat on Tyndall AFB includes approximately 18 miles of undeveloped barrier islands situated on the GOM that provides habitat for beach mice, nesting sea turtles, and nesting and wintering shorebirds protected under the Endangered Species Act and Florida Administrative Code. Hurricane Michael demonstrated the vulnerability and fragility of these barrier islands, leveling 10-15 ft. dunes, denuding some areas of vegetation, creating washovers, and breaching the tip of CIE.

Climate Change Vulnerability Assessment

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

<u>Background</u>

For the Florida panhandle, climate models predict an average increase in temperature of 3.2°F by 2050 and 5.4°F by the end of the century. Minor changes are projected for annual precipitation averages, but seasonal changes could be more pronounced. Global climate change is also predicted to result in greater climate variability, with more extended droughts and increased storm intensity (Parry et al. 2007). While sea level rise is anticipated, determining its timing and extent is problematic. The Intergovernmental Panel on

Climate Change (IPCC) estimates a global sea level rise of 0.6 to 1.9 feet (0.18 to 0.59 m) by 2100 (IPCC, 2007). Models by Vemeer and Rahmstorf (2009) predict a sea level rise between 2.5 to 6 feet (0.75 to 1.9 m) by 2100.

Carbon, Greenhouse Gases and Biofuels

The storage of carbon in forest biomass, litter, and soils is a significant mitigation factor for climate change resulting from elevated emissions of greenhouse gases from fossil fuel combustion (IPCC 2007, National Research Council 2000, Wayburn et al. 2007). Since forest biomass and productivity are generally well known for most forest types in the south, it is not difficult to estimate the large carbon storage in pine biomass.

Regional land use activities interact with climate change in dynamic ways, and their influence upon the carbon cycle provides for feedbacks through the storage of carbon in forests, and the emissions of carbon via deforestation. In southeastern forests the storage of carbon in biomass and soils is a mitigation factor for the emissions of greenhouse gases (carbon dioxide) from combustion of fossil fuels. Understanding the carbon cycle and management influences upon it are critical, especially the context for carbon dioxide emissions with prescribed fire in healthy forests versus wildfires in fire-suppressed scenarios. In carbon accounting, also understanding the C costs and efficiencies of harvesting forest biomass for fuelwood can inform environmental policies, and influence the use of sustainable forest biomass for energy.

Ecosystem research has only recently begun to assimilate individual studies on fire-maintained longleaf pine into integrated C models that can evaluate net values for a range of different productivity classes (Starr et al. 2010). There is also a need to model a range of management scenarios, to include the utilization of prescribed fire versus its suppression and alternative wildfire scenarios, and alternative utilization of wood products as biofuels under different regulatory policies. Managers will need to understand how best to maximize the restoration and ecological value of biomass removal while minimizing the potential (both in the near and distant future) of negative and unintended ecological impacts.

Management Responses to Climate Change

There are two primary categories of management strategies for addressing climate change and sea level rise: (1) increasing the resiliency of ecological systems and (2) providing areas for migration of habitat and species (also known as a mitigation strategy) (Joyce 2008, Peterson 2008). The uncertainties surrounding actions related to climate change or sea level rise require an adaptive management approach to the evaluation and implementation of management responses (Kareiva 2008). Some of the areas of uncertainty include how climate change will affect:

- Hydrologic regime, water temperature, water chemistry, sediment, and rare aquatic species in the wetlands and water bodies on and adjacent to Tyndall AFB.
- Amount and proportion of beach habitat for nesting sea turtles, beach mice, piping plovers, snowy plovers, and other beach species.
- Foraging habitat for immature turtles through introduction of invasive species or die off of seagrass species
- Sex ratio of sea turtles may shift; the proportion of males and females in in-water assemblages may be altered
- Habitat and food sources for gopher tortoises, indigo snakes, and black bears.
- Growth rates and mortality of longleaf pine.
- Regeneration and restoration of longleaf pine.

- Wildfires and prescribed fires.
- Spread of invasive non-native plant and animal species.
- Threat of erosion.

Below is a list of possible general adaptation approaches for natural resource management at Tyndall AFB in response to climate change:

1. Reduce the impacts of current stressors to enhance ecosystem resilience to climate change in the near term. Current stressors include altered fire regimes (unnaturally high fuel loads, presence of off-site species), invasive species, and altered hydrology.
2. Maximize unfragmented patches of ecological systems, including within ecosystem topographic and hydrologic variability, functional ecological processes, and landscape patterns of ecological systems.
3. To ensure there are migration corridors for rare plants and wildlife, encourage the land management of natural vegetation in areas of potential inland migration by the use of prescribed fire and invasive species control. Dense vegetation and invasive species may interfere with the inland migration of marsh vegetation.
4. Monitor trends in ecological systems to assess changes in reference conditions, especially longleaf pine regeneration and ground cover responses. Use the dynamic reference condition approach to assess changes over time.

Identifying and adapting to the likely effects of climate change calls for a proactive rather than reactive approach to maintain cost effective programs and meet legal requirements to manage natural resources. Collaboration with other natural resources agencies will lead to a successful result for all stakeholders. These management strategies will help foster an ecosystem approach that considers and addresses the impacts of climate change.

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Constraints are considered to be anything that causes restrictions to Tyndall's military mission. In some instances, constraints may include the presence of T&E species, water resources, or sensitive habitats that may limit the types and degree of mission-related activities in an area. Rarely are mission activities completely restricted due to natural resource issues. Early consideration of these issues in planning (i.e. during EIAP) typically results in solutions where the mission can proceed unimpeded, either through slight modifications in location or timing or by obtaining permits through the appropriate regulatory channels that allow for the potential for negative impacts to the resource (i.e., Section 7 Consultation). Section 7 consultations previously completed by Tyndall (formal and informal) are summarized in Table 11.

The Tyndall AFB missions of training personnel and evaluating weapons require adequate air space but use of specific habitats or plant community types is not required. Wildland fires on and around Tyndall AFB are anticipated to increase with warming and drying conditions. Additionally, while Tyndall AFB has done significant work to remove downed timber from Hurricane Michael, dead and downed woody debris in some areas may pose a smoke management concern. Hurricane Michael destroyed much of the infrastructure shown to be inundated by SLR and SS projections in the future. While the discussion of potential future impacts to installation infrastructure because of climate change is not included in this plan, the rebuild plan for Tyndall AFB is expected to accommodate projected future conditions (refer to *Tyndall AFB Installation Facility Standards 2020*).

Habitat changes for the numerous federal or state listed species known to occur on the installation (e.g., Choctawhatchee beach mouse and Piping Plover) could impact the military mission if the changes lead to operation restrictions during breeding, or other sensitive time periods in the future.

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

- Increase 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, requirement for new equipment, or decrease launch capacity (DoD 2014);
- Increased dust generation effecting equipment and visibility (DoD 2014);
- Increased wind velocities damaging vital mission infrastructure (Sydeman et al. 2014);
- Increased drought potential (Glick et al. 2011);
- Potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

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).

Table 11 - Section 7 consultations affecting Tyndall AFB.

Consultation Title	Proponent	Location	Year	Affected Species
Combat Support Training Complex Tyndall AFB, Florida	Tyndall AFB	Farmdale Site	1989	American alligator, Eastern indigo snake, Piping Plover, and Red-cockaded woodpecker (RCW)
Family Housing Project	Tyndall AFB	Wood manor Housing	1993	Eastern indigo snake
Increase in F-15 Fighter Aircraft Assets	Tyndall AFB	Installation wide	1994	Sea turtles, Gulf sturgeon, Piping Plover, Bald Eagle, Least tern, and RCW
Armed Forces mission-related vehicle access and driving (USFWS, 1998)*	Tyndall AFB	GOM beaches except Shell Island	1998	Sea turtles and Piping plovers
The Employment of Chaff and Flares in the Carrabelle and Compass Lake Overland Work Areas	Tyndall AFB	Airspace north and east of Tyndall AFB	1998	Sea turtles and RCW

Consultation Title	Proponent	Location	Year	Affected Species
Reopening of East Pass (USFWS, 2001 and 2002)*	Bay County Board of Commissioners and Tyndall AFB	East Pass between GOM and St. Andrew Bay on Shell Island	2001, Amended in 2002	Choctawhatchee and St. Andrew beach mice, Piping Plover, and Sea turtles
Tyndall FY02 Pest Management plan	Tyndall AFB	Installation wide	2002	Choctawhatchee and St. Andrew beach mice
Military Point Transmission Line Project*	Gulf Power	Transmission line over St. Andrew Bay extending from Parker to Tyndall AFB	2004	Bald Eagle
Tyndall AFB Bald Eagle Monitoring Plan for New Nest within a Installation Restoration Program Site	Tyndall AFB	Drainage ditch 1 and 2 south of old Wastewater Treatment Plant site LF006	2004	Bald Eagle
Military Family Housing Privatization	Tyndall AFB	Military Family Housing units in Shoal Point, Bay View, and Wood Manor	2005	Eastern indigo snake and Bald Eagle
Sky X Utilities	Tyndall AFB (Research Laboratory)	Farmdale 2 Road	2006	Bald Eagle
325th FW INRMP	Tyndall AFB	Installation wide	2006	Choctawhatchee and St. Andrew beach mice, Piping Plover, Sea turtles, Gulf sturgeon, American alligator, West Indian manatee, Bald Eagle, and Godfrey's butterwort
Construction of a Multi- Story Dormitory at Tyndall AFB	Tyndall AFB	Georgia Avenue, Tyndall AFB	2006	Sea turtles
Fitness Center	Tyndall AFB	Mississippi Road, Tyndall AFB	2007	Sea turtles

Consultation Title	Proponent	Location	Year	Affected Species
325th FW Construction and Operation of AF Research Laboratory Facilities in the 9700 Area of Tyndall AFB	Tyndall AFB	9700 Area of Tyndall AFB	2008	Sea turtles
Rebuild Bonita Bay dock	Tyndall AFB (82nd Aerial Targets Squadron)	Pearl Bayou	2010	West Indian manatee, Gulf sturgeon
F-22 Operational Squadron and T-38A Detachment Beddown at Tyndall AFB, Florida	Tyndall AFB	Installation wide	2011	Bald Eagle, Alligator snapping turtle (P), American alligator, Eastern indigo snake, and Piping Plover
East Boundary Fire Break	Natural Resources	East boundary line, south of Highway 98	2011	St. Andrew beach mouse
Silver Flag EA	823rd RED HORSE	Eastern part of Tyndall AFB along southern coast of East Bay	2013	Godfrey's butterwort
SR 30 (US 98) at Tyndall AFB, Highway Flyovers with Gate Reconfiguration	Florida Department of Transportation	Highway 98	2013	Sea turtles
NCO Beach Access Road Maintenance Project (USFWS, 2014)	Natural Resources	NCO beach access road	2014	Choctawhatchee and St. Andrew beach mice, Piping Plover, and Sea turtles
Water Survival Training	325th Operations Group	St. Andrews Bay	2016	Choctawhatchee and St. Andrew beach mice, Piping Plover
Munitions Storage Complex and Facilities	Tyndall AFB	F-22 Munitions Storage Complex	2016	Godfrey's butterwort
Tyndall Air Force Base Track-Field Lighting	Tyndall AFB	Outdoor running track	2019	Sea turtles, beach mice
MQ-9 Beddown	Tyndall AFB	West of Drone Runway	2020	Godfrey's butterwort

Consultation Title	Proponent	Location	Year	Affected Species
Construction of a Commercial Gate – Tyndall AFB	Tyndall AFB	Proposed Commercial Gate for rebuild	2020	Telephus spurge

AF = Air Force; AFB = Air Force Base; EA = Environmental Assessment; ESA = Endangered Species Act; FW = Fighter Wing; GOM = Gulf of Mexico; NCO = Noncommissioned Officer; P = Petitioned species; RED HORSE = Rapid Engineer Deployable Heavy Operational Repair Squadron; USFWS = U.S. Fish and Wildlife Service *Indicates Formal consultation

2.4.2 Land Use

Although open space is the predominant land use on the installation, environmental constraints limit the use of certain areas for development, and in some cases for ground training. Portions of Tyndall may be constrained by natural resources concerns including T&E species and habitat, wetlands and floodplains, and beach areas. Missions may also be affected on days with high fire danger when missions with potential to start wildfires may be restricted or in situations where missions are shut down or delayed due to smoke and/or fire suppression activities.

Seasonal natural resource considerations exist for some species including sea turtles and shorebirds, including piping plovers and red knots. For many species requiring seasonal considerations, shifting the timing of a mission outside of the nesting or foraging season results in few to no requirements. In other situations, the consideration may be the location; oftentimes, a simple shifting of 100 feet (30.5 m) or a modification in the extent of the activity will resolve location conflicts. Coordination with mission planners allows Tyndall Natural Resources to initiate Section 7 consultations in a timely manner to avoid mission delays. Early planning is key to making these resources "considerations" as opposed to "constraints."

The environmental requirements developed through the EIAP or brought forward by other regulatory drivers are mandatory. Personnel and unit commanders may be held personally liable for violations of environmental statutes and regulations. Failure to follow these requirements may constitute a violation of federal and state environmental laws. Adherence to these requirements helps maintain quality environments for future missions and ensures that Tyndall is in compliance with all applicable state and Federal regulations. Natural resource requirements from Section 7 consultations, EISs, EAs, and other applicable regulatory permits are communicated to pertinent personnel, and that these requirements are being implemented. One aspect of this process will be the briefing of incoming commanders by the Natural Resources office. Examples of natural resources requirements include:

- Avoid activities that may damage dunes or shoreline vegetation.
- Beachfront activities occurring between 01 May and 31 October must follow numerous requirements to avoid impacts to sea turtles. Sea turtles are sensitive to noise, light, and ground disturbing activities.
- Beach driving must be coordinated through Tyndall Natural Resources.
- Maintain 660 ft. construction buffer around bald eagle nests.
- Avoid vehicles and heavy equipment use within 25 ft. (7.6 m) radius of gopher tortoise burrow entrances.
- Require all contractors bringing vehicles onto the base to undergo an inspection and decontamination in order to reduce the spread of invasive species.

FWC has designated the entire emergent lands known as CIE, CIW, and Shell Island as Critical Wildlife Areas. Areas within the Critical Wildlife Area may be posted and closed to access from April 1 to

September 15 for the protection of nesting birds or year round protection of migratory and resident wintering birds.

2.4.3 Current Major Impacts

This section describes those current mission activities that affect or may potentially affect natural resources. The primary concerns for natural resources within the installation are associated with direct impacts to species and their habitats. Mission requirements mandate clear zones and airspace glide slopes (Figure 14) around active airfields, thus resulting in the extension of non-forested areas and the harvest of areas every 25 years where trees are projected to penetrate certain air slope requirements (refer to *Forest Management Component Plan for detail*). Runway clear zones are 3,000 square feet (278.7 square meters) areas at the end of a runway. Runway Clear Zones should be actively mowed so no trees can grow. Several areas on Tyndall AFB are designated as explosive ordnance clear zones. These zones range in radius from 400 to 4,000 feet (122 to 1219 m). These designated areas are restricted, allowing no hunting or public/recreational access. Airfield approaches are managed as to reduce the attractiveness of habitat to birds to reduce collisions with aircraft. Osprey nests are removed from towers, navigational and utility structures, and around the airfield.

Recreational areas for hunting and fishing (Big Ammo Lake and Little Ammo Lake) near the Ammunition Storage facilities were closed in 2012 for safety concerns.

There is also the potential for impacts from air and water pollution point sources, noise, hazardous waste, and Environmental Restoration Program (ERP) sites, but Tyndall Compliance organizations maintain permits and monitor these, and there are currently no major concerns for natural resource impacts. Some freshwater fishing ponds are now restricted because of lead contamination (ERP site) or graywater reuse (Davis Pond at old Golf Course). Tyndall AFB manages potential environmental contamination sites through the ERP. Tyndall addresses potential industrial point source water pollution problems through a Multi-Sector General Permit, which is described in the base's Stormwater Pollution Prevention Plan. A stormwater management program for potential non-industrial discharges is addressed through Best Management Practices (BMPs) implemented under the base's Municipal Separate Storm Sewer System (MS4) permit.

Following Hurricane Michael, the Air Force developed a master plan to assist the 325 FW in recovering the installation. This plan included demolition, construction and renovation of numerous facilities throughout the installation that were severely damaged. Under the Proposed Action, 28 individual projects spanning six planning areas throughout the installation would be constructed. It is estimated that approximately 134.9 acres (54.6 ha) of wetlands and 120,300 LF (i.e., drainage features) and 15.8 acres (6.4 ha) (stormwater pond/open water/drainage features) of other surface waters are located within the proposed project areas.

Site preparation and construction activities would directly disturb approximately 1,164 acres (471 ha) of native and non-native soils, over half of which (approximately 629 acres (255 ha)) would result from the Flightline drainage improvement and utility upgrade projects. Erosion from the construction sites could result in additional indirect effects; consequently, any soil disturbance that would expose the soils to wind, rain, and stormwater runoff must be stabilized by some means. Tyndall AFB would be obtain a required permit from state and federal agencies to mitigate any impacts associated with reconstruction of the base.

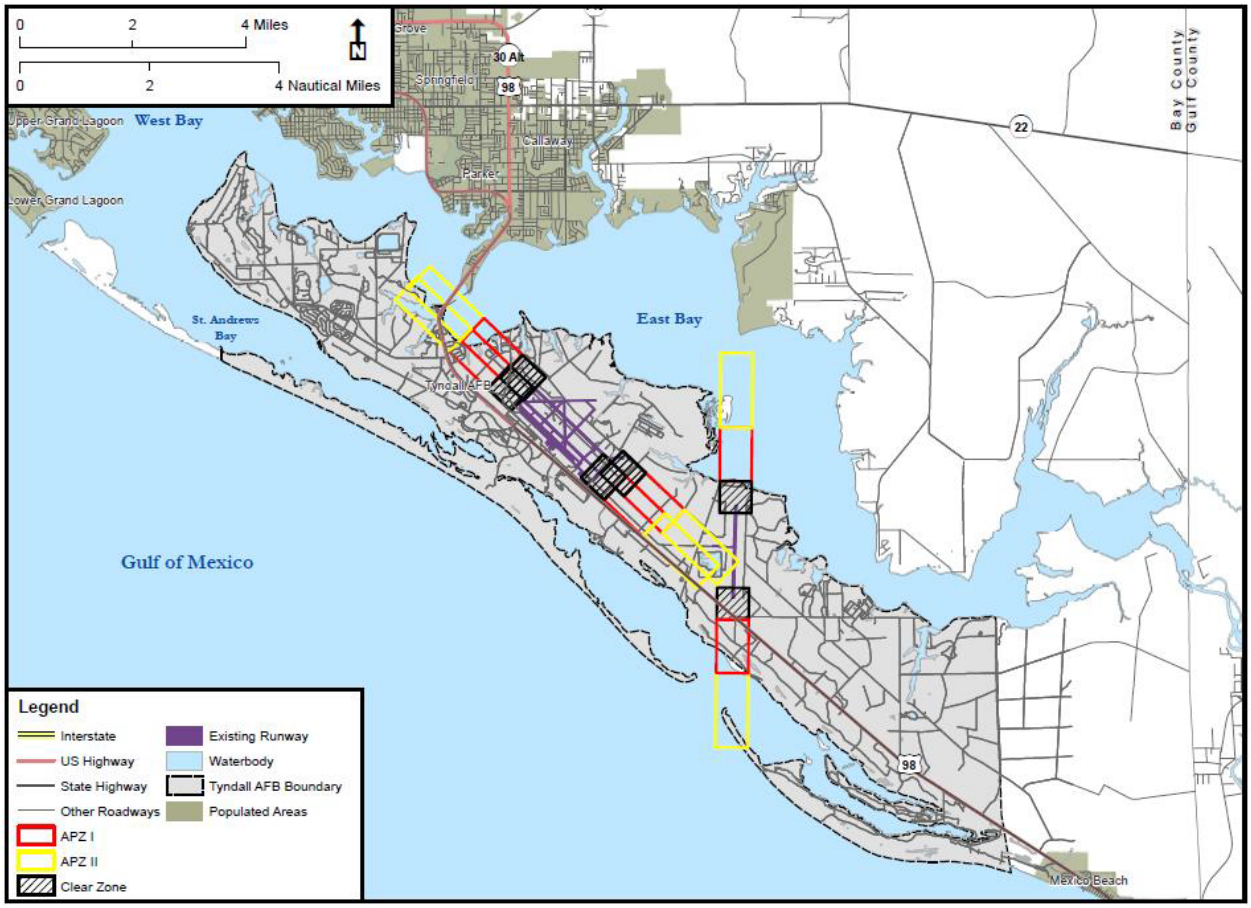

Figure 14 - Clear zones at Tyndall AFB.

2.4.4 Potential Future Impacts

Land clearing, construction, and ground training activities are the main activities with the potential to affect natural resources on Tyndall AFB, primarily through stormwater issues and reduction in natural areas. Current and proposed construction projects may impact sensitive habitats for federally listed species, either directly through habitat destruction, or indirectly through changes in management, such as decreased ability to conduct prescribed burns near new buildings. Proposed construction may also impact species indirectly by prohibiting growth of the species or connection of suitable habitat to merge populations, as well as increasing predators and nuisance wildlife drawn to food (i.e., trash) in developed areas. Equipment decontamination procedures for construction will be needed to slow the spread of invasive plants.

Tyndall Installation Development Plan

The Tyndall Installation Development Plan (IDP) was completed in April 2015. The IDP was designed to meet AF Comprehensive Planning instruction requirements (AFI 32-7062), which were substantially revised in 2013. This IDP was established to guide development decisions at Tyndall AFB for the next 20 to 30 years, and to assist Tyndall AFB to meet the U.S. Air Force (USAF) goals for mission capability, sustainability, readiness, and modernization. Shortly after Hurricane Michael, a Task Force was assembled to assist the 325 FW with assessing damage to installation facilities and infrastructure, determining usability of these assets, and preserving future mission capability. The task Force developed

the Recovery Plan. The plan was intended to provide a way forward to repair, reshape, and rebuild Tyndall AFB to resume near-term mission operations and to maximize mid- and long-term mission capabilities. Due to the extensive damage caused by the hurricane, Tyndall AFB has an opportunity to implement several long-range planning objectives from the Tyndall AFB Installation Development Plan, as well as strategies from the 21st Century Installation concepts.

The reconstruction of Tyndall AFB provides the opportunity to achieve key objectives listed below to support Tyndall's vision as a 21st Century Installation.

1. Size and locate facilities to improve organizational efficiencies and improve the resiliency, sustainability, and adaptability of Tyndall AFB.
2. Meet current and proposed mission requirements well into the 21st Century.
3. Use the opportunity to improve mission efficiencies by realigning mission sets that would also influence short- and long-term redevelopment.
4. Provide capacity for future growth.

Ground Training Operations

Increased ground training operations may limit access for natural resource management; this may result in a decreased ability to conduct prescribed fires, forest restoration activities, and monitoring of protected species. Habitat alteration is the primary natural resources concern associated with increased ground training as heavy ground training may cause erosion problems in areas where vegetation is trampled. In addition, increased human presence and noise may harass protected species (i.e., nesting sea turtles). Tyndall Natural Resources will need to address conflicts between military missions and protected species management through Section 7consultations.

2.4.5 Natural Resources Needed to Support the Military Mission

The primary objective of Air Force natural resources program is to sustain, restore, and create a more resilient natural infrastructure using nature-based engineering solutions, in order to ensure operational capability and no net loss in the capability of AF lands to support the military mission of the installation (AFM 32-7003, 20 April 2020). This INRMP assists installation commanders with natural resources conservation and rehabilitation, consistent with installation use that ensures Armed Forces readiness.

This INRMP provides strategic direction for natural resources management at Tyndall Air Force Base (AFB), Florida. It provides natural resources management goals and objectives to ensure continued access to the land and airspace required to accomplish the Air Force mission while maintaining the natural resources in a healthy condition.

Standards outlined by the INRMP foster successful and timely integration of conservation and military activities. Avoidance and minimization measures protect resources and may reduce future operational costs. INRMP implementation helps ensure that military ground operators have quality environments to utilize for training; and promotes future mission capacity through good stewardship of natural resources and ecosystem management. Tyndall's conservation activities and outdoor recreation program promote positive relationships with the public, agencies, and organizations.

Natural resources are valuable assets of the United States Air Force. 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 Air Force adaptability

in all environments. Some of these environments include open fields, forested land, and coastal shorelines. The Air Force has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in a sustainable manner.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The AF environmental program adheres to the Environmental Management System (EMS) framework and it's Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

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

4.0 GENERAL ROLES AND RESPONSIBILITIES

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

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Commander	The Tyndall AFB Wing Commander, 325th Fighter Wing (FW), is responsible for the following aspects of the Tyndall AFB INRMP: o Approve the INRMP o Certify the annual review of the INRMP as valid and current; or delegate the certification of the annual INRMP review to the appropriate designee. o Control access to and use of installation natural resources.
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	Provide guidance to the Installation Natural Resources Manager about specific programs outlined in the INRMP.
Installation Natural Resources Manager/POC	Implement INRMP programs and attain goals of the INRMP.
Installation Security Forces	Provide security for the installation.
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	Provide guidance and adherence to environmental laws and regulations. See AFI 32-7001 for role description.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Wildland Fire Program Manager	The AFCEC Wildland Fire Branch (established in July 2012) is responsible for updating the Wildland Fire Management Component Plan, developing prescribed fire burn plans for each compartment and implementing prescribed fire
Pest Manager	Implement the Pest Management Plan.
Range Operating Agency	N/A
Conservation Law Enforcement Officer (CLEO)	Enforce installation laws with emphasis on outdoor recreation.
NEPA/Environmental Impact Analysis Process (EIAP) Manager	The Environmental Impact Analysis Process (EIAP) Program Manager will: o Act in accordance with (IAW) 32 Code of Federal Regulations (CFR) Part 989, Environmental Impact Analysis Process. This is generally accomplished through processing of AF Form 813s, Request for Environmental Impact Analysis. o Attend the Facilities Review Board to ensure an AF Form 813 has been or will be submitted for proposed projects that have the potential to impact the environment. o Collaborate with the Environmental Element Chief to ensure any activity that has the potential to negatively impact natural resources is reviewed and that potential impacts to federally listed species are assessed per Section 7 of the ESA. o Manage National Environmental Policy Act (NEPA) documentation.
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	NOAA: o Southeast Fisheries Science Center in Panama City Beach conducts shark surveys, monitoring, and population assessments in nursery grounds one to two timers per month, since 2005. o Tracking Gulf Sturgeon during winter months in marine waters since 2007. NMFS: o The NMFS is the regulatory agency that enforces the MMPA and the ESA for marine species. NMFS works with action proponents to prevent or minimize potential take or harassment of marine species protected under these laws. Multiple over-water missions originating at Tyndall are addressed in the *Eglin Gulf Test and Training Range EA* and the associated Biological Opinion and MMPA take permit.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
US Forest Service	The USDA Forest Service provided support for wildland fire and prescribed burning through Nationwide Memorandum of Understanding (MOU) with DoD, 2000-2012.
US Fish and Wildlife Service	The USFWS Ecological Services Office in Panama City, Florida has worked cooperatively with Tyndall Natural Resources for several years. The Service's primary role on Tyndall has been to support Natural Resources programs with the conservation and management of federally listed T&E species that occur on the installation, wetland restoration, and the forestry program in a manner that sustains and supports Tyndall's military mission. The USFWS currently provides three full-time employees (GS12-Liason, GS-9 Biologist, and a WG-5 Tractor Operator) to Tyndall through an interagency agreement. Tyndall coordinates annually with the USFWS regarding INRMP updates and adjustments made to goals and objectives.
US Armp Corps of Enigneers (USACE)	The U.S. USACE provides the following services to Tyndall AFB: o Cooperative agreements (projects) o Dredge and fill permitting o Regulatory, wetlands delineation

5.0 TRAINING

AF 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

Natural resources management training is provided to ensure that base 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 NR management-related training requirements and programs:

1. FWC Florida Black Bear Hazing training.
2. ATV certification through the National ATV Safety Institute
3. Sea Turtle Permit Holder Meeting (annual) and volunteer training
4. Wildland Fire Fighter Training

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System (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

Not Applicable

6.2 Reporting

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

Installation Supplement –Reporting

Not Applicable

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

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

Installation Supplement –Natural Resources Program Management

Natural resources management is an inherently integrated process. While this chapter discusses programs separately, it must be noted that each of the strategic priorities of Tyndall Natural Resources involves multiple program elements. All INRMP projects support achievement of the five overarching principal natural resources management goals, which are:

• Restore and manage forests for mission use, habitat improvement, and protection of T&E species.
• Enable long-term sustainability of beach environments for military use by protecting T&E species and their habitats.
• Restore and protect wetland habitats to comply with federal law and protect T&E species.
• Provide a variety of uses, values, products, and services to present and future generations while maintaining sustainable ecosystems.

To ensure Tyndall AFB's military missions and environmental conservation missions are compatible and mutually supportive, multiple installation organizations play a role in managing, protecting, and supporting Tyndall's natural resources. A description of the organizations necessary to implement

Tyndall's INRMP, as well as descriptions of the entities involved in stewardship of Tyndall's natural resources, is provided in the following subsections.

7.1 Fish and Wildlife Management

Applicability Statement

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

Program Overview/Current Management Practices

Critical Wildlife Area

Critical Wildlife Areas are specific sites designated by the FWC to protect places where wildlife congregates to nest, roost, and feed (Florida Administrative Code [FAC] 68A-19.005, 68A- 14.001 and 68A-14.0011). These areas are designated through an establishment order where these important wildlife areas can be impacted by human-related activities. Tyndall's Critical Wildlife Areas include the entire emergent lands known as CIE, CIW, and Shell Island. Areas within the Critical Wildlife Area boundary may be posted and closed to dogs, vehicles, and people from April 1 to September 15 for the protection of nesting shorebirds or year-round for the protection of migratory and resident wintering shorebirds. Areas not posted are open to public access. The boundary was revised in 2014 using GPS coordinates to more accurately define the shorebird habitat on the barrier islands. The re-designation document was signed by FWC in March 2015.

Wildlife Management Area

Tyndall's East Unit is designated as a Florida Wildlife Management Area (WMA). This designation enables Tyndall AFB-specific rules and regulations to be codified into FAC 68A-15.063(18). Under this program, Tyndall Natural Resources serves as the lead management agency and collects fees from the sale of hunting and fishing permitsto manage fish and wildlife resources under state jurisdiction. In exchange, Tyndall AFB permits public hunting and fishing opportunities and FWC provides fish and wildlife law enforcement support. These actions enable FWC Wildlife Officers to enforce Tyndall AFB-specific rules, such as no hunting in closed areas and unique management unit regulations.

Fish and Wildlife Management and Climate

Fish and wildlife management on Tyndall AFB will not change dramatically because of climate change. Many current fish and wildlife management issues are likely to become exacerbated by climate change but management programs are already in place. Future issues could include habitat erosion (inland and barrier island shorelines), spread of invasive flora/fauna, and potential for increased wildfire hazard risk. Fish and wildlife surveys should be conducted routinely to monitor changes in wildlife communities. Projected temperature and precipitation increases are not likely to affect current invasive and nuisance species populations. Invasive species management strategies should be flexible enough to evolve and accommodate an array of issues (Hellmann et al. 2008). Nuisance wildlife incidents, such as encounters with bears, could become more frequent if traditional food sources become scarce. If this occurs, steps will need to be taken to deter wildlife so they do not become habituated to human food and garbage.

Barrier islands are important coastal habitat for wildlife at Tyndall AFB and are at particularly high risk from sea level rise and increasing storm surges associated with climate change. It could become important to initiate mechanisms to nourish sandy shorelines and restabilize them (Kutiel, 2001). Methods should focus on using native vegetation that will also benefit native wildlife species. Planting native vegetation is important for habitat and food sources for the Choctawhatchee beach mouse and St. Andrew beach mouse. Foot traffic or vehicular travel over vegetation on sandy shorelines should be restricted to protect vegetation and sand dune stability (Nordstrom & Arens, 1998).

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

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

Program Overview/Current Management Practices

Tyndall Natural Resources strives to promote and develop sustainable recreational opportunities, which include hunting, fishing, and non-consumptive uses, in a manner compatible with the military mission and subject to safety and security requirements (Tyndall AFB, 2020a). The FWC established approximately 12,000 acres (4,856 ha) of Tyndall AFB property as a WMA. A WMA is a public hunting and recreation area operated by the landowner in cooperation with the FWC. With some restrictions for force protection, public safety, operations, and ecological protection, the public can enjoy many recreation activities on the installation. Tyndall has entered into Cooperative Agreements with the USFWS and FWC, under which these agencies provide technical data and management assistance in developing the installation's recreation plan. The following section provides a general overview of the Tyndall fish and wildlife program; detailed information is provided in the Tyndall AFB *Outdoor Recreation Component Plan* and *Hunting, Fishing, and General Recreation Regulations* (Figure 15). Objectives for future outdoor recreation management are in the Management Goals and Objectives section, and additional detail on management activities is provided in the *Outdoor Recreation Component Plan*.

Outdoor recreation and public access to natural areas at Tyndall AFB could be greatly impacted by climate change. With threats from sea level rise there is a strong possibility that sandy shoreline habitats will be severely reduced unless serious efforts to conserve this habitat are enacted. Intensive beach use activities may need to be limited in order to improve efficiency of beach nourishment and stabilization projects. Without placing restrictions on intensive beach use, foot traffic, and human activity could compound negative effects of climate change on shorelines leading to complete erosion of sandy shores and complete elimination of the possibility of recreational use there. Fishing opportunities are likely to continue unimpeded, however game species surveys should be conducted and assessed frequently to provide status of hunting opportunities. There is a strong possibility that game numbers will decrease as sea levels rise and reduce their available habitat on post. Other activities such as skeet shooting, camping, paintballing, boating, hiking and nature viewing should continue as normal as long as associated infrastructure and facilities are not flooded due to sea level rise.

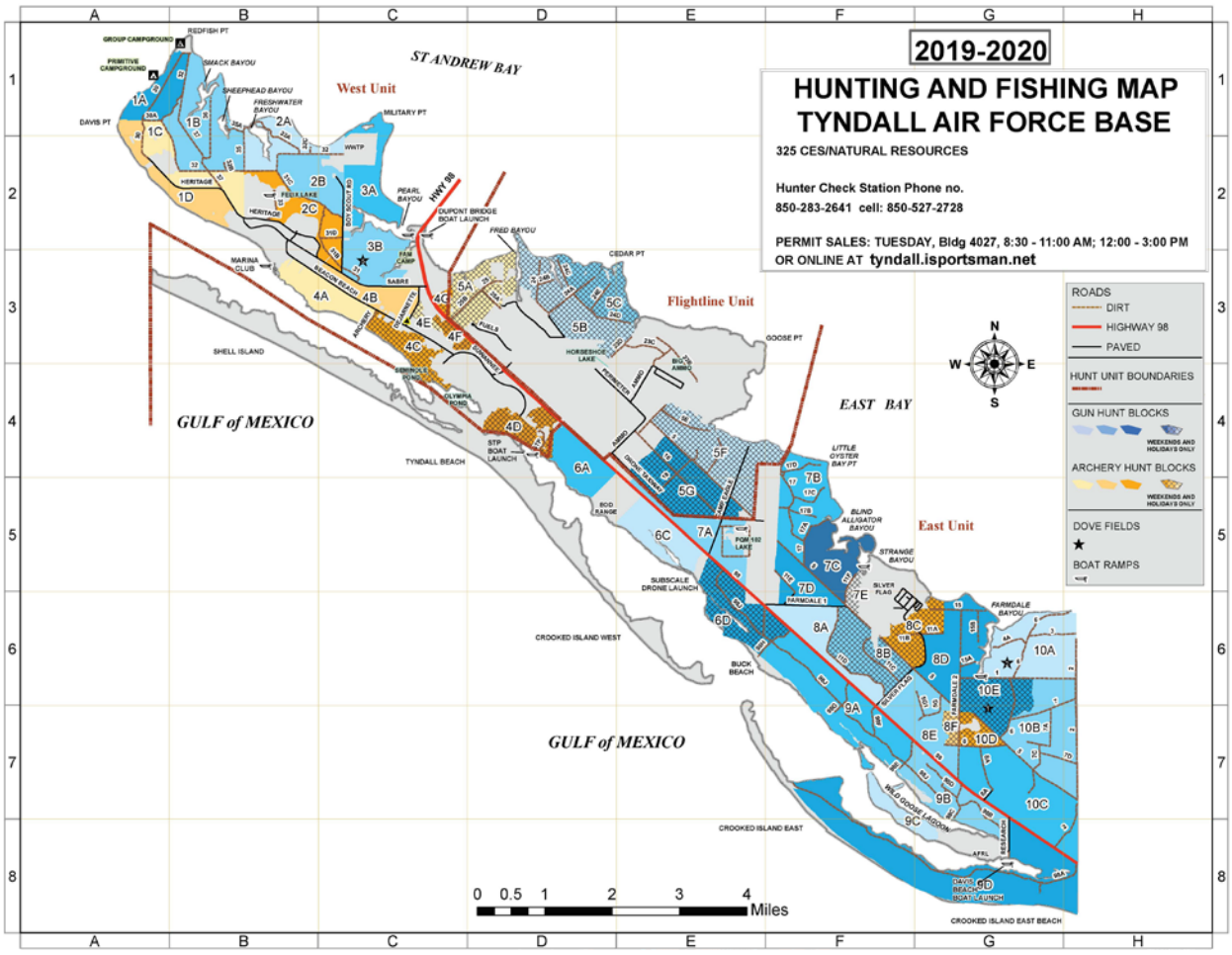

Figure 15 - Tyndall AFB 2019-2020 hunting and fishing map.

Outdoor recreation is managed by 325th FSS and 325th CES Natural Resources offices (Table 12). The 325th FSS provides rental and for fee recreational services such as recreation equipment rental, boat rental, and archery; these activities must either be self-sustaining or receive marginal cross funding from profits generated by the Base Exchange. Natural Resources hosts activities that qualify for Sikes Act and other public funding, such as hunting, camp sites, hiking trails, beach oversight, and other property management related to recreation. These two offices currently operate with separate information access systems and under separate commanders. An online permit system was implemented in FY2015. *iSportsman* is now used at Tyndall AFB to manage permit sales, in addition to in-person sales at the Hunter Check-Station.

Table 12 - Recreational activities at Tyndall AFB and responsible entities.

Activity	Responsible Organization	
	325 CES/CEIEA (Natural Resources)	**325 FSS (Force Support**
Hunting	X	
Freshwater fishing	X	
Archery range		X
RV park (Fam Camp)		X
Tent Camping	X	X
Boat rental		X
Hiking trails	X	
Non-consumptive use (hiking, biking, bird watching, etc.) of beaches, woodlands	X	

325 CES/CEIEA = 325th Civil Engineer Squadron, Environmental Element, Natural Resources; AFB = Air Force Base; FSS = Force Support Squadron

*325 FSS maintains a website (http://325fss.com/) that lists recreational activities and contact information.

Recreation on Tyndall follows all Federal and State regulations, with additional Tyndall-specific restrictions on off-road vehicle use, after-dark access, weapon choice, and weekday access as detailed in the *Tyndall AFB Hunting, Fishing, and General Recreation Regulations*, including the following (Tyndall AFB, 2020b):

- Off-road vehicles, motorcycles, and bicycles are restricted to established named roads. Unauthorized "trail busting" is aggressively discouraged. Violators risk losing installation-driving privileges.
- To prevent accidental interaction between hunters and ground forces performing exercises, public access is prohibited during the hours of full darkness (1.5 hours after sunset/before sunrise). Weapon choice is limited to shotguns, black powder rifles, bows, and cross-bows. Pistols and rifles are excluded to prevent over-travel across roads or inhabited areas.
- Weekday access restrictions to ensure a safety buffer around military working areas during high activity periods.

Closed areas are fenced or posted; however, with over 120 miles (193 km) of shoreline, Tyndall does not have all shoreline areas posted. FWC officers enforce only state and federal law; the Tyndall Conservation Law Enforcement officer additionally enforces Tyndall-specific regulations. Tyndall Security Forces focus on traditional law enforcement activities and do not typically check for compliance with natural resources regulations. Community Police have all- terrain vehicles (ATVs), boats, and jet skis and may assist when it is necessary to get to areas with limited access.

Tyndall AFB's hunting and fishing regulations and map are reviewed and updated annually by Natural Resources, including any modifications requested by mission groups (i.e., Silver Flag, Security Forces), and then they are submitted to the Base Commander, Civil Engineer Commander, and the Legal office for approval. This map/regulations product is provided to persons purchasing permits. It contains federal, state, and installation fish, wildlife, and natural resources laws, defines hunting areas, and establishes legal hunting days and methods. User fees are collected to offset costs incurred for the protection, conservation, and management of fish and wildlife programs, including habitat improvement. Tyndall Natural Resources

generates approximately $18,000 annually from permits sales, the majority of which goes to pay for game check station operators.

Public Access Classifications

AFI 32-7064 requires classification of AF managed lands into categories that describe the degree of public access for all areas that are identified as suitable for outdoor recreation. Tyndall classifies its property into open, restricted, and prohibited areas for public access purposes:

- *Open Areas:* DoD and non-DoD personnel are permitted to enjoy many recreation activities on the installation including beach activities, boating, canoeing, fishing, hunting, and trail walking. Note: DoD personnel are defined as Active Duty Military, Reserve, National Guard, DoD Civilians, Retired Military, Retired DoD Civilians, their dependents, and DoD Contractors with a current DoD identification card with base wide access. Individuals who are members of the public and are not affiliated with the DoD are herein referred to as non-DoD
- *Restricted Areas*: DoD personnel are afforded additional recreational opportunities on Tyndall AFB under the authority of AFI 34-262.
- *Prohibited Areas*: Certain areas of Tyndall AFB are prohibited for recreational activities for force protection, public safety, operations, or ecological protection.

Access to Tyndall AFB for recreational purposes is in part determined by the force protection level of the base. Because portions of Tyndall are designated WMAs, when restrictions of recreational use of the base (due to higher force protection levels) will remain in effect for a significant period of time, Natural Resources will contact FWC to explain the situation. The West Hunt Unit is not incorporated into the WMA system because background checks are required and immediate access is not available to the public.

Hunting Program

The greatest public demand for Tyndall's land is deer hunting. The installation includes the following hunting seasons: archery, small game, muzzle-loading, general gun, spring turkey (draw hunt), and migratory bird season (as defined in the State of Florida Hunting Regulations). Specific regulations are provided in the *Tyndall AFB Hunting, Fishing, and General Recreation Regulations*. Additional information regarding hunting on Tyndall AFB is provided in the 2020 *Tyndall AFB Outdoor Recreation Component Plan.* All hunters must also follow general state laws and regulations relating to wildlife unless specifically noted otherwise. Hunting programs at Tyndall AFB are managed to ensure wildlife resources are conserved and protected:

- Three dove fields are planted (contingent upon funding), and maintained as needed by mowing, burning, and disking. These fields tend to pull doves away from the airfields, thus reducing the BASH potential.
- Disabled persons' hunting and fishing is available along with viewing points
    - Disabled persons' fishing access is available on the dock and in designated areas.
- Food plots may be planted (contingent upon funding) to lure deer from areas near U.S. Highway 98 in an effort to reduce the threat of deer/car strikes.
- Food plots may be (contingent upon funding) used to concentrate turkey for controlled hunts.
- Ensure carcasses from hunting program are removed from the base or immediately buried to prevent attracting scavenger animals.

Open and closed areas are coordinated through a check station. A hunting check station is manned as appropriated funds are available. Hunting permits may be obtained at the check station (when manned). Hunters must check in prior to going out, and are required to have a tag for the specific block they are hunting that day. The check station is typically only open on Fridays, Saturdays, Sundays, and holidays, but may be open additional days during the opening of some seasons (i.e., archery) or around Christmas. Currently, a quota of one hunter per 45 acres (18.2 ha) is set to ensure a quality hunt. However, this quota can be adjusted to meet certain management objectives.

White-tailed Deer

Tyndall AFB has an excellent deer herd in terms of numbers, body weights, and antler development. This is largely a result of the Mature Buck definitions for Tyndall AFB as introduced in the 1995 Hunting and Fishing Regulations. The definition described a mature buck as an antlered deer with at least three antler points on one side, with each point at least one inch in length (East and West Units). During the 2019/2020 hunting season 55 hunters were surveyed to see if they would agree to go to a four point rule. Fifty out 55 hunters agreed with the rule change and this rule was made official on 27 January 2020. Deer herd management is divided into three zones: the West Hunt Unit, East Hunt Unit, and the Flight Line Hunt Unit.

West Hunt Unit

The West Hunt Unit comprises the areas around main base and housing. It has the highest deer density and the highest hunter pressure.

East Hunt Unit

The East Hunt Unit encompasses the areas to the east surrounding the drone runway and Silver Flag. Body weights, condition indices, and antler development are slightly lower in the East Hunt Unit than in the West Hunt Unit. This area also has fewer hardwoods in comparison to the West Hunt Unit; habitat in this unit is expected to improve as prescribed burning increases. Deer density in this unit is moderate relative to other areas on Tyndall.

Flight Line Hunt Unit

The Flight Line Hunt Unit is located behind the flight line in the vicinity of the alert area. Unlike the white-tailed deer management philosophy in the East and West Hunt Units, the management goal in the Flight Line Unit is to harvest enough deer to keep the population low. By controlling the population size, the possibility of a deer strike on the airfield will be reduced.

Wild Turkey

Turkey restoration began in 1993 when 23 turkeys were released on the West Hunt Unit. An additional seven turkeys were introduced in 1997 to the East Hunt Unit. A sighting index is used to monitor populations on both hunt units. Spring gobbler hunting began on the West Hunt Unit in 1998. Tyndall AFB has fair turkey habitat on the West and East Hunt Units. Expansion of the controlled burning program is expected to improve marginal turkey habitat. Turkey hunting at Tyndall AFB currently occurs during select weekends in March and April. Hunters for these two-day hunts are selected at random.

Wood Duck

Wood Duck management on Tyndall AFB has historically been sporadic. Several small man-made water holes were dug on the West Hunt Unit to serve as temporary feeding and roosting areas. During dry periods of the year, these ponds evaporate and the resident Wood Ducks congregate in Lake Yvonne and the freshwater swamp adjacent to Warbler's Way. In the past, several dozen Wood Duck nesting boxes have been erected in or along the shores of most of Tyndall's suitable nesting habitat.

Mourning Dove

There is low demand for managed dove hunting on Tyndall AFB, possibly due to the fact that there is very little agriculture and other quality dove habitat in Bay County. Due to Tyndall's proximity to Panama City, many hunters would rather drive to the base than the northernmost counties in the Panhandle. Three dove fields may be planted by Natural Resources Staff, contingent upon funding, which may attract new hunters.

Other Game Species

Tyndall has hunting seasons open for other small game species (i.e., gray squirrel), but habitat is not actively managed for these species. General land management such as prescribed fire typically is beneficial to these species.

Recreational Fisheries Program

Tyndall offers freshwater and saltwater fishing options. Tyndall AFB fishing permits may be obtained at the hunter check station. All State of Florida rules apply to fishing on the installation (includes required state recreational fishing license). Freshwater fishing areas include Felix Lake, Horseshoe Lake, PQM-102, and Olympia and Seminole Ponds (Figure 15 above). Tynd*all AFB Hunting, Fishing, and General Recreation Regulations* provides detail for access restrictions.

Saltwater fishing is allowed for DoD personnel at designated boat ramps and along shorelines unless otherwise posted. A Tyndall AFB permit is required for non-DoD personnel to saltwater fish from shore.

The fish species in Tyndall ponds/lakes include largemouth bass (*Micropterus salmoides*), bluegill bream (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), crappie (Pomoxis sp.), channel catfish (*Ictalurus punctatus*), threadfin shad (*Dorosoma petenense*), and grass carp (*Ctenopharyngodon idella*). Good water quality and adequate habitat are necessary for largemouth bass reproduction, and with proper management, the population is generally self-sustaining with little to no restocking. Bluegill are managed in the fisheries program because they provide a source of food for largemouth bass, are prolific spawners, usually do not require restocking, and populations can withstand intense fishing pressure. Small ponds on Tyndall AFB are managed for channel catfish, these fish are utilized by visiting anglers, special event and outreach groups as a put-grow-and-take-fishery and are restocked as needed and as funding allows. Additional information on the specific management requirements and access categories for the managed ponds and lakes will be available in the Tynd*all AFB Outdoor Recreation Component Plan*.

General Outdoor Recreation Program

In addition to hunting and fishing, many other recreational opportunities are provided on Tyndall AFB, including access to boating, swimming, diving, waterskiing, canoeing, camping, picnicking, trail walking, and boardwalks. A general recreation permit is required for such activities, and may be obtained at the

hunting check station or through the online permit system. Applicable regulations are provided in the *Tyndall AFB Hunting, Fishing, and General Recreation Regulations*.

Off-Road Vehicle and Mountain Bike Use

Tyndall AFB has 120 miles (193 km) of existing roads and trails designated for off-road vehicle and mountain bike use. The use of off-road vehicles and mountain bikes on the beach or undesignated areas and trails is prohibited. Oversight of all maintenance and rehabilitation of off-road vehicle roads and trails is performed by Tyndall Natural Resources.

7.3 Conservation Law Enforcement

Applicability Statement

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

Program Overview/Current Management Practices

The Natural Resources Conservation Law Enforcement Officer and FWC Officers enforce the laws pertaining to natural resources at Tyndall AFB. Hunting and fishing regulations and a corresponding map are published annually and are provided to persons purchasing permits. Hunting and fishing regulations contain federal, state and installation fish, wildlife, and natural resources laws. Additionally, the hunting and fishing regulations define hunting areas and establishes legal hunting days and methods. Tyndall AFB game regulations are state law and enforceable by the base Conservation Officer and FWC through FAC 68A-15.004 and 68A-15.063 (20) and US Code 16 USC 670 (UCMJ). Additionally, installation personnel are encouraged to report violations to the commander, who can take action to bar or otherwise discipline violators outside of formal law enforcement channels.

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

Applicability Statement

This section applies to AF installations that have threatened and endangered species on AF property. This section is applicable to this installation.

Program Overview/Current Management Practices

A number of state and federally listed species occur on Tyndall AFB. Tyndall Natural Resources in cooperation with the USFWS strives to protect, recover, and manage these species in a manner that provides maximum mission flexibility while still ensuring regulatory compliance. The installation's protected species are generally found either on the barrier islands or within wetlands where interactions with the military mission are minimal. With proper management, Tyndall AFB can practice good stewardship without compromising its military mission. Objectives for future management of T&E species and habitats are in the Management Goals and Objectives section, and additional detail on management activities are provided in the *Threatened and Endangered Species Component Plan*.

Management and Recovery of T&E Species for Mission Support

A combination of habitat and species management is used to protect T&E species. Natural Resources conducts a variety of management activities to conserve and manage T&E species habitat, such as prescribed burning, longleaf pine ecosystem restoration, dune restoration, and wetland restoration. Species-specific management may include population monitoring, habitat management, and translocation of species. When progress is made toward species recovery, mission flexibility is increased.

Legal Requirement to Manage and Conserve T&E Species

The ESA is the primary legal driver for the protection and management of federally listed species. The ESA is intended to conserve the ecosystems upon which T&E species depend, and to provide a program for the conservation of these species. Section 7 of the ESA outlines the obligations of federal agencies pertaining to the ESA, including the duties to conserve and refrain from jeopardizing species and their habitats. In preparation of a Biological Assessment, Section 7 requires agencies to determine if listed species are present within or in close proximity to an action area, and if the action may potentially affect the listed species. Section 7 (a) (2) of the ESA requires that each federal agency consult with the USFWS and/or NMFS on proposed actions that the AF has determined may affect federally listed species. The MMPA is also a legal driver for protection of marine species and permits are required for operations that may affect marine mammals.

To further stress and clarify the importance of conserving T&E species, the DoD along with the Departments of Commerce, Interior, Transportation, USDA, and the USEPA, signed a Memorandum of Understanding (MOU) in 1994. Section III of the MOU reads as follows: "Each individual agency that is a party of this MOU will:

- "*Use its authority to further the purposes of the ESA by carrying out programs for the conservation of federally listed species, including implementing appropriate recovery actions that are identified in recovery plans.*"

State-listed animal species are statutorily designated via FAC Rules 68-A27.003, 68-A27.004, and 68-A-27.005, and maintained by FWC as endangered, threatened, or SSC. State-listed plant species are statutorily designated via The Preservation of Native Flora of Florida Act (s.581.185- 187, Florida Statutes) and maintained by Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened, or SSC.

ESA Section 7 and MMPA Consultations for Mission Support

Projects or activities that may impact federally protected species must go through EIAP review. During this process, required consultations and permits are identified and protective measures are developed to avoid or minimize impacts. Tyndall Natural Resources supports consultations with the USFWS regarding potential impacts to T&E species associated with missions. Natural Resources works closely with mission personnel in preparing Biological Assessments, coordinating permit details with regulators, and briefing binding Terms and Conditions to mission proponents. The continuance of good working relationships with regulators is vital to the expedient processing of consultations. It is expected that the number of ESA consultations will increase due to impacts incurred from Hurricane Michael and the associated rebuild of the installation infrastructure as well as military mission realignment.

Some of Tyndall's missions occur over the GOM and have the potential to impact marine mammals. In these instances, a permit under the MMPA is required. These permits are granted by the NMFS. Most of Tyndall's over-water missions are currently included in a Programmatic Environmental Assessment and associated Biological Assessment and MMPA permit prepared by Eglin AFB. However, it is possible that Tyndall will need to prepare MMPA permit applications in the future.

Natural Resources Compliance

After Section 7 consultations with the USFWS and/or NMFS, a concurrence letter or a Biological Opinion, including an Incidental Take Statement is sent to Tyndall AFB. The concurrence letter or Biological Opinion outlines the conservation measures and Terms and Conditions that must be completed in order for the exemption in Section 7 of the ESA to apply; these are legally binding and non-discretionary. If Tyndall AFB fails to assume and assure implementation of the Terms and Conditions, or (2) fails to require the participants in the activities to adhere to the Terms and Conditions of the incidental take statement through enforceable terms, the protective coverage of Section 7(a)(2) may lapse. Tyndall AFB works in coordination with the USFWS to streamline Section 7 consultations, EISs, EAs, and other applicable regulatory permits and facilitates communication with pertinent personnel to implement legal requirements. One aspect of this process will be the briefing of incoming commanders by the Natural Resources office.

The INRMP as a Substitute for Critical Habitat Designation

Unless it is determined to not be prudent or determinable, designation of Critical Habitat is intended to occur simultaneously with the listing of a species as threatened or endangered. Areas designated as Critical Habitat are constrained with respect to the types of activities that can occur. Federal agencies are required (Section 7(a) of the ESA) to ensure that their actions do not jeopardize the continued existence of listed species, and do not result in the destruction or adverse modification of Critical Habitat. Designation of Critical Habitat uses the best available scientific data and considers the economic and other impacts of such designation. The Secretary of the Interior (USFWS) or the Secretary of Commerce (NMFS) is responsible for designating Critical Habitat for species listed as threatened or endangered.

National Defense Authorization Act for FY 2004 (House Resolution 1588)

The passage of the National Defense Authorization Act for FY04 further emphasized the importance of the INRMP by allowing the substitution of an INRMP for CH designation under the ESA so long as implementation of the INRMP provides a benefit to the particular species. Significant changes to the ESA and the MMPA are identified in the National Defense Authorization Act for FY04 (House Resolution 1588) including:

Section 318. Military Readiness and Conservation of Protected Species

- Critical Habitat will not be designated on any lands or geographical areas owned or controlled by DoD if an approved INRMP is in place.
- Section 7 consultations will still be required for activities affecting listed species.
- National security must be considered when designating Critical Habitat.

Section 319. Military Readiness and Marine Mammal Protection

- The Secretary of Defense, after "conferring" with the Secretary of Commerce/Interior, may exempt any action from compliance with any MMPA requirement, if it is necessary for national defense.
- "Harassment" definitions are modified for military readiness activities.
  - Level A: any act that injures or has the significant potential to injure
  - Level B: any act that disrupts behavioral patterns such that they are abandoned or significantly altered
- For incidental take authorizations (one- or five-year), determination of "least practicable adverse impact" must take into consideration military personnel safety, practicality of implementation, and impact on the effectiveness of a military readiness activity.
- Incidental take authorizations affecting military readiness activities will not be subject to "geographical region" or "small numbers" restrictions.

Using the INRMP to Avoid Critical Habitat Listings on Tyndall AFB

Pursuant to Title 16, USC, Section 1533((1)(3)(B)(i)), the Secretary of Interior "shall not designate as Critical Habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an INRMP prepared under section 101 of the Sikes Act (16 USC 670a), if the Secretary determines in writing that the plan provides a benefit to the species for which CH is proposed for designation."

This INRMP and the associated T&E Species Component Plan is meant to serve as the substitute for Critical Habitat designation under the ESA special management criteria. In order for this to occur, the plan must provide a conservation benefit to the species; the plan must provide certainty that the management plan will be implemented; and the plan must provide certainty that the conservation effort will be effective. This is particularly important given the candidate and petitioned species occurring in the vicinity of Tyndall that could become listed. Tyndall's INRMP and T&E Species Component Plan clearly show how management actions adequately protect and benefit species, and thus should preclude any future Critical Habitat designation on the installation.

Critical Habitat designations were made for the piping plover, Gulf sturgeon, Choctawhatchee beach mouse, and St. Andrew beach mouse prior to finalization of Tyndall's INRMP in 2006, thus Tyndall did not qualify for exemption from designation (Figure 16).

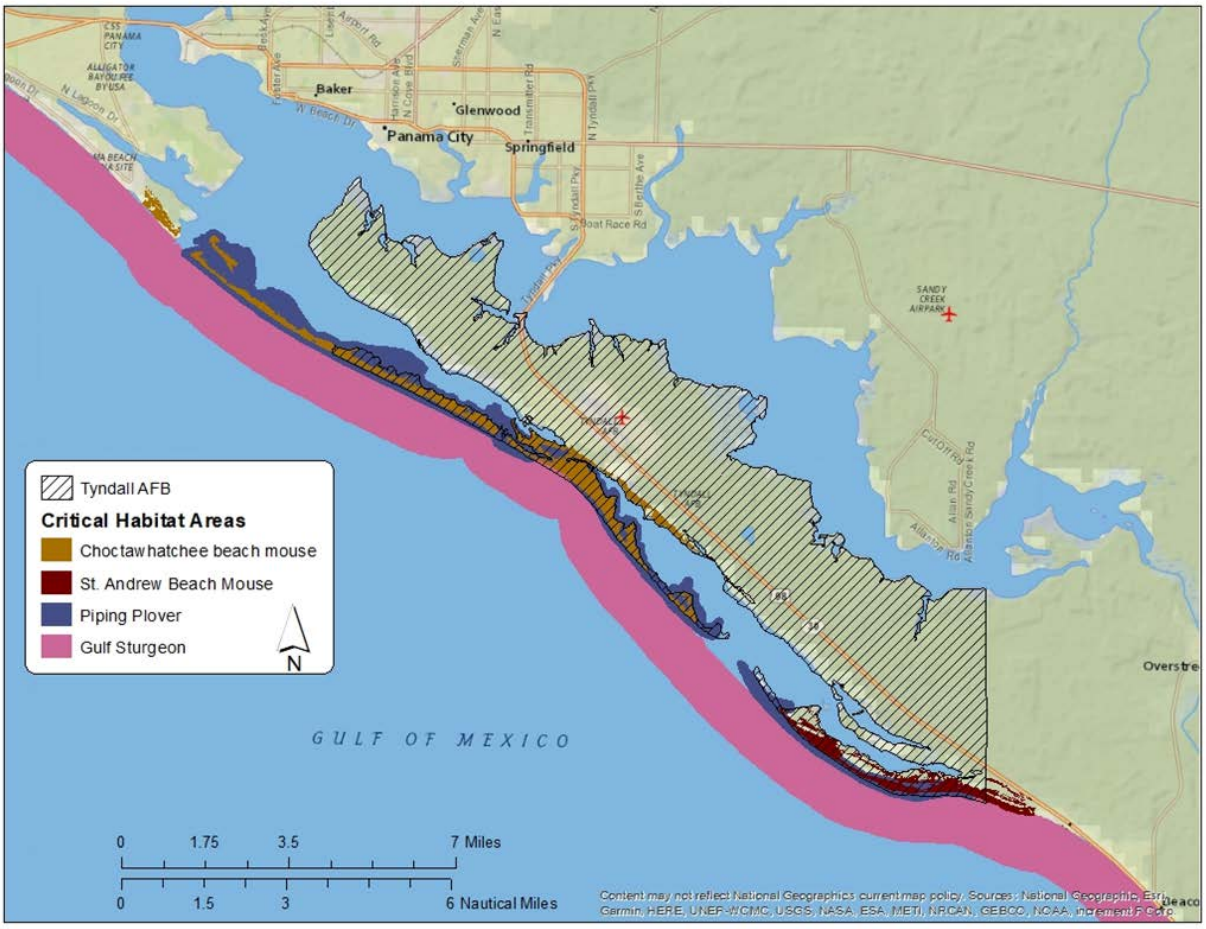

Figure 16 - Designated critical habitat areas for Choctawhatchee beach mice, St. Andrew beach mice, Piping Plover, and Gulf Sturgeon in areas on and near Tyndall AFB.

Climate Change and T&E Species Management

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 and Sgrò 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 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.

Management and Monitoring of Federally Listed Species

Tyndall's management and monitoring activities are conducted in accordance with applicable species recovery plans and permits and are coordinated with the USFWS and FWC through INRMP reviews and additional discussions as necessary. In situations where recovery plans are not available, or where specific guidance is not provided in the recovery plan, Tyndall confers with the USFWS and species experts to determine acceptable methods.

Federally listed species, federal Candidate and Petitioned species, and species protected by other federal laws are described below. A summary of status, monitoring, and management activities are provided as applicable. Refer to the Other Natural Resource Information section for discussion of climate change as it relates to T&E species and natural resource management at Tyndall AFB. The *Threatened and Endangered Species Component Plan* will include more detailed information.

Red-cockaded Woodpecker

The Red-cockaded Woodpecker (RCW) is a federally endangered bird species endemic to open, frequently burned pine ecosystems in the southeastern United States (USFWS, 2003). RCWs are the only woodpecker species in the Southeast to excavate cavities in live pine trees. They prefer mature longleaf pine in particular, because older longleaf have greater incidence of red heart disease, which makes cavity excavation easier. Prior to Hurricane Michael, RCW did not occur on the installation but did nest and forage in areas near Tyndall AFB (approximately 1.5 miles (2.4 km) away at Lathrop Island). Severe damage to the timber (cavity trees) on Lathrop Island destroyed most if not all cavity trees but status of the RCW population on Lathrop is unclear. Severe wind damage to mature slash pine trees from the hurricane resulted in nearly 10,000 acres (4,047 ha) being clearcut. Tyndall AFB plans to reforest 9,000-10,000 acres (3,642-4,047 ha)with containerized longleaf pine seedlings from 2020 to 2025.

Piping Plover and Critical Habitat

The Piping Plover is a state and federally threatened migratory shorebird that is present at Tyndall during the non-breeding season. In Florida, Piping Plovers utilize sandy beaches and tidal flats on barrier islands and bay shoreline (USFWS, 1996). All of the barrier islands within Tyndall ABF are identified as Critical Habitat for non-breeding Piping Plovers; the area is also designated as a Critical Wildlife Area by FWC

(Figure 16 above). Critical Habitat one the installation includes Shell Island, CIW, and CIE. The boundaries of designated Critical Habitat are subject to change due to the changing morphology of the shoreline.

Piping Plovers consistently winter along Tyndall's shoreline during the non-breeding (wintering and migrating) season of July 15 through May 15. Concentration is highest in areas containing pools and low elevation beach sites that are washed over and exposed by tidal fluctuations. This includes, but is not limited to, the tidal salt pools on CIE, both sand spits adjacent to Hurricane Cut (currently closed), and the area known as East Pass on Shell Island, which has been a closed pass since 2002. On October 10, 2018, an approximate half-mile section of the tip of CIE was cut off from the main island and is separated by approximately ¾ mile of water. This island has become a preferred area for nesting and over-wintering shorebirds, in part, due to the lack of predators on this newly formed island. Piping plovers are observed annually along Tyndall's shorelines.

Surveys are currently conducted in partnership with FWC and Audubon. Data is entered into the Florida Shorebird Database. FWC and Audubon also conduct the winter shorebird count annually.

Tyndall's management for the piping plover includes the maintenance of suitable habitat and preventing or minimizing disturbance. Signs and fencing are used to protect foraging areas within piping plover Critical Habitat from human disturbance. Disturbance due to dogs and beach driving is minimized through implementation of applicable Tyndall AFB Instructions and enforcement of Critical Wildlife Area provisions. Predator control, including feral cat control, is conducted (detailed in the *Nuisance Species Component Plan)*. Detailed management practices are provided in the *Threatened and Endangered Species Component Plan*.

Rufa Red Knot

The USFWS ruled to list the Rufa red knot as a threatened species in December of 2014. The red knot occurs in small numbers at Tyndall AFB during migration and has similar habitat requirements and is present during similar times as piping plovers. Therefore, Tyndall's management for the piping plover provides benefits to red knots as well. The red knot is included in bimonthly shorebird monitoring surveys conducted in cooperation with FWC, Audubon, and FDEP and is observed annually along the shorelines of Tyndall AFB.

Bald Eagle

The bald eagle has been removed from federal listing, but remains protected at the federal level under the BGEPA and the MBTA. FWC removed the bald eagle from the state's list of threatened species in 2008 and simultaneously passed an eagle-specific rule in the Florida Administrative Code (FAC 68a- 16.002). The bald eagle is seldom seen far from water, typically occurring along coastal and bay shorelines, rivers, and lakes. Bald eagles are regularly observed on the installation during winter months. Bald eagle nest surveys are conducted annually to record nest status (active/inactive) and presence of juveniles. After two aircraft collisions with bald eagles in 2013 GPS tracking/monitoring project was proposed but never funded. If a BASH conflict with bald eagles is identified, relocation of the nest may be needed (once proper permits have been obtained); however, this approach is not likely to succeed without constant harassment since abundant nesting habitat available throughout the installation. In addition, Airfield Management and Flight Safety are actively engaged in habitat modification to discourage prey in the airfield.

Eastern Indigo Snake

The eastern indigo snake is a federally threatened species. The eastern indigo is a large, conspicuous, slow-moving, and docile snake that can attain a body length of 8.5 feet (2.6 m). These characteristics make it an easy target for those who indiscriminately kill snakes on sight. Additionally, eastern indigo snakes are highly sought after by collectors in the commercial pet industry. This species utilizes sandhills during the winter months and occupies the burrows of gopher tortoises and other species during winter months or for refugia from fire (USFWS 1982). Riparian areas are frequently used in the summer. There have been no documented sightings of the indigo snake on Tyndall AFB although suitable habitat is available. Due to the lack of sightings, the species is not actively managed but habitat management for the gopher tortoise will benefit the eastern indigo snake.

American Alligator

The American alligator is federally threatened due to similarity of appearance (FT S/A) to the American crocodile and is additionally protected as a Federally-designated threatened species under Florida's Endangered and Threatened Species Rule. Therefore, there are generally no Section 7 requirements under the ESA. Alligators are abundant on the installation, having been observed in nearly every body of water including freshwater ponds, wetlands, and brackish and saltwater areas. No specific monitoring or management activities for the American alligator are in place on Tyndall AFB. However, nuisance alligators are relocated or removed depending on the size of the alligator (See details in the *Nuisance and Invasive Species Component Plan*).

Loggerhead, Green, Kemp's Ridley, and Leatherback Sea Turtles

Status

Four species of sea turtles occur in the nearshore GOM waters off Tyndall AFB. These species include the loggerhead, green, Kemp's ridley, and leatherback sea turtles. The loggerhead and green sea turtles are threatened, while the Kemp's ridley and leatherback sea turtles are endangered (NMFS and USFWS 1991, NMFS and USFWS 1992, NMFS and USFWS 2008, NMFS, USFWS, and Secretaría del Medio Ambiente y Recursos Naturales 2011). As of October 2014, fourteen turtles (Kemp's ridleys, greens and loggerheads) have been caught in waters surrounding Tyndall AFB and seven have been tracked with satellite tags (Lamont 2015). These turtles are abundant in the waters around Tyndall AFB and data suggest they show fidelity to these habitats (Lamont 2015). The loggerhead is the most common of the four species and it nests every year on Tyndall's beaches, including Shell Island, CIE, and CIW and sporadically on Buck Beach. There is occasional nesting by leatherback, green, and Kemp's Ridley sea turtles. Peak nesting season for all four species occurs in June and July.

Monitoring

A Marine Turtle Permit (F.A.C. Rule 68E-1) issued by FWC is required for conducting activities involving sea turtles in Florida. Under Section 6 of the ESA, a cooperative agreement between the USFWS and FWC granted the state of Florida the authority to issue permits and monitor activities involving sea turtles. Tyndall AFB implements sea turtle surveying and monitoring in accordance with the specific protocols detailed in the State permit.

Tyndall Natural Resources conducts early morning sea turtle surveys five times per week on 18 miles (29 km) of Shell Island, CIE, and CIW from May 1 to August 31. These surveys are intended to locate the crawls of nesting female turtles, identify the species, determine whether the crawl is a nesting crawl or a false crawl, place protective screening over the nest to deter predators, and mark the nest location. Nests are checked three times per week (or until the last nest hatches) from September through November for potential storm damage, hatching activity, and predation. The objective of the sea turtle monitoring program is to provide location information (for mission avoidance) and annual data on the distribution and abundance of sea turtle nesting activity on Tyndall's beaches. Additional information on monitoring is available in the *Threatened and Endangered Species Component Plan.*

Management

The primary goal of sea turtle management on Tyndall AFB is to provide the highest level of capability and flexibility to the military operations while meeting the legal requirements of the ESA. Tyndall Natural Resources implements sea turtle conservation and management activities including locating, marking, and protecting sea turtle nests. Additionally, Tyndall Natural Resources assesses potential impacts to sea turtles from proposed mission activity, recommends conservation measures to avoid impacts to nesting sea turtles, their nests, and emerging hatchlings, and relocates turtle nests only if necessary and under specifically permitted conditions.

In addition to the actions identified above, Tyndall AFB implements the following management measures:

- Respond to and investigate all sea turtle stranding reports on AF property
- Collect Appropriate data and report to the stranding and salvage network; contact within 24 hours of investigating the report
- Predator control with USDA Wildlife Services personnel
- Prohibition of lights (FWC, 2011), fires, and camping on beaches
- Require wildlife friendly lighting on the Support Side of the installation as part of the Installation Facility Standards and Lighting Management Plan being updated and developed in relation to the post-hurricane infrastructure rebuild
- Avoidance of off-road vehicle use during nesting season
- Construction and maintenance of elevated boardwalks to eliminate pedestrian traffic in and around dunes and prevent erosion
- Protection, enhancement, and restoration of dune habitats using alternative techniques to build dunes and other coastal resilience considerations discussed in this document
- Support of U.S. Geological Survey and UF sea turtle tagging and tracking project

Choctawhatchee Beach Mouse and Critical Habitat

The federally endangered Choctawhatchee beach mouse occurs in Bay, Okaloosa, and Walton Counties. Beach mice inhabit coastal dune ecosystems, including primary, secondary, and tertiary dunes, and prefer well-developed dunes vegetated with sea oats, gulf bluestem, and other herbaceous plant species as well as live oak, rosemary, and other scrubby species associated with secondary and tertiary dunes (Federal Register, 2006). Habitat loss from storms and human disturbance may have contributed to the decline of beach mice. Critical Habitat Unit 5 for the Choctawhatchee beach mouse consists of over 1,700 acres (688 ha) in Bay County that contain essential habitat features, and includes portions of Shell Island,

CIW and the bay shoreline of the main peninsula. USFWS conducts monthly track tube surveys to monitor for the presence of the Choctawhatchee beach mouse on Tyndall. Tyndall may consider translocation of beach mice to suitable habitat along the bay shoreline, as well as translocations to off-site (off-Tyndall) locations. Management actions conducted for other species may also benefit the beach mouse. These actions include protection of dune habitat (i.e., boardwalks), dune habitat enhancement and restoration and predator control (see *Threatened and Endangered Species Component Plan*).

St. Andrew Beach Mouse and Critical Habitat

The federally endangered St. Andrew beach mouse inhabits Bay and Gulf Counties (USFWS, 2010). The species currently consists of two distinct populations, with the majority of the St. Andrew beach mouse Critical Habitat Unit 1 occurring on Tyndall's CIE property. Similar to the Choctawhatchee beach mouse, USFWS conducts monthly track tube surveys to monitor presence of the St. Andrew beach mouse along 6 miles of dune habitat on CIE. Actions beneficial to the St. Andrew beach mouse include protection of dune habitat (i.e., boardwalks), dune habitat enhancement and restoration and predator control (see *Threatened and Endangered Species Component Plan*).

Florida Manatee

The Florida manatee, a subspecies of the West Indian manatee, is a federally threatened marine mammal. Manatees are generally restricted to peninsular Florida in winter, but disperse throughout the GOM and Atlantic Ocean coastlines during warm months and during migration, moving freely between freshwater and near shore marine environments. Manatees are occasionally observed during the summer in the bays and GOM adjacent to Tyndall AFB. Manatee strandings have occurred as recently as winter 2020, and these incidents may increase as ocean water temperatures increase. Tyndall provides educational materials for outreach. Additionally, Tyndall AFB may close portions of base-controlled marinas if manatees are present. The marina is maintained as a clean harbor with strict refueling and waste disposal protocols in place.

Sperm Whale

The sperm whale is a large whale species, federally listed as endangered. Sperm whales are generally found in offshore waters beyond the 200 m (656 feet) isobath. Due to their wide distribution in the GOM, there are no active management measures in place for Tyndall AFB. Many of the over-water training activities originating from Tyndall that may potentially affect sperm whales are included in the *Eglin Gulf Test and Training Programmatic EA*, Biological Assessment, and associated MMPA permit.

Gulf Sturgeon and Critical Habitat

The federally threatened Gulf sturgeon is an anadromous fish occurring in most major river systems from the Pearl River, Louisiana, to the Suwannee River, Florida, and in marine waters from the central and eastern GOM to Florida Bay offshore (USFWS and Gulf States Marine Fisheries Commission, 1995). This large fish occurs predominately in the northeastern GOM, feeding in offshore areas and inland bays during the winter months and moving into freshwater rivers during the spring to spawn. Migration into freshwater generally occurs from March to May, and migration into the GOM starts in the fall. Sturgeon from multiple river systems have been detected overwintering in marine nearshore waters off Tyndall. At Tyndall, Critical Habitat extends from the Gulf coastal shoreline to one nautical

mile (1.85 km). Tyndall does not conduct active management for Gulf sturgeon; however, stormwater is managed to reduce or eliminate sediment, nutrients and other forms of pollution as part of operational BMPs.

Smalltooth Sawfish and Critical Habitat

The federally endangered smalltooth sawfish is an elasmobranch that currently inhabits warm, shallow coastal and estuarine waters of southern peninsular Florida. In the U.S., this species historically occurred in the GOM from southern Florida to Texas and along the Atlantic coast from Florida to Cape Hatteras. The distribution range has contracted dramatically due primarily to by-catch effects and habitat loss. Critical Habitat consists of two areas along the southwestern coast of Florida between Charlotte Harbor and Florida Bay. Due to the unlikelihood of occurrence, Tyndall Natural Resources does not conduct active management for smalltooth sawfish. However, stormwater is managed to reduce or eliminate sediment, nutrients and other forms of pollution as part of operational BMPs.

Godfrey's Butterwort

Godfrey's butterwort (also known as violet butterwort) is a federally threatened carnivorous plant species endemic to the Florida Panhandle (USFWS, 1994). Typical habitat includes open, acidic soils of seepage bogs on gentle slopes, deep quagmire bogs, ditches, and depressions in grassy pine flatwoods and grassy savannas, often occurring in shallow standing water. Primary threats include successional changes to habitat resulting from elongated fire return intervals and the alteration of habitat from the timber industry and development.

Godfrey's butterwort is known to occur at 12 locations on Tyndall. A site was located in February 2016 at the F-22 Munitions Storage Complex. At the time, Tyndall AFB requested a formal consultation with the Panama City Field office of the USFWS regarding the impact of construction on the Godfrey's butterwort population within the construction zone. The USFWS service developed a biological opinion, and the population of 240 plants were subsequently removed from the construction site and transplanted within the Drone Recovery Field containing suitable habitat and an already existing population. The USFWS staff at Tyndall continues to conduct bi-monthly monitoring of the transplanted population to track growth, reproduction, and survival.

In addition to rare plant surveys, Tyndall conducts prescribed fire in cooperation with the AF Wildland Fire Branch to manage these areas; however, more growing season burns and burning through wetlands are necessary to promote the plant. Additionally, wetland restoration involving a combination of hand and mechanical removal of the dense shrub layer is being conducted to enhance wetland habitat.

Telephus Spurge

Telephus spurge is a federally threatened and state endangered perennial herbaceous plant species endemic to coastal (within 4 miles of the coast) areas of Bay, Franklin, and Gulf counties in the Florida panhandle (USFWS 2007). This species occurs in a variety of habitats ranging from xeric scrub to mesic pine flatwoods, along disturbed sandy roads, and less commonly in wetlands with seepage slope species. Within pine flatwoods or upland pine communities, telephus spurge is associated with a longleaf pine and/or slash pine overstory and an herbaceous understory dominated by wiregrass, other native warm season grasses, sedges, and forbs that have historically been burned on a 2 to 3 year fire return interval.

In August 2015, the first population of telephus spurge was found on Tyndall AFB. The population is located along an open sandy road adjacent to the explosive ordinance disposal (EOD) range. Large clusters of plants were detected during surveys in August 2017 in close proximity to the original EOD range population and in March 2018 near PQM Lake. Specific monitoring objectives for telephus spurge at Tyndall AFB include:

- Monitoring the known population annually to determine changes in growth or decline over time relating to habitat enhancement or degradation
- Survey previously un-surveyed areas in an effort to detect new populations
- Map the distribution of telephus spurge on Tyndall AFB as new sites are detected
- Survey telephus spurge site(s) for invasive species and conduct invasive species treatments

As part of the Programmatic Environmental Assessment for Hurricane Recovery and Installation Development at Tyndall AFB, surveys for federally listed and candidate species were conducted and a Biological Evaluation was prepared. During surveys of the action area (proposed commercial gate location), a population of telephus spurge was discovered. Formal consultation was initiated on January 24, 2020 and a BO was developed and submitted to Tyndall AFB on March 24, 2020 outlining proposed mitigation efforts for impacts to this population of telephus spurge.

Federal Candidate Species

Gopher Tortoise

The gopher tortoise is a federal candidate species and a state-designated Threatened species (USFWS, 2008). The Federal Register Vol. 76, No. 144 / July 27, 2011, documented the 12-month finding on a petition to list the gopher tortoise as threatened in the eastern portion of its range. The review found that the listing of the gopher tortoise is warranted; however, listing is precluded by higher priority actions. The Federal Register notice also stated that a proposed rule to list the gopher tortoise will be developed as priorities allow. In 2008, all DoD entities, as well as state agencies and other non-governmental organizations signed a Candidate Conservation Agreement with the USFWS. This agreement defines what each agency will voluntarily do to conserve the gopher tortoise and its habitat.

The gopher tortoise typically inhabits sandhills, pine/scrub oak uplands, and pine flatwoods associated with the longleaf pine ecosystem. High-quality tortoise habitat can be maintained by prescribed fire or cutting/thinning when scrub oaks displace the herbaceous ground cover utilized as forage by the gopher tortoise. Gopher tortoise burrows serve as important habitat for more than 300 commensal species, some of which are threatened or endangered. Gopher tortoise burrows are easily damaged and are at risk of collapse by ground disturbance, especially from heavy equipment. Within the installation, individual burrows are marked, and buffer of a 25 ft. (7.6 m) radius around the mouth of the burrow is maintained during forestry, fire, military training, construction or other ground disturbing activities.

Management actions for gopher tortoises consist of longleaf pine forest restoration across the installation, the application of prescribed burning, invasive plant management, and predator control. Gopher tortoise burrow surveys are conducted annually and reported to AFCEC and in support of specific activities such as construction projects, and affected tortoises are relocated as necessary in accordance with FWC permitting guidelines and protocols. The primary objective of field surveys is to achieve complete (100%) coverage of suitable habitat by walking transects, visually locating and scoping the burrows. Global

positioning system (GPS) coordinates and burrow size are recorded at each active burrow and then marked with a PVC pole, pink flag, and a tag containing a unique number. Line Transect Distance Sampling was attempted in 2017 but was deemed unsuccessful due to the small population size on the installation.

Federally Petitioned Species

In 2011, the USFWS announced a finding on a petition to list over 400 plant and animal species occurring in the southeastern United States under the ESA (USFWS, 2011). The Service found that there is substantial information indicating that listing may be warranted for 374 of the species; a status review of these species is currently in progress. Additionally, in 2012 the CBD submitted a petition to the USFWS to consider protection for 53 amphibian and reptile species under the ESA (CBD 2012). Some of these petitioned plant and animal species may occur on Tyndall AFB (Table 13).

Table 13 - Federally petitioned species known or potentially occurring on Tyndall AFB.

Species	Scientific Name	Habitat	Management
Henry's spiderlily*	*Hymenocallis henryae*	Endemic to Florida Panhandle. Found in wet flatwoods and along edges of cypress stringers and ponds. Populations on Tyndall are in wet prairie habitats.	Prescribed fire and avoidance of soil disturbing activities
Bear tupelo*	*Nyssa ursina*	Endemic to Florida Panhandle. Documented on Tyndall in wet wiregrass savanna habitat.	
Kral's yelloweyed grass	*Xyris longisepala*	Found in moist to wet margins of sinkhole lakes and sandhill upland lakes; seepage slopes and bogs; and wet prairies	Not confirmed on Tyndall, but potential habitat exists
Blackbract pipewort	*Eriocaulon nigrobracteatum*	Found in open, wet, mucky bogs at stream heads or in open, grassy seepage slopes	
Hairy peduncled beakrush	*Rhynchospora crinipes*	Occurs along streams/ rivers in wet, peaty silt of narrow shelving banks or sand-clay bars; may be rooted in streambeds.	
Panhandle meadowbeauty	*Rhexia salicifolia*	Inhabits sunny margins of depression marshes, flatwoods ponds, and sandhill upland lakes in wet sands or peats.	
Small-flower meadow-beauty	*Rhexia parviflora*	Occurs in seepage slopes, margins of dome swamps, depression marshes, and evergreen shrub ponds.	
Smooth barked St. John's-wort	*Hypericum lissophloeus*	Occurs along shorelines and in shallow waters of sandhill upland lakes, typically within longleaf pine-deciduous scrub oak sandhills.	
West's Flax	*Linum westii*	Found in wet flatwoods, depression ponds, dome swamps, and at the edges of pond cypress swamps.	

Species	Scientific Name	Habitat	Management
Eastern diamondback rattlesnake*	*Crotalus adamanteus*	Inhabits sandy woodlands, pine flatwoods, and coastal scrub habitats. Utilizes gopher tortoise burrows to overwinter.	Prescribed fire and avoidance of soil disturbing activities, particularly near gopher tortoise
Alligator snapping turtle	*Macroclemys temminckii*	Occurs in the deep water of streams, rivers, lakes, and swamps. Nests on land.	Wetlands and stream buffer protections apply
Coastal flatwoods crayfish*	*Procambarus apalachicolae*	Found in seasonal ponds, and may inhabit wet depressions in flatwoods. Constructs a burrow when ponds/depressions	Wetlands protections apply
Purple Skimmer	*Libellula jesseana*	Inhabits clear-water ponds and lakes with sand bottoms. Adults forage in open woodland or shrubland.	Not confirmed on Tyndall, but potential habitat does exist. Tyndall is conducting species inventories. Wetlands
Say's Spiketail	*Cordulegaster sayi*	Found at silt-bottom seepage streams in hardwood forests. Adults forage in open woodlands and clearings.	

*Known to occur on Tyndall AFB

Management of State-Listed T&E Species and SSC

There are numerous state-listed T&E species and SSC occurring seasonally or year-round on Tyndall AFB (Table 14). AFI 32-7064 encourages biodiversity management to include the conservation of state-listed and other rare species, stating that INRMPs will provide for the protection and conservation of state listed species when practicable and when protection is not in direct conflict with the military mission. In addition, INRMPs are developed in cooperation with state wildlife agencies. However, biodiversity management is not an AF mandate and as such is not considered a "must fund" area in the AF budgetary system. Nonetheless, the conservation of state-listed species and other rare but unlisted species is encouraged. Protection of state-listed and/or petitioned species on Tyndall AFB could help decrease the likelihood that listing under the federal ESA becomes necessary.

Management operations conducted by Tyndall Natural Resources for many of the federally listed species and for the health of the ecosystem provide direct and indirect benefits to state-listed, petitioned and other species. For example, Tyndall's habitat management of the flatwoods ecosystem, which includes prescribed fire, longleaf pine restoration, and invasive species control will benefit many state-listed species. Other beneficial management operations include coastal habitat enhancement and restoration, wetlands protection and improvement through use of prescribed fire, public education, and limiting public access in sensitive habitat areas. Protective measures for state-listed species are recommended during the NEPA process.

Table 14 - State-listed species and species of special concern known to occur on Tyndall AFB.

Scientific Name	Common Name	State Status
Mammals		
Ursus americanus floridanus	Florida black bear	FBBMP

Plants		
Andropogon arctatus	Pinewoods bluestem	T
Asclepias viridula	Southern milkweed	T
Chrysopsis godfreyi	Godfrey's goldenaster	E
Cleistesiopsis bifaria	Apalachicola small spreading pogonia	E
Drosera intermedia	Spoonleaf sundew	E
Eurybia spinulosa	Pinewoods aster	E
Gentiana pennelliana	Wiregrass gentian	E
Justicia crassifolia	Thick-leaved water-willow	E
Lilium catesbaei	Southern red lily	T
Lupinus westianus	Gulf Coast lupine	T
Tiedemannia filiformis subsp. greenmanii	Giant water-dropwort	E
Physostegia godfreyi	Apalachicola dragonhead	T
Pinguicula lutea	Yellow butterwort	T
Pinguicula planifolia	Chapman's butterwort	T
Pogonia ophioglossoides	Rose pogonia	T
Polygonella macrophylla	Large-leaved jointweed	T
Ruellia noctiflora	Nightflowering wild petunia	E
Verbesina chapmanii	Chapman's crownbeard	T
Xyris isoetifolia	Quillwort yellow-eyed grass	E
Xyris scabrifolia	Harper's yellow-eyed grass	T
Shorebirds and Wading Birds		
Charadrius nivosus	Snowy plover	T
Haematopus palliatus	American oystercatcher	T
Rynchops niger	Black skimmer	T
Sternula antillarum	Least tern	T
Egretta caerulea	Little blue heron	T
Egretta rufescens	Reddish egret	T
Egretta tricolor	Tri-colored heron	T

E = Endangered, T = Threatened, SSC = Species of Special Concern, FBBMP = Florida Black Bear Management Plan

7.5 Water Resource Protection

Applicability Statement

This section applies to AF installations that have water resources. This section is applicable to this installation.

Program Overview/Current Management Practices

Water resources include groundwater and surface waters such as ponds/lakes, bays, bayous, and wetlands. Tyndall AFB is surrounded on three sides by East Bay to the north, St. Andrew Bay and Sound to the west and south, and the GOM to the south. Primary threats to these water resources are excess sedimentation, bacterial contamination, and high water use demand.

Water Supply

Three groundwater aquifers underlie Tyndall AFB. These include the surficial aquifer, the Intermediate Confining Unit, and the Floridan Aquifer. Tyndall has three permitted drinking water wells that pump from the Floridan Aquifer. Other wells on base pump from the surficial aquifer, and this water is used primarily for irrigation. Tyndall AFB purchases potable water from Bay County. Bay County's water supply comes from Deer Point Lake, a 5,000-acre (2,023 ha) impoundment on the St. Andrew Bay system located northwest of Tyndall AFB.

Water resources include groundwater and surface waters including ponds/lakes, bays, bayous, and wetlands. Tyndall AFB is surrounded on three sides by East Bay to the north, St. Andrew Bay and Sound to the west and south, and the GOM to the south. Primary threats to these water resources are excess sedimentation, bacterial contamination, and high water use demand.

Wastewater and Stormwater Management

Almost all wastewater on Tyndall AFB is collected and sent to Bay County Advanced Wastewater Treatment Plant. The sanitary wastewater collection system consists of building sewers, laterals, mains, manholes, cleanouts, lift stations, oil water separators, grease traps, and septic tanks. Wastewater lift stations are used to convey wastewater from the buildings to the Bay County Wastewater Treatment Plant. No hydraulic capacity study has been performed for the wastewater gravity collection system. Six lift stations have run time meters and three lift stations (1722, Silver Flag, and Housing) have either a flow and pH meter or both installed. A slip line and pipe bursting project updated much of the wastewater piping throughout the base. Due to the large available on-site storage, system overflow rarely occurs. A hydraulic capacity study should be performed to include lift station interactions. Several areas are still on septic tanks, including the 9700 area, AFCEC (formerly AF Research Lab), the 9300 area (Full Scale Drone launch and recovery), the 8500 area (Sub-Scale Drone Launch), and several buildings in the 9400 area (Silver Flag). The major portion of Silver Flag was connected to Sanitary Sewer with waste being sent to Bay County Wastewater Treatment Plant in 2012. As of April 2020, during the rebuild of Tyndall AFB, following Hurricane Michael, the base has planned various wastewater infrastructure improvements and/or modifications. These projects include, but are not limited to, LS 1722 redesign, forcemain replacement, grit chamber replacement, wastewater storage modifications, and upgraded drying beds. One of two major lift stations on the flightline will be moved to accommodate the redesign as well. Various gravity lines and smaller lateral forcemains will be constructed throughout the base to accommodate new facilities.

Stormwater percolates into the sand rapidly and surface drainage is adequate in most parts of the base. Tyndall AFB currently operates under a Multi-Sector Generic Permit issued by the FDEP, and is permitted under the Industrial Sector "S," Air Transportation Facilities, of the National Pollutant Discharge Elimination System (NPDES) to operate facilities and discharge industrial stormwater from the flightline side of the base to surface waters. Tyndall also has a MS4 permit from FDEP to discharge stormwater to surface waters. The NPDES stormwater permitting program is separate from Florida's stormwater/environmental resource permitting programs and local stormwater/water quality programs, which maintain their own regulations and permitting requirements.

Effective stormwater pollution prevention relies on BMPs such as preventative maintenance, prevention and response to spills, sediment and erosion control, structural runoff controls, hazardous material and waste management, petroleum, oil, and lubricant management, pesticide management, shoreline cleanups,

industrial and domestic wastewater management. Tyndall's stormwater system consists primarily of open ditches in undeveloped areas and underground piping in developed areas. Tyndall AFB has seven permitted stormwater discharge points from the airfield and industrial areas. Tyndall AFB does have drainage outfalls to receiving waters off-base, including some into Shoal Point Bayou, which is located to the northwest of the base and is the major receiving water to the north. Other outfalls discharge into Little Cedar Bayou (northeast of the base), Saint Andrew Sound (south of the base), and East Bay (northeast of the base). As of April 2020, to accommodate the rebuild of Tyndall AFB, various Stormwater improvements will be constructed throughout the flightline, support side, and Silver Flag. Regional systems will be constructed where possible.

7.6 Wetland Protection

Applicability Statement

This section applies to AF installations that have existing wetlands on AF property. This section is applicable to this installation.

Program Overview/Current Management Practices

With approximately 40 percent of the installation classified as wetlands (see section 2.3.5 Wetlands and Floodplains above), their protection is vital to the maintenance of natural systems within the installation. Wetlands on Tyndall AFB are protected to the greatest extent possible, but are still vulnerable to threats such as non-native invasive species, loss of plant species diversity due to inadequate fire frequency, fire seasonality (i.e., dormant season vs. growing season burning) and non-point source pollution in the form of sediment, nutrients, pesticides, oil, grease, and debris (see Wastewater and Stormwater Management). Ground disturbance and hydrologic alteration (primarily from past practices) are also concerns for Tyndall's wetlands. Within Tyndall AFB, wetland protection measures include restoring wetlands via invasive species control, control of hardwoods and other encroaching vegetation, implementing prescribed fire with appropriate seasonality and frequency considerations, protecting wetlands from vehicle and equipment damage, and mitigating wetland losses associated with construction or military activities.

In providing protection for wetlands within the installation, Tyndall AFB complies with the following regulations:

- Clean Water Act 1972
- Rivers and Harbors Act 1899
- EO 11990, Protection of Wetlands 1977
- EO 11988, Floodplain Management 1977
- Safe Drinking Water Act 1974
- Watershed Protection and Flood Prevention Act 1954
- North American Wetlands Conservation Act 1989
- Coastal Wetlands Protection Act 1972

Projects or activities with the potential to impact wetlands must go through EIAP review. During this process, required permits are identified and other protective measures are developed to avoid or minimize impacts. The 325th Civil Engineer Squadron, Environmental Element, Compliance (325th CES/CEIEC) is responsible for ensuring any wetland/dredge and fill permits are obtained through the FDEP and USACE,

Regulatory Division. Ground disturbing activities such as off-road driving and digging are restricted in wetlands, unless the proper permits have been obtained.

Tyndall Natural Resources manages wetlands with prescribed fire to promote native plant community composition and structure and through control of non-native plants and animals that may alter these fragile systems. Prescribed fire and forest management activities are conducted in accordance with *Silviculture Best Management Practices* (FDACS 2008). Efforts are taken to avoid fire suppression and/or exclusion activities within wetlands unless it is an emergency situation (i.e., if the fire threatens man-made structures or other fire sensitive areas); any damage caused to wetlands during wildfire support activities is rehabilitated to restore natural conditions.

While prescribed fire is the preferred tool for management, restoration, and enhancement of wetlands on the installation, in areas where prescribed fire has not been effective, alternative management methods may be used. Tyndall AFB will consider management techniques such as selective herbicide treatments, thinning, mowing, roller chopping, and/or hand removal of vegetation in combination with fire as part of an integrated approach to the management of wetland features within the installation.

Wetland Restoration, Enhancement, and Mitigation

Wetland enhancement at a high priority wetland site began in June 2018. Enhancement methods involved a combination of hand and mechanical removal of the dense shrub layer from the wetland in and around the population of Godfrey's butterwort at that site. Restoration in this area will continue using programmed Air Force funding. In addition, several areas on the installation are serving as wetland mitigation areas, permitted by the USACE to mitigate impacts from installation infrastructure development. Mitigation areas are being managed with prescribed fire on a 2-3 year fire return interval to reduce the unnaturally dense midstory shrub layer at some sites and/or promote the re-establishment of the native herbaceous understory.

Tyndall AFB has implemented wetland mitigation to satisfy regulatory requirements for compensatory mitigation associated with several individual permits for projects on the installation. The USACE maintains a hierarchical preference for mitigation bank credits, in-lieu fee programs, and permittee-responsible compensatory mitigation. Given costs associated with some forms of mitigation, TAFB has conducted permitee-responsible mitigation to offset wetland impacts associated with installation projects. Details regarding specific projects are included in Table 15.

Table 15 - Wetland mitigation projects on Tyndall AFB,

Project Year	Project Name	Impact Acres Wetland	Mitigation Acres	Associated Permitting
2011	Runway Drainage Improvements – Airfield Phase I	15.8 (6.4 ha)	32 (12.9 ha)	USACE SAJ-2011-02326
2014	F-22 Complex Project	3.85 (1.6 ha)	7.4 (3.0 ha)	FDEP 03-0327261-001 USACE SAJ-2014-01746
2015	Repair Airfield Drainage - Airfield Phase III	9.7 (3.9 ha)	37.9 (15.3 ha)	USACE SAJ-2011-02326
2016	Runway Drainage Improvements – Airfield Phase IV	19.9 (8.1 ha)	38 (15.4 ha)	USACE SAJ-2016-01484

Hydrologic Restoration

A hydrologic restoration plan for Tyndall AFB will identify projects to restore and enhance ecosystem resilience, sustainability, and natural defense by reestablishing natural hydrology and connectivity between freshwater and marine environments. Once developed, this plan can also be used by the installation to identify potential on-site wetland mitigation projects that would serve to offset any wetland impacts associated with the post-Hurricane Michael rebuilding activities.

The rationale for developing a hydrologic restoration plan stems from the fact that silvicultural activities on the installation (i.e., roads, bedding, ditching, etc.) have impacted ecological communities and altered the magnitude, timing, and quality of the surface water runoff to the estuaries. The plan would provide benefit to base operations through the identification of projects that would improve management of stormwater onsite and minimize road flooding that impedes access after storm events.

Wetland Protection and Climate

Wetlands account for approximately 40% of the landcover on Tyndall AFB and historically, Tyndall has implemented management and restoration activities to ensure the protection and perpetuation of wetland systems. This estimation represents the percentage of area covered by wetlands, swamps, saltwater marshes, estuarine, open water and freshwater marsh habitats. Climate projections suggest temperature increases of 2.0 ºF (1.1 ºC), which could increase evaporation rates in these areas and alterations in hydrological regimes (Erwin, 2009). However, annual precipitation is projected to also increase, which could help to maintain some of the wetlands in their current status.

Impacts specific to Tyndall AFB wetlands include the possible loss of up to 98% of current estuarine habitat and loss of more than 60% of salt marsh habitat (mostly in the Goose Point area) due to SLR. The ability of salt marsh and other types of coastal ecosystems to migrate to higher elevation will depend on local connectivity, barriers, topography and the rate of SLR. Some salt marsh will undoubtedly be converted to estuarine habitat, which also has high ecological value. Facilitating (active conversion) or allowing (passive transition) a portion of the current palustrine wetlands at Tyndall AFB to shift to salt marsh habitat could alleviate some loss, providing saltwater intrusion of current freshwater systems can be avoided.

7.7 Grounds Maintenance

Applicability Statement

This section applies to AF installations that perform ground maintenance activities that could impact natural resources. This section is applicable to this installation.

Program Overview/Current Management Practices

Routine land management and grounds maintenance activities conducted on Tyndall AFB include mowing, fertilization, pest management, urban landscape management, and related activities. These actions are accomplished under contract for both the main base area and the surrounding areas of the installation. The Natural Resources staff works with grounds maintenance contracted personnel to ensure that BMPs are used near wetlands. Tyndall Natural Resources is responsible for non-native invasive plant species control efforts (discussed in the Integrated Pest Management Programs section).

7.8 Forest Management

Applicability Statement

This section applies to AF installations that maintain forested land on AF property. This section is applicable to this installation.

Program Overview/Current Management Practices

The principal focus of forest management on AF installations is to support the military mission while remaining consistent with long-term ecosystem-based management goals that put ecological sustainability objectives above revenue optimization goals (see DoDI 4715.03). Under the principles of ecosystem management, forest treatments may be used to achieve installation goals for forest enhancement and restoration, T&E species and wildlife habitat improvement, wildfire protection, recreational development, military training requirements, and airfield safety compliance.

Prior to AF ownership in the 1940's, the majority of Tyndall AFB was forested with longleaf pine and then clearcut across the installation. Reforestation of Tyndall AFB began in the early 1960's with the focus on planting commercial slash pine (*Pinus elliottii*) and sand pine (*Pinus clausa*) plantations to generate revenue for the Tyndall AFB Forestry Program. In 2006, Tyndall shifted from commercial forestry practices (timber production) to an ecological forestry program that emphasizes restoration of pre-settlement vegetation conditions and natural processes through selective thinning, natural and artificial regeneration of native species, and prescribed fire. The shift away from commercial forestry practices promotes restoration of the structure, community composition, and function of the longleaf pine ecosystem, which is a regional conservation priority due to its vast destruction and importance as critical habitat for a large number of Threatened and Endangered species (T&E species).

On October 10, 2018, Hurricane Michael made landfall on Tyndall AFB as a Category 5 hurricane with maximum sustained winds of 160 mph, causing catastrophic damage to Tyndall AFB and surrounding areas. In addition to significant loss and damage to base infrastructure, natural resources were severely impacted. A total of 12,000 acres (4,856 ha) of pine forest sustained severe (5,000 acres (2,023 ha)) or catastrophic (7,000 acres (2,833 ha)) wind damage. Clean up operations on nearly 10,000 acres (4,047 ha) was completed in March 2020 and involved traditional timber salvage in the early stages, shifting to cutting, chipping, and hauling tree debris from the installation in the latter stages.

Timber Management

Military Mission Support

Most timber management activities result in benefits to both the military mission and to native ecosystems. Direct mission support includes cuts of merchantable timber from areas that interfere with military mission capabilities (i.e., glide slope) and clearing of new areas in support of missions. Activities may also include manipulation of forest structure for a specific mission need or to create a security buffer, visual screen, or noise buffer. Objectives for future forest management are in the Management Goals and Objectives section, and additional detail on management activities are provided in the *Forest Management Component Plan*.

Forest Inventory

During Tyndall's last forest inventory in 2006, all pine plantations were sampled. Tyndall will be updating the forest inventory on approximately 450 acres (182 ha) of plantation and 300 acres (121 ha) of natural slash stands annually, based on upcoming timber sale funds. An installation-wide inventory of merchantable timber on 13,793 acres (5,582 ha) was scheduled for FY2019 but was not accomplished due to catastrophic damage to the forests from Hurricane Michael (2018). In longleaf pine restoration areas, one year post-planting survival checks are conducted to determine first year survival of planted seedlings and five year post-planting stocking checks are conducted to determine survivorship of the planted longleaf pine seedlings and assess the need for re-planting.

Sand Pine Removal

Sand pine has replaced longleaf through much of its historic range on Tyndall, and has been targeted for removal. Forest Management has the goal to identify priority sand pine stands that would be candidates for removal and subsequent restoration back to longleaf pine (Figure: Planted Pine Locations on Tyndall AFB). Sand pine stands are clearcut to remove all standing sand pine and hardwood trees ≤10 inches DBH. Hardwoods ≥ 10 inches (25.4 cm) DBH are left uncut to benefit wildlife. Clear cut stands are then site prepped using herbicides, mowing, and/or prescribed fire prior to planting containerized longleaf pine seedlings. As of 2013, Tyndall had removed approximately 700 acres (283 ha) of sand pine. Around 350 acres (142 ha) of those have been planted in longleaf. Starting in 2018, Tyndall Forest Managers and the USFWS Ecologist will apply a new restoration approach on previously cut sand pine stands. The restoration approach will involve roller chopping the regenerating hardwoods, application of prescribed fire and herbicides, seeding native groundcover, and planting containerized longleaf pine seedlings (details provided in the *Forest Management Component Plan*).

Slash Pine Plantation Management

Prior to Hurricane Michael, Tyndall was working to convert slash pine plantations to uneven aged pine forests with a mixed composition of artificially regenerated longleaf and naturally regenerated Slash Pine. This conversion is occurring in two 20-year phases. The first phase creates 40–50 foot (12–15 m) gaps through selective row harvesting that are subsequently roller chopped and hand planted (when possible) with containerized longleaf pine seedlings. The second phase removes the remaining slash pine rows with the exception of legacy trees. Legacy trees are old trees that have been spared during harvest or have survived stand-replacing natural disturbances. Legacy trees have achieved near-maximum size and age and are significantly larger and older than the average trees on the landscape. The legacy trees will be widely spaced at two to four trees per acre, and prescribed fire will be used within these areas.

Commercial Forestry Areas

The active flight lines have areas with glide slope restrictions that dictate maximum tree height. These areas are planted with slash pine and are designated for a 25-year rotation for commercial forestry.

Restoration and Reforestation Program

The restoration/reforestation program promotes the restoration and natural regeneration of longleaf pine in support of ecosystem management and T&E species recovery. Prior to Hurricane Michael, restoration consisted of a gradual conversion of slash pine plantations back to longleaf pine by creating regeneration

gaps through two 20-year harvest phases, planting all gaps with longleaf pine, and maintaining with frequent fire (two- to three-year return interval depending on objectives). Site preparation in harvested gaps involves using a single drum roller chopper followed by prescribed fire when possible. Gaps are then hand planted with containerized longleaf pine seedlings using a random orientation to mimic natural regeneration patterns. One-year post-planting survival checks are conducted to determine first year survival of planted seedlings and five year post-planting stocking checks are conducted to determine survivorship of the planted longleaf pine seedlings and assess the need for re-planting.

Tyndall will be replanting containerized longleaf pine seedlings on 9,000-10,000 acres (3,642-4,047 ha)of clearcut forest areas on an accelerated timeline of 3-5 years. Tyndall AFB will collaborate with Eglin AFB to receive a local longleaf pine seed source that will be contracted out and grown by a local nursery. Achievable future forest conditions on Tyndall include longleaf pine forest thinned to a target basal area of 50-70 square feet per acre with little to no shrub component in the midstory and a floristically diverse understory composed of native grasses, sedges, and forbs. Restoration of the structure and function of the ecosystem will be achieved using low intensity, frequent fire (2-3 year fire return interval) with an emphasis on growing season burning to promote floristic diversity and control undesirable shrubs. Where fire is not achieving desirable results, mechanical and/or chemical timber stand improvement activities may be necessary to manage undesirable vegetation (details in *Forest Management Component Plan*).

Timber Stand Improvement

Mechanical and chemical timber stand improvement (TSI) methods have been used at Tyndall AFB to control non-merchantable hardwoods and sand pine that compete with planted longleaf pine seedlings in restoration areas. The primary goal of TSI is to restore the longleaf pine ecosystem by promoting 1) survival of planted longleaf pine seedlings and 2) desirable longleaf pine ecosystem structure. Removal of competing sand pine and hardwoods helps facilitate the re-establishment of desirable native ground cover thereby improving ecosystem structure and enabling frequent low intensity prescribed fire to maintain ecosystem structure and function.

Best Management Practices

Tyndall follows the *Silviculture Best Management Practices* (published by FDACS) to minimize impacts to the environment resulting from forest restoration activities. The DoD may be held to higher standards than what is expected of private landowners. The BMPs set forth by the Florida Forest Service include specific guidance for timber harvests, site preparation, planting, working around wetlands and streams, stream crossings, construction and maintenance and forest roads.

Before any work begins on a timber sale, the contract inspector conducts a briefing with the contract logging crew emphasizing expectations and the crew’s responsibility to follow Florida BMPs. The timber management contract inspector will conduct inspections as frequently as once a day to ensure the crews are following the BMPs. If an infraction is found by the contract inspector, the logging crew must take immediate action to correct it. If it is not corrected in a timely manner, the crew may face a monetary penalty or may lose the privilege of conducting business on the installation.

7.9 Wildland Fire Management

Applicability Statement

This section applies to AF 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

Mission support, ecosystem management, and protection of life and property all depend on a professionally managed wildland fire program. Effective 2014, Tyndall AFB began receiving support from the Air Force Wildland Fire Branch (AFWFB) Eglin Wildland Support Module (WSM) for all fire management activities on the installation. The Tyndall AFB Fire and Emergency Services supports the Eglin WSM with water support during prescribed burns but is only able to support wildfire suppression through structure protection from the urban interface. Fire and Emergency Services is neither funded nor trained to handle wildfire operations. AFI 32-7064 states that wildland fire management personnel "must meet the applicable National Fire Protection Association (NFPA) standards for wildland fire activities [and] may use training criteria in the National Wildland Fire Coordinating Group Wildland Fire Qualification Subsystem Guide (PMS 310-1/NFES 1414) to attain equivalent NFPA certifications." Objectives for future fire management are in Table 16 (below), and additional detail on management activities will be provided in the *Wildland Fire Management Plan*.

On October 10, 2018, Hurricane Michael made landfall on Tyndall AFB as a Category 5 hurricane with maximum sustained winds of 160 mph, causing catastrophic damage to Tyndall AFB and surrounding areas. In addition to significant loss and damage to base infrastructure, natural resources were severely impacted. A total of 12,000 acres (4,856 ha) of pine forest sustained severe (5,000 acres (2,023 ha)) or catastrophic (7,000 acres (2,833 ha) wind damage creating a hazardous fuel situation within hours. Timber salvage operations on 9,285 acres (3,758 ha) began in December 2018 and was completed in March 2020. Salvage operations included traditional timber salvage of long poles until product degradation occurred then shifting to a chipping and grinding operation in which all damaged timber was cut, chipped, and hauled to WestRock Paper Mill in Panama City. The chipping operations leave most sites relatively clean, aside from chipping decks and scattered debris, so in areas that have been chipped, fuels are similar to what they were previous to the storm minus the large trees.

Prescribed Fire

Prescribed fire is the most important ecosystem management tool for Tyndall's natural resources managers, and is vital to reducing hazardous fuels that could negatively impact the mission. An aggressive prescribed fire program is essential for meeting ecosystem management goals, maintenance/restoration of natural communities including enhancement of T&E species habitat, and control of non-native invasive plant species. In addition to improving habitat for numerous fire dependent plants and animals, it is used for minimizing damage and costs from wildfires, reducing mission interference from wildfire smoke and wildfire suppression efforts, eliminating Brown Spot Needle Blight disease from longleaf pine seedlings, preparing areas for longleaf pine restoration, creating conditions that promote a diverse native understory plant community by suppressing hardwoods and other undesirable plant species, and manipulating vegetation for mission requirements. Prescribed fire requires close coordination with military mission personnel as well as state and federal cooperators/regulators. The complexities of smoke management, military mission coordination and airspace restrictions pose significant challenges to the prescribed fire program. Smoke management is a priority for all prescribed burns, and a burn authorization is requested

from Florida Forest Service (Chipola District) for every burn. Wind and atmospheric conditions that result in smoke on Highway 98, the Tyndall AFB runway, or other sensitive smoke receptors will be avoided when possible.

Prior to Hurricane Michael, the Eglin WSM, in consultation with TAFB NR, set an objective of burning 6,000 acres/year (2,428 ha/year) to meet ecosystem management and protected species goals (see Figure 18 for Tyndall fire history since 2014). The desired fire return interval is every 18 months to 2 years, with a combination of growing and dormant season burns. Factors considered in the prioritization of areas for prescribed burning included the time elapsed since the last burn, the fire frequency, silvicultural treatments (particularly sand pine TSI), and multiple floral and faunal elements, such as the presence of T&E species. Details for prescribed fire planning, policy, smoke management, and implementation on Tyndall AFB are covered in the *Tyndall AFB Wildland Fire Management Plan.*

The near-term priorities for re-introducing prescribed fire at TAFB are 1) to provide suitable planting conditions for a massive reforestation effort planned for the installation, and 2) to keep fuels reduced to mitigate wildfire intensity and severity. Due to uncertainties and constraints posed by the dramatic change in fuel structure and loading associated with Hurricane Michael, the interim annual prescribed fire objective for FY2020 - FY2022 will be 4,500 acres/year (1,821 ha/year). Over time as hurricane fuels are reduced, and the Eglin WSM adjusts to burning in hurricane fuels, our hope is that the annual acreage objective can be increased back up to the pre-hurricane level 6,000 acres/year (2,428 ha/year). These projected acreage objectives will be reviewed annually for feasibility. In the next four years, over half of the annual acres each year will be focused on site preparation burning ahead of winter planting of longleaf pine seedlings. By 2024, most of the site preparation should be complete and priority can shift back to burning primarily for fuel reduction and ecological restoration and maintenance. Table 16 details post-hurricane prescribed fire requirements for Tyndall AFB.

Table 16 - Post-hurricane prescribed fire requirements for Tyndall AFB.

Year	Site Prep Acres	Non-Site Prep Acres	Minimum Total Acres	Target Total Acres
FY2020	700 (283 ha)	3,800 (1,538 ha)	4,500 (1,821 ha)	4,500 (1,821 ha)
FY2021	2,500 (1,012 ha)	2,000 (809 ha)	4,500 (1,821 ha)	4,500 (1,821 ha)
Fy2022	2,500 (1,012 ha)	2,000 (809 ha)	4,500 (1,821 ha)	4,500 (1,821 ha)
FY2023	2,500 (1,012 ha)	2,000 (809 ha)	4,500 (1,821 ha)	6,000 (2,428 ha)
FY2024	1,000 (405 ha)	3,500 (1,416 ha)	4,500 (1,821 ha)	6,000 (2,428 ha)

The absence of pine trees over much of the chipped stands will likely affect fuels and fire behavior in a number of ways 1) reduction in fine fuel loading from pine litter inputs, 2) reduction in loading of coarse woody debris (except currently in chipping deck and loading areas), and 3) change in microclimate, due to absence of trees, and associated effects on fuel drying rates and wind speed attenuation. Prior to Hurricane Michael, fuels in most of the bedded slash pine plantations on Tyndall AFB were shrub-dominated, lacked a grassy groundcover component, and exhibited an excess of duff accumulation due to lack of fire. The dominant shrub layer coupled with the fact that many of the chipped areas had been recently burned (within 1-2 years) prior to the storm has created novel fuel beds that lack a fine fuel component and may pose challenges to burning and fire spread under low to moderate wind speeds. Smoke management has also become more challenging following Hurricane Michael due to the massive increase in coarse woody debris and associated potential for prolonged smoldering.

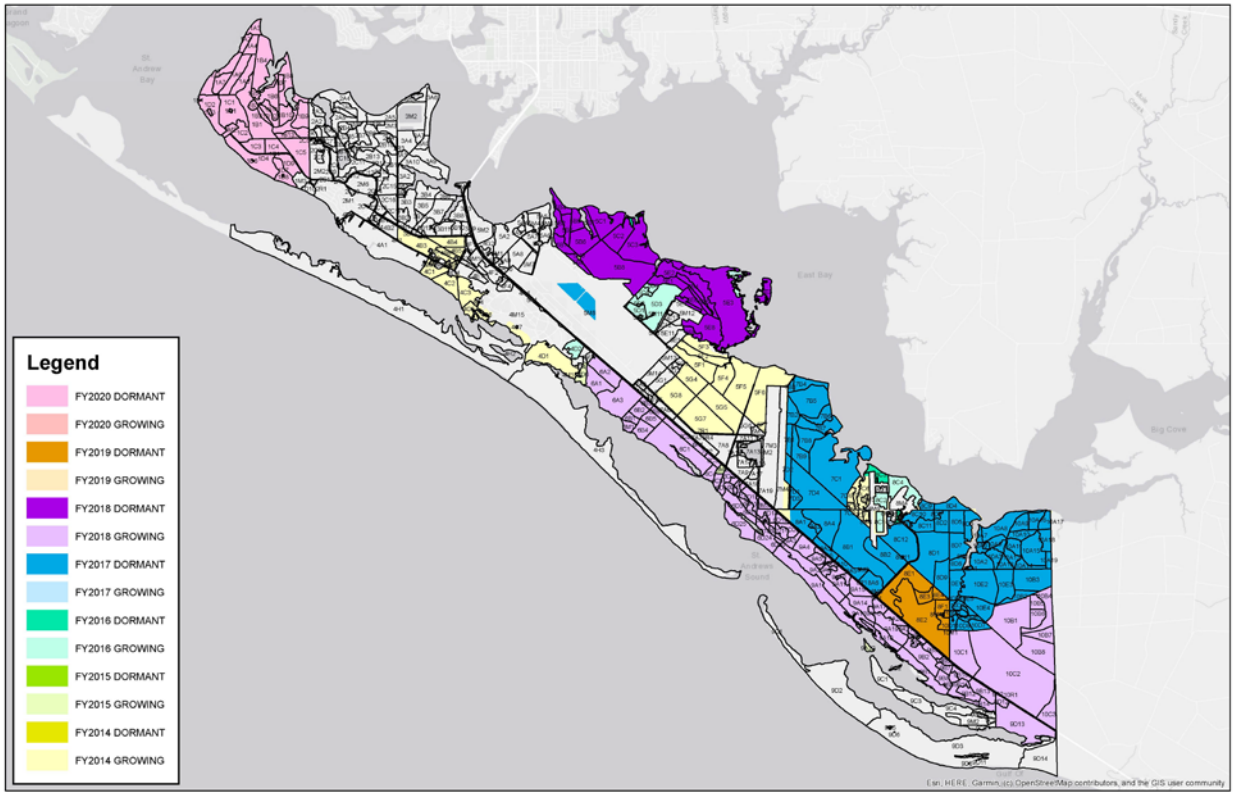

Figure 17 - Prescribed fire history on Tyndall AFB.

Wildfire Support

Wildfire support includes all aspects of fire prevention, detection, suppression, readiness, fireline rehabilitation, and training. Wildfire frequency at Tyndall is approximately three to five per year, but challenges to wildfire suppression in the aftermath of Hurricane Michael have increased. In areas in which hurricane debris has not been removed through salvage logging/chipping, equipment access will likely be hindered, suppression will likely take longer, and firefighter safety will remain a concern. More fuel will be available to burn, and fireline intensities are expected to increase due to higher fuel loadings and more ladder fuels. Smoke from wildfires will likely smolder longer and more woody material will be available for smoldering consumption. Mop-up will be constrained by access to the fires and will likely take longer than it used to pre-storm. The Wildland Fire Program Coordinator (WFPC) designated in the TAFB WFMP ultimately has authority over wildfire suppression plans and decisions, but suppression decisions are typically made in partnership among TAFB NR Chief, Tyndall Fire and Emergency Services, and the Eglin WSM. The Eglin WSM lead at Tyndall AFB, or another qualified Eglin WSM firefighter, typically serves as the Incident Commander for wildfires on Tyndall when available, but in his/her absence, the Florida Forest Service (FFS) – Chipola District may serve as Incident Commander on Tyndall AFB. FFS Chipola currently honors a Mutual Aid Agreement between Eglin AFB and the Florida Forest Service that provides for 24-hour wildfire suppression response on Tyndall AFB at no cost. Pertinent installation personnel create an annually updated map of internal and external values at risk from wildfire. At all times, for all wildfires, the safety of firefighting personnel will be the governing consideration.

Equipment is maintained on a daily basis and personnel maintain a state of readiness for possible wildfires. When fire danger or occurrence is high, pre-positioning of equipment and personnel may be required. When

wildfire risk and/or occurrence is very high to extreme, additional resources may be ordered through the Florida Forest Service. Additional detail for wildfire control activities for Tyndall AFB will be provided in the *Wildland Fire Management Plan*.

Fire and Climate Change

Annual precipitation increased by more than 14% in the RCP 4.5 scenario and by more than 8% in the RCP8.5 scenario. In 81% of the simulated future months, precipitation increased, and in over half of those the increase is more than 10%. While temperature also increases, the changes are more moderate and it is likely the increased precipitation will inhibit wildfire ignitions and spread. January and February, however, are projected to retain historic rainfall amounts, as are July through September. These months may retain some of their current day fire likelihood, while the other months are likely to experience reduced fire frequency.

Tyndall AFB is not expected to experience wholesale vegetation changes in the modeled scenarios. Coupled with CO_2 fertilization southern pine forests are expected to become more dense and shift away from the more open savannas that are predominant in many areas (Beckage, Gross, & Platt, 2006; Bond & Midgley, 2000). Additionally, increased rainfall and temperatures, predicted across all scenarios and time horizons, will push the saw palmetto beyond the known bioclimatic envelope in the US (Van Deelen, 1991), with unknown effects. If saw palmetto increases in understory dominance, fires may become more intense as understory fuels shift from grass and litter dominated to more saw palmetto dominated. Whether this represents an increase in fire intensity will depend on the current understory, with areas shifting from low or moderate load grasses to saw palmetto resulting in an increase in intensity, and areas shifting from heavy grass load areas generally experiencing a decrease in fire behavior except under the highest intensity fire conditions. The shift to saw palmetto, away from grasslands, may result in decreased spread rates relative to grass fuels. Relative to litter dominated understory, a shift to saw palmetto would represent an increase in fire rate of spread and intensity under most circumstances.

As it is unknown how saw palmetto may respond to the increasingly wet and warm conditions, it is possible grass may expand in dominance at the expense of saw palmetto. However, woody plants are generally favored in high CO_2 conditions and may outcompete the grasses in some locales (Bond & Midgley, 2000).

7.10 Agricultural Outleasing

Applicability Statement

This section applies to AF installations that lease eligible AF land for agricultural purposes. This section is not applicable to this installation.

Program Overview/Current Management Practices

Currently there are no agricultural outleasing activities on the installation and none are under consideration. Any changes to this program would be reflected in future revisions of this document.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to AF installations that perform pest management activities in support of natural resources management, e.g. invasive species, forest pests, etc. This section is applicable to this installation.

Program Overview/Current Management Practices

An invasive species can be defined as a species that is not native to an ecosystem and who's intentional or accidental introduction causes or is likely to cause environmental and/or economic damage or harm to human health. Once established, invasive species may reduce biological diversity and disrupt the natural community integrity and function by altering habitat and out-competing native species. The introduction and spread of non-native invasive species may also create negative issues for military training or for other anthropogenic land uses. Objectives for future management of invasive species are in the Management Goals and Objectives section, and additional detail on management activities will be provided in the *Nuisance Species Component Plan*.

EO 13112, Invasive Species, requires federal agencies to identify actions that may affect the status of invasive species and to use appropriate programs and authorities to:

- Prevent invasive species introductions
- Detect populations of invasive species and rapidly institute cost-effective and environmentally sound control measures
- Monitor invasive species populations
- Restore native species and habitat conditions in areas that have been invaded
- Conduct research and develop technologies to prevent the introduction of, and to control the spread of, invasive species
- Promote public awareness of invasive species and the means to address them

The order also states that federal agencies are not to authorize, fund, or carry out actions that are likely to promote the introduction or spread of invasive species unless the agency has made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species and that all reasonable measures to minimize the risk of harm will be taken in conjunction with the actions. Tyndall's *Nuisance Species Component Plan* describes the management of non-native invasive, pest, and nuisance species.

Invasive Non-native Plant Species

Tyndall AFB is committed to the identification, control, and eradication of invasive non-native plant species. The overall goal is to restore areas to their ecological communities to their natural conditions, prevent new introductions, and protect imperiled species and their habitats in compliance with EO 13112, the Sikes Act, and the ESA. The primary invasive plants of concern for Tyndall AFB are cogon grass (*Imperata cylindrica*), Japanese climbing fern (*Lygodium japonicum*), and Chinese tallow (*Triadica sebifera*); a complete list of invasive plant species documented on Tyndall will be provided in the *Nuisance Species Component Plan*.

Primary objectives for non-native invasive plan management include:

- Treating and controlling infestations

- Preventing new infestations
- Restoring infest areas to the natural ecological community type
- Providing protection to T&E species and habitats

Control of invasive plants is necessary to inhibit the establishment and proliferation of non-native plant species and is an integral component in the maintenance and restoration of natural communities.

Disturbances associated with events such as hurricane Michael provide opportunity on the landscape for the introduction and subsequent establishment of new populations of invasive plants through wind and water movement of plant propagules as well as transport of propagules in and on vehicles and machinery used in clean up and recovery (Hodkinson and Thompson 1997). Key in preventing the establishment and spread of invasive species is early detection and eradication. In an effort to limit potential impacts of invasive species on Tyndall AFB, a comprehensive installation-wide inventory with continued monitoring is necessary to locate, identify, and assess the level of infestation to assist in developing and prioritizing treatment plans.

Non-native and Nuisance Animal Species

Non-native and nuisance animals can prey on rare and sensitive species, compete with native species for resources, damage desirable/managed habitats, and carry rabies and other infectious diseases that may affect wildlife populations. The presence of non-native animals may also cause nuisance issues on the installation. Nuisance species are defined as wild animals that cause annoyance, health hazard, safety hazard, landscape or property damage, or compromise mission objectives, and may be native or non-native. Control of nuisance animals is the responsibility of the Pest Management Shop and Tyndall Natural Resources. The Pest Management Shop responds to complaints of nuisance animals in and around buildings and other structures, with the exception of Base Housing. The Military Housing Contractor responds to all Base Housing complaints. Natural Resources removes nuisance wildlife upon request.

Non-native and nuisance animal species present on the base include black bears, alligators, osprey, deer, bats, coyotes, feral hogs, red and gray foxes, fire ants, feral dogs and cats, and other species such as snakes, raccoons, beavers, skunks, and nine-banded armadillos. Tyndall AFB has the ability to use lethal and non-lethal methods to control wildlife. Applicable federal and state permits are obtained prior to implementation of any wildlife control activity. Required permits include, but are not limited to, black bear hazing/capture, MBTA depredation, Bald Eagle harassment, FWC alligator relocation permit, and DoD pesticide certification. Tyndall also conducts preventative nuisance animal control through securing/removal of attractants (i.e., trash, pet food, bird feeders), and provides education to base residents, as resources allow.

Nuisance animals that impact T&E species, particularly on the barrier islands, are removed by a full-time USDA contractor. Target predators include coyotes (*Canis latrans*), grey fox (*Urocyon cinereoargenteus*), raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), opossum (*Didelphis virginiana*), feral cats (*Felis catus*), feral hogs (*Sus scrofa*), and crows (*Corvus brachyrhynchos*). Early Restoration funding from the Deepwater Horizons oil spill of 2010, created supplemental funding for shorebird protection through the USDA predator removal from 2013-2017. A contract with the USDA and 325 CES began in 2017 and is still in place for predator control.

Refer to the *Nuisance Species Component Plan* for more information. Details regarding bird control, including incidental and intentional takes, during military readiness activities are described in the *Tyndall AFB BASH Plan* (Tyndall AFB, 2013b).

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to AF 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

Birds and wildlife have the potential to cause millions of dollars in damage to aircraft and the loss of human life. The 325th FW Flight Safety (325 FW/SEF) is the office of primary responsibility for monitoring and implementation of BASH Plan 910 (Tyndall AFB, 2018). The participation of Tyndall Natural Resources in the BASH program is directed by AFM 32-7003, *Environmental Conservation*, and AFI 91-202/Air Combat Command Supplement 1, *The USAF Mishap Prevention Program*. The directives mandate that Tyndall Natural Resources participate in the development, review, approval, and implementation of the Tyndall BASH Plan. Additional Natural Resources responsibilities include maintaining current state and federal permits required for management of birds and wildlife to promote airfield safety.

Passive control measures such as landscape design, elimination of food and roost sources, turf/water management and forest management are the most permanent ways of reducing the attractiveness of airfields for bird and wildlife utilization. Active control measures may incorporate trained working dogs, pyrotechnics, bioacoustics, and depredation (lethal control) activities. Depredation activity is only implemented as a last resort when other scare tactics are proven unsuccessful.

Specific types of management strategies and actions incorporated into the BASH program include the following:

- Bird harassment techniques
- Removal of dead animals (carrion) from airfields; carrion should be removed promptly to prevent attracting scavenger animals
- Auditory bird dispersal unit
- Sirens/horns/lights
- Pyrotechnics (shell crackers)
- Maintain drainage ditches in areas that have potential to hold water
- Grass heights are maintained at 11 inches
- Insect outbreaks may be sprayed with pesticides
- Tree and scrub vegetation management
- Broadleaf seed and berry producing vegetation controlled with herbicide treatment
- Keep main installation dumpsters secure when not in use to prevent wildlife access and maintain sanitary conditions around dumpsters
- Lethal control measures, as necessary (depredation permits are acquired and annual reports are submitted to the USFWS by the 325th FW/SEF office)

USDA Wildlife Services is the primary source for observing wildlife hazard conditions; they coordinate with Base Operation and maintenance personnel for collection of bird remains after strikes, submitting reports, shipping salvaged bird remains for analysis, and providing wildlife harassment and dispersal services. Wildlife Services conducts wildlife surveys, maintains a database of wildlife activities to identify long-term trends, traps animals when necessary (raccoons, coyotes, etc.), and trains airfield management personnel on proper BASH response. Wildlife Services also prevents other animal hazards to aircraft by use of trapping and exclusion methods for animals such as wild hogs. Fencing may control deer, and the deer hunting program is considered part of the BASH program. Some animals may be removed by shooting. See the *Tyndall BASH Plan* for additional information.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to AF installations that are located along coasts and/or within coastal management zones. This section is applicable to this installation.

Program Overview/Current Management Practices

Under the Coastal Management Act, the Florida Coastal Management Program (FCMP) was established for determining federal consistency under the federal Coastal Zone Management Act (CZMA). Approved by the National Oceanic and Atmospheric Administration in 1981, the FCMP is based on 24 statutes administered by a network of nine state agencies and five water management districts. Federal agency activities that have the potential to impact Florida's coastal resources are required to be consistent with the FCMP.

Federal agencies, such as Tyndall AFB, make determinations as to whether their actions are consistent with the 24 statues of the FCMP. Determinations are submitted to the FDEP State Clearinghouse for review and concurrence. The Clearinghouse enables state agencies to review federal activities. If a reviewing agency determines that a project is not consistent with Florida's statutes, the FCMP requires the applicant to revise its plans. In this way, the Florida State Clearinghouse and the federal agency work together to ensure projects are consistent with Florida's statutes thus protecting coastal resources. Natural Resources coordinates planned construction activities through the use of the CZMA as part of the EIAP review process. Projects do not proceed until all clearances and approvals are in place.

In the 2019 *Report on Effects of a Changing Climate to the Department of Defense*, the Department of Defense (DoD) acknowledged the increasing risk that climate change poses to US military installations and their missions globally. Tyndall Air Force Base (TAFB) which was heavily impacted by wind and storm surge from Hurricane Michael provided a prime example of this risk. Nearly two years after the storm, TAFB continues to recover. Clean-up of storm impacts to infrastructure and natural systems is ongoing, and planning efforts for rebuilding Tyndall as a "Base of the Future" are well underway. The rebuild of TAFB has been mandated to align with DoD and Air Force directives promoting coastal resiliency.

The rebuild stresses a reliance not only on resilient man-made structures constructed to withstand major hurricane-force winds, but also on natural and nature-based features to absorb the impacts of sea level rise and catastrophic storm surge. Over the past several decades, the barrier Islands of Shell Island, Crooked Island West (CIW), and Crooked Island East (CIE) have provided TAFB with a measure of natural defense

against wave action and storm surge impacts associated with storm events. Shell Island, CIW, and CIE also provide 18 miles of critical habitat for beach mice, nesting sea turtles, and shorebird species protected by the Endangered Species Act and Florida Administrative Code. However, Hurricane Michael demonstrated the fragility of these barrier islands, flattening 10-20 ft. dunes, denuding sections of vegetation, and completely breaching portions of the islands.

Coastal Zone and Marine Resources Management and Climate

Based on projected inundation, the following set of adaptation strategies have been identified for consideration (**Table 17**). Suggested adaptation projects are rated by their difficulty to implement and their relative efficacy. Ease of implementation is ranked from 1 to 3, with 1 being most difficult to implement and 3 being the easiest to implement. Efficacy is ranked from 1 to 3, 1 being the least effective and 3 being the most effective.

The ecological impacts related to adopting each of these projects is stated to be positive if no negative impacts are expected. If these projects are expected to have negative ecological impacts, they are rated one (being as low negative impacts) through three (being high negative impacts).

Table 17 - Summary of adaptation strategies to mitigate potential SLR and SS inundation

Strategy	Implementation	Efficacy	Ecological impacts	Ecological resources
Coastal Relocation	3	3	Site specific	Bronen 2011
Controlled Overtopping	2	2	Positive	NRC 2013
Saltwater Intrusion Barriers	2	3	Positive	USEPA 2015
Sea Walls	3	3	2	Gittman et al. 2016
Storm Surge Gates	3	3	1	Tam 2009

7.14 Cultural Resources Protection

Applicability Statement

This section applies to AF 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

The primary goal of cultural resources management at Tyndall is to support mission readiness through regulatory compliance. As a federal agency, Tyndall is required by law to consider the effects of its actions on archaeological sites and historic properties. Mandating legislation includes:

- Antiquities Act of 1906
- Historic Sites Act of 1935
- National Historic Preservation Act (NHPA) of 1966 as amended, 36 CFR Part 800
- Archaeological and Historical Preservation Act of 1974
- Archaeological Resources Protection Act of 1979, the NEPA of 1969

- Native American Graves and Repatriation Act of 1990
- American Indian Religious Freedom Act
- Air Force Manual 32-7003, Environmental Conservation

Tyndall's ICRMP provides recommendations for the routine maintenance of both National Register of Historic Places (NRHP) eligible and potentially eligible archeological sites, as well as historic buildings on Tyndall AFB (Tyndall AFB, 2014c). The ICRMP for Tyndall AFB was last updated in 2019.

Projects and other resource management activities located in un-surveyed areas have the potential to impact unknown sites. NHPA Section 106 requires that federal agencies analyze the impacts of their activities on historic properties, or cultural resources included in, or eligible for inclusion in, the NRHP through the State Historic Preservation Officer. Activities outlined in this INRMP are subject to Section 106 review; close coordination between Cultural Resources and Natural Resources staff occurs to avoid impacts to cultural resources, especially for timber sales, TSI, prescribed fire, erosion control, invasive species, and recreational use projects. For instance, Tyndall Natural Resources Forest Management personnel submit maps to Cultural Resources to determine if the areas will require a survey prior to a forestry operation. Fire Management personnel coordinate directly with Cultural Resources by providing burn maps in advance of scheduled burns so that resources and areas that need to be protected from fire and heavy equipment can be identified.

7.15 Public Outreach

Applicability Statement

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

Program Overview/Current Management Practices

Communication and cooperation with the public is a critical component of any natural resource management effort. The goal of public outreach efforts is to encourage understanding of, support for, and involvement in the many management and monitoring programs within the installation. Without the support of partner organizations and local citizens, it becomes very difficult to implement effective management programs. Outreach is accomplished through:

- Research partnerships and internships
- Presentations and guided tours
- Volunteer involvement (i.e., T&E monitoring, permit sales, forestry program, and hunting)

As resources permit, Tyndall's wildlife biologist, forester, and USFWS staff provide classes and tours to interested parties, including, but not limited to, Boy/Girl Scouts, school groups, Tyndall Youth Center, civic groups, and wildlife-oriented organizations.

7.16 Geographic Information Systems (GIS)

Applicability Statement

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

Program Overview/Current Management Practices

Tyndall AFB utilizes a geographic information system (GIS) called GeoBase to assist base planners with making informed decisions for current and future activities. This system contains digitized maps, land use data, and planning information. Tyndall Natural Resources uses ArcView GIS to assist with natural resources management. Currently, natural resources information incorporated into the GIS includes fire management, forestry, wildlife, and outdoor recreation.

The AF is working to consolidate and centralize all AF GIS data. The current centralized system loses fidelity at the installation level because the installations have had no ability to update the system; this situation is being addressed as funding permits. The consolidated system has not been conducive to T&E data or protected cultural data management. Should the centralized system be adopted, the ability to use GIS for natural resources planning will be diminished.

8.0 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 AF 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 – Management Goals and Objectives

Based on an assessment of the resources, current conditions, and management issues identified in the previous chapters, this section details the primary and supporting goals of the INRMP to ensure Tyndall AFB successfully accomplishes its mission while maintaining and improving the natural environment. The full scope of the Tyndall Natural Resources program is a combination of continuing established protocols, programs, and projects (detailed in the Natural Resource Program Management section) in the context of strategic priorities and new objectives in the Management Goals and Objectives section.

GOAL I. PROVIDE NATURAL RESOURCE MANAGEMENT AND COORDINATION SERVICES IN SUPPORT OF THE MISSION.

- SUPPORTING GOAL I.A. Support military mission objectives through a responsive natural resources analysis and consultation process (NEPA/ESA).
    - OBJECTIVE I.A.1. Continue to develop safeguards in the EIAP to ensure that actions do not proceed until all pertinent coordinating agencies have had the opportunity to comment, and any necessary CZMA, ESA, Essential Fish Habitat (EFH), and MMPA clearances have been obtained.
- SUPPORTING GOAL I.B. Ensure long-term availability of natural resources to support the military mission through coordination with other environmental and mission organizations.
    - OBJECTIVE I.B.1. Review all Section 7 consultations, Environmental Impact Statements (EISs), EAs, and other applicable regulatory permits for commitments made by Tyndall, and establish a process by which natural resource requirements are communicated to pertinent personnel for implementation. For those that are the responsibility of Natural Resources, ensure these are programmed for in ACES.
    - OBJECTIVE I.B.2. Establish a process to track natural resource requirements from Section 7 consultations, MMPA and EFH permits, EISs, EAs, and other applicable regulatory permits, and implement a system that ensures compliance with the requirements (i.e., site inspections). Provide required annual reports to regulators.
    - OBJECTIVE I.B.3. Provide a Natural Resources familiarization briefing and tour of the base for commanders within three months of taking command.
    - OBJECTIVE I.B.4. Develop a briefing on natural resources and associated protection measures, and provide to appropriate organizations and projects that have the potential to impact these resources.
    - OBJECTIVE I.B.5. By January 1 of each year, conduct assessment to determine what organizations have a need for beach access and driving; by February 1 of each year, provide a reminder or new notice about the base operating instruction to affected organizations.
    - OBJECTIVE I.B.6. Ensure compatibility of recreation areas with the short and long-term requirements of the military mission through at least annual coordination with natural and cultural resource managers.
    - OBJECTIVE I.B.7. At least annually review and update natural resources data layers.
    - OBJECTIVE I.B.8. Coordinate with other agencies and organizations regarding climate change impacts that may affect Tyndall AFB, and communicate pertinent information to base leadership.
    - OBJECTIVE I.B.9. Evaluate options for addressing climate change impacts on Tyndall's natural resources (i.e., movement corridors for federally listed species and other wildlife).
- SUPPORTING GOAL I.C. Provide wildland fire management support to Tyndall's military mission, in coordination with the AFWFC.
- **I.C.1.** Update the TAFB WFMP annually, or as needed, in cooperation with AFCEC/CZOF to capture any changes to the Tyndall mission, land use, wildland fire objectives and strategies, and/or burn unit boundaries.
- **I.C.2.** Conduct annual planning meetings between the Eglin Wildland Support Module (AFCEC/CZOF) and TAFB Natural Resources staff to establish criteria to prioritize compartments and units that require prescribed fire and create an annually updated map displaying proposed burn units.

- **I.C.3.** Coordinate with pertinent installation personnel to develop an annually updated map of internal and external values at risk from wildfire.
- **I.C.4.** Submit annual AF Form 813 detailing proposed burn units and proposed roads and firebreaks to be maintained or created.
- **I.C.5.** Annually, **e**ducate training groups and other organizations at TAFB concerning wildfire prevention/mitigation and the benefits of prescribed fire to facilitate a reduction in fire starts.
- **I.C.6.** Through a responsive planning process, ensure minimal interference with military mission activity during wildland fire operations.
- **I.C.7.** By 2021, update all interagency agreements related to wildfire incident response that formalizes and integrates this response with TAFB's FES and other responding agencies.
- **I.C.8.** Enter the perimeters of all hazardous fuel treatments into the Fire DSS database to be maintained by AFWFB. Periodically analyze this database to ensure all priority lands within TAFB are being included in the prescribed fire program.
- **I.C.9.** By 2023, establish criteria to identify priority fire-dependent areas that require mechanical vegetation removal due to the difficulty of burning (i.e., urban interface, fire suppressed/high hazard). By 2024, conduct mechanical fuel treatments on identified areas.
- **I.C.10.** By 2023, identify a system of fire breaks, including minimum specifications and condition monitoring protocols to reduce the probability of a fire threatening identified high values at risk.
- **I.C.11.** Annually maintain firebreaks based on needs identified during condition monitoring.
- **I.C.12.** By 2022, develop a fire considerations map detailing sensitive areas such as wetlands, endangered species locations, and unexploded ordinance contaminated areas, and formalize procedures required for these areas.
- SUPPORTING GOAL I.D. Provide for effective resource conservation and protection through enforcement of natural resources laws and public use outdoor recreation rules and regulations.
    - OBJECTIVE I.D.1. Maintain conservation law enforcement presence at Tyndall to enforce natural resource regulations.
    - OBJECTIVE I.D.2. Annually coordinate with Security Forces to identify areas where they could assist with enforcement of natural resources regulations, and develop procedures to support this coordinated effort.
- SUPPORTING GOAL I.E. Provide natural resources expertise and field support to Flight Safety and BASH program.
    - OBJECTIVE I.E.1. Annually maintain all permits required for lethal control of migratory birds and coordinate removal of nuisance wildlife as needed to promote airfield safety.
    - OBJECTIVE I.E.2. Semi-annually meet with BASH Working Group to identify long-term solutions for management of airfield wetlands that minimize adverse effects to natural resources while reducing BASH.
    - OBJECTIVE I.E.3. Conduct forestry operations when practical to remove trees that are in or have immediate potential to encroach into airfield glide slopes.

GOAL II. RESTORE AND MANAGE FORESTS FOR MISSION USE, HABITAT IMPROVEMENT, AND PROTECTION OF T&E SPECIES.

- SUPPORTING GOAL II.A. Annually prioritize and maintain/ restore native forest ecosystems and associated species to increase ecosystem resiliency and military mission flexibility.

- OBJECTIVE II.A.1. Annually initiate any NEPA, Section 7 consultation, Section 106 consultation, and other pertinent consultations/permits required for Tyndall INRMP activities.
- OBJECTIVE II.A.2. Complete at least 4500 acres (1,821 ha) of prescribed fire annually based on a five-year running average.
- OBJECTIVE II.A.3 Over the next five years, meet annual prescribed fire acreage targets prescribed in Table 3.8 of the Tyndall WFMP and prioritized based on fuel reduction, ecological, and/or silvicultural drivers for fire.
- OBJECTIVE II.A.4. Annually establish criteria to prioritize areas for longleaf pine restoration.
- OBJECTIVE II.A.5. Site preparation and plant 9,000 acres (3,642 ha) of longleaf seedlings by 2025 for hurricane Michael recovery at approximately 681 trees per acre.
- OBJECTIVE II.A.6. Continue to establish criteria and a process to prioritize areas of invasive plant species infestations for treatment.
- OBJECTIVE II.A.7. Annually identify and map locations of invasive plant species, and treat approximately 500 acres (202 ha) of priority areas.
- OBJECTIVE II.A.8. Conduct predator and nuisance animal removal, control, hazing, and trapping in priority areas.
- OBJECTIVE II.A.9. Provide education/outreach services to housing residents, Security Forces, and geographically separated work areas on the Tyndall range regarding nuisance species.
- OBJECTIVE II.A.10. Annually integrate groundcover restoration with longleaf restoration, including a needs assessment of areas for planting, identification of suitable harvest sites, and determination of the best species composition and planting times for Tyndall.
- OBJECTIVE II.A.11. Complete 100% of annual site prep burning requirements prescribed by the TAFB Forester based on projected annual planting rates to remove logging slash and reduce interspecific competition with planted pine seedlings.
- OBJECTIVE II.A.12. Monitor and annually adjust prescribed fire plan prescription parameters through an iterative process based on fire behavior and fire effects in response to novel fuel conditions caused by Hurricane Michael
- OBJECTIVE II.A.13. Monitor and annually adjust prescribed fire plan smoke management guidelines based on experience and lessons learned burning in hurricane-impacted fuels.
- OBJECTIVE II.A.14. Conduct first order fire effects monitoring using the Composite Burn Index (CBI) protocol within all permanent vegetation plots established by the Florida Natural Areas Inventory (FNAI) that fall within prescribed burns or wildfires as they occur.

- SUPPORTING GOAL II.B. Protect bald eagles, migratory birds, and other protected avian species IAW federal law.
  - OBJECTIVE II.B.1. Annually survey for new bald eagle nests, and conduct monthly checks during nesting season. Maintain a minimum 330-foot buffer around active nests, follow Activity Specific guidelines for any applicable category of activity (A-H), and implement any other pertinent recommendations from the Bald Eagle Management Guidelines.
- SUPPORTING GOAL II.C. Protect indigo snakes and their habitats IAW federal law, and prepare for federal listing of the gopher tortoise.

  - OBJECTIVE II.C.1. Survey for gopher tortoises, indigo snakes, and other sensitive commensals at proposed project areas within high priority habitat where the ground will be significantly disturbed.
  - OBJECTIVE II.C.2. Annually develop a comprehensive map layer of known gopher tortoise burrows and report for CCA data call.
- SUPPORTING GOAL II.D. Survey for and manage federally listed and petitioned plant species IAW federal law, and to minimize potential listing impacts.
  - OBJECTIVE II.D.1. Continue to survey and map federally listed and petitioned plant species which are either known to occur or may occur on Tyndall, including the following: Godfrey's butterwort, bog tupelo, Henry's spider lily, black-bract pipewort, hairy-peduncled beakrush, Kral's yellow-eyed grass, panhandle meadow-beauty, small- flower meadow-beauty, smooth-barked St John's wort, West's flax, Florida skullcap, white birds-in-a-nest, and telephus spurge. Conduct annual population counts for federally listed plant species.

GOAL III. ENABLE LONG- TERM SUSTAINABILITY OF BARRIER ISLAND ENVIRONMENTS FOR MILITARY USE BY PROTECTING T&E SPECIES AND THEIR HABITATS.

- SUPPORTING GOAL III.A. Monitor and survey sea turtles, beach mice, shorebirds, and Gulf sturgeon IAW federal law.
  - OBJECTIVE III.A.1. Locate, protect, and evaluate 100 percent of sea turtle nests on Tyndall property. Collect and maintain data on nest success, depredation, and disorientation for all nests.
  - OBJECTIVE III.A.2. Respond to, and investigate, 100 percent of sea turtle stranding reports on AF property. Collect appropriate data and report to the Florida Stranding and Salvage Network; contact within 24 hours of investigating the report. Coordinate with outside partners on marine mammal strandings. Report 100% Gulf sturgeon strandings to USFWS-Panama City and NMFS-Southeast Regional Office/Office of Protected Resources/St. Petersburg.
  - OBJECTIVE III.A.3. Conduct or support FWC and USFWS track count surveys, tracking tube surveys, and trapping for population density and trends in Choctawhatchee and St. Andrew beach mice, and support with translocation of Tyndall's beach mice off-site if deemed helpful to achieving species recovery.
  - OBJECTIVE III.A.4. Monitor beach mice for activities that result in or could result in take or habitat loss, and conduct periodic monitoring of habitat and species health (live trapping/observation). Conduct population surveys as needed to verify the success of the overall recovery effort.
- SUPPORTING GOAL III.B. Reduce or eliminate threats to sea turtles, beach mice, and shorebirds IAW federal law.
  - OBJECTIVE III.B.1. Annually post nesting and wintering areas for shorebirds (piping plover, red knot, snowy plover, least tern, black skimmer, American oystercatcher) for protection.
  - OBJECTIVE III.B.2. Install scavenger-proof trashcans in areas where beach mice are found and work with 325th CES/Operations to ensure frequent trash pick-up.

- OBJECTIVE III.B.3. Maintain the NCOs beach access road as needed.

- SUPPORTING GOAL III.C. Protect and restore beach habitats for sea turtles, beach mice, and shorebirds IAW federal law.
  - OBJECTIVE III.C.1. Identify priority beach areas in need of erosion prevention, food sources, and cover for protected species, and employ appropriate dune and/or native vegetation reestablishment methods.

GOAL IV. RESTORE AND PROTECT WETLAND HABITATS TO COMPLY WITH FEDERAL LAW AND PROTECT T&E SPECIES.

- SUPPORTING GOAL IV.A. Survey and rehabilitate priority wetlands IAW federal law.
  - OBJECTIVE IV.A.1. By 2021, conduct wetland field investigations, update wetland GIS data, and complete written reports of investigations to include executable discrete steps for required remediation/restoration of wetland hydrology across Tyndall, as well as project prioritization based on impact and cost.
- SUPPORTING GOAL IV.B. Survey for and manage federally petitioned wetland animal species IAW federal law, and to minimize potential listing impacts.
  - OBJECTIVE IV.B.1. As needed, survey and map federally petitioned wetland animal species locations which may occur on Tyndall, including the following: *Procambarus apalachicolae*, purple skimmer, and Say's spiketail.

GOAL V. PROVIDE A VARIETY OF USES, VALUES, PRODUCTS, AND SERVICES TO PRESENT AND FUTURE GENERATIONS WHILE MAINTAINING SUSTAINABLE ECOSYSTEMS.

- SUPPORTING GOAL V.A. Provide hunting and fishing opportunities consistent with demand, quality, and cost within the constraints of the AF mission.
  - OBJECTIVE V.A.1. Annually evaluate, prioritize, and submit 332s to maintain/repair boat ramps to prevent erosion and safety issues.
  - OBJECTIVE V.A.2. Work with the USFWS to evaluate the fisheries management potential for Tyndall's ponds, develop a management plan, and work with FWC/USFWS on stocking ponds as funding allows.
  - OBJECTIVE V.A.3. Annually monitor deer populations to ensure management objectives are being met, and determine feasibility of other game species surveys (turkey, quail).
  - OBJECTIVE V.A.4. Maintain Tyndall iSportsman website.
- SUPPORTING GOAL V.B. Provide non- consumptive recreation opportunities consistent with demand, quality, and cost within the constraints of the AF mission.
  - OBJECTIVE V.B.1. By 2023, evaluate funding and logistical options for replacing downed bridge on the Felix Lake Nature Trail.
  - OBJECTIVE V.B.2. Annually evaluate and repair posted informational signs describing sensitive beach habitats and species, along with protective measures that should be followed.
  - OBJECTIVE V.B.3. Provide information to the public on sensitive species, habitats, and regulatory requirements.

  - OBJECTIVE V.B.4. By 2022, develop and implement penalties for violations of Tyndall regulations on the beaches, including presence of pets, pedestrian traffic on dunes, camping and lights at night.
- SUPPORTING GOAL V.C. Provide forest products compatible with the military mission while restoring and maintaining long- term ecosystem sustainability, diversity, and productivity.
  - OBJECTIVE V.C.1. Annually update a three-year reforestation prioritization plan.
  - OBJECTIVE V.C.2. Review 813s and 332s to identify and mitigate potential conflicts between reforestation plan and installation projects.
- SUPPORTING GOAL V.D. Provide wildfire protection for all of Tyndall (including the wildland/urban interface areas) to reduce potential threats to life, property and natural resources.
  - OBJECTIVE V.D.1. Safely and professionally suppress all wildfires on Tyndall to the extent possible commensurate with firefighter safety, current and expected fire behavior, resource values at risk and impacts to public health and safety.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

Tyndall's goals and objectives (see the Management Goals and Objectives section) are primarily carried out as duties and responsibilities of the Environmental Element Chief, as relayed to the Natural Resources staff. When possible, other organizations, contractors, and volunteers are utilized to provide technical assistance. Efforts beyond the capabilities of the installation are carried forward as projects to AFCEC for inclusion in the five-year budget review. Current program staffing is provided in Table 18.

Table 18 - Tyndall AFB Natural Resources Staff

Scale or Organization	**Title or Position**
GS-12	Environmental Element Chief
GS-11	Wildlife Biologist
GS-11	Forester
GS-09	Conservation Law Enforcement Officer
GS-07	Forestry Technician
GS-05	Biological Technician
NAF	Seasonal Biological Aid
NAF	Seasonal Biological Aid
USFWS – GS-12	Liaison/Supervisory Biologist
USFWS – GS-9	Wildlife Biologist
USFWS – WG-5	Tractor Operator
Longleaf Alliance (contracted by USFWS)	2 part-time Biologists
USDA-WS	Biological Technician

Environmental Fence to Fence Contract	Archeologist
USFWS	Wildland Fire Manager
USFWS	Wildland Fire Technician
Colorado State	Wildland Fire Technician
GS = General Schedule; USFWS = U.S. Fish and Wildlife Service; USDA-WS = USDA Wildlife Services	

To fully implement the Goals and Objectives of this INRMP, additional resources are needed. Requests are dependent on the availability of base resources, AFCEC resources/expertise, funding, and civilian volunteers.

Implementation

Responsibility for implementation of the Tyndall AFB INRMP (not including the supporting plans) and coordination of reviews has been delegated to the Environmental Element Chief. Interim updates to the INRMP are made in cases where changes in the military mission, environmental compliance requirements, threatened or endangered species listings, or other new information significantly affect the ability of Tyndall AFB to implement the INRMP.

INRMP implementation includes, but is not limited to, the following:

- Execute all "must fund" projects and activities in accordance with specific timeframes identified in the INRMP
- Ensure sufficient professionally trained natural resources management personnel are available to perform the tasks required by the INRMP
- Review the INRMP annually, update goals and objectives, and coordinate changes with regulators, as appropriate
- Document specific INRMP accomplishments undertaken each year

Supporting plans and organizations each have their own authority for budgeting and implementation. The Environmental Element Chief has the responsibility to review, provide input, and recommend changes to plans so they further the goals and objectives of the Tyndall INRMP. Overall implementation responsibility remains with the Installation Commander.

9.2 Monitoring INRMP Implementation

Monitoring of the INRMP implementation is accomplished on a yearly basis. Goals and objectives are re-evaluated yearly to adjust for what has been accomplished, what needs to be added, and what is ongoing.

9.3 Annual INRMP Review and Update Requirements

GUIDANCE FROM AFM 32-7003 (REVIEW AND REPLACE WITH INSTALLATION-SPECIFIC CONTENT): *Explain how the annual INRMP review is used to identify and validate required INRMP updates, and the conditions under which a major INRMP revision would be required.*

The INRMP requires annual review, in accordance with DoDI 4715.03, *Natural Resources Conservation Program,* and AFM 32-7003, to ensure the achievement of mission goals, verify the implementation of projects, and establish any necessary new management requirements. This process involves installation natural resources personnel and external agencies working in coordination to review the INRMP. If the installation mission or any of its natural resources management issues change significantly after the creation of the original INRMP, a major revision to the INRMP is required. The need to accomplish a major revision is normally determined during the annual review with USFWS, the appropriate State agency, and NOAA (if required). The NRM/POC documents the findings of the annual review in an Annual INRMP Review Summary and obtains signatures from the coordinating agencies on review findings. By signing the Annual INRMP Review Summary, the collaborating agency representatives assert concurrence with the findings. If any agency declines to participate in an on-site annual review, the NRM submits the INRMP for review along with the Annual INRMP Review Summary document to the agency via official correspondence and request return correspondence with comments/concurrence.

10.0 ANNUAL WORK PLANS

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

- High: The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the Air Force is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a “Benefit of the Species” determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.
- Medium: Project supports a specific INRMP goal and objective, and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not be implemented if not accomplished within programmed year due to other priorities.
- Low: Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or support long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

Project Title	Project Justification	Project Description
EQUIPMENT, CN ACTIVITIES	Equipment required for sampling, analysis, and monitoring for Compliance (i.e., Air, Hazardous Waste) and Natural Resources (i.e., conservation law enforcement, wildlife management/ monitoring, and wildland fire activities) IAW Sikes Act, INRMP, DoDI 4715.3, and AFI 32-7064.	Purchase/lease lab equipment, analyzers, field survey equipment, ATVs, fuel, biologist field supplies, hand tools, electronic monitoring and communication gear, traps, and equipment for wildland fire program support, such as ATV torches and water reservoirs, blowers, drip torches, and tractor accessories.
EQUIPMENT PURCHASE / MAINTAIN, EC, SAM	EQ vehicles are required to support conservation activities on 30,000 acres (12,141 ha) of woodlands, 18 miles of beaches, and on marginal roads IAW the Sikes Act, INRMP, DoDI 4715.3, and AFI 32-7064.	Purchase and maintain equipment required for sampling, analysis, and monitoring. Also purchase fuel and maintain EQ- owned/leased (non-General Services Administration [GSA) vehicles and ATVs used primarily for Conservation, Compliance, and endangered species management (i.e., fire breaks, monitoring, posting, prescribed burning). One dedicated conservation law enforcement vehicle, one dedicated reimbursable forestry work (not EQ) vehicle.
SUPPLIES, CN	Supplies required to support Conservation activities IAW ESA Biological Opinion (BO) 4-P-98-020); Sikes Act, INRMP.	Purchase expendable supplies including, sea turtle nest protection devices, specialized marking flags/ tape, fencing, lumber, signage, and wildlife tranquilizers.
VEHICLE FUEL & MAINTENANCE , IN EXCESS OF TOA, CN	EQ vehicles are required to support fire program, conservation activities, and conservation law enforcement on 30,000 acres (12,141 ha) of woodlands, 18 miles of beaches, and on marginal roads IAW the Sikes Act, INRMP, DoDI 4715.3, and AFI 32-7064.	Purchase fuel and maintain EQ-owned/leased (non-GSA) vehicles and ATVs used primarily for Conservation, Compliance, and endangered species MGT (i.e., fire breaks, monitoring, posting, prescribed burning). One dedicated conservation law enforcement vehicle, one dedicated reimbursable forestry work (not EQ) vehicle.
MGT, INVASIVE SPECIES	Control spread of invasive species, particularly those threatening Godfrey's butterwort, bear tupelo, Henry's spider lily, beach mice, gopher tortoise, shorebirds, piping plover, and RCW, IAW ESA* (including BO 4-P-00-211 and BO 4-P.-98-020), pertinent species Recovery Plans**, MBTA, Sikes Act, INRMP, EO 13112.	Hire technician to locate invasive plants, verify by ground survey, create GIS maps, and to treat invasive plants by methods such as herbicide, prescribed fire, mastication, and removal, and monitor the previous year's treatment blocks. Coordinate prescribed fire with AFWFC, and forest area mechanical grubbing and mastication with 325 CES contractors or USACE.

MGT, SPECIES, NUISANCE WILDLIFE	Remove non-native and nuisance animals in uplands, wetlands, and beach habitats for protection of beach mice, piping plover, sea turtles, shorebirds, and gopher tortoises IAW Sikes Act, INRMP, and ESA* (including BO 4-P-00-211, and CH for beach mice and piping plover), and pertinent species Recovery Plans**. Reduce nuisance wildlife impacts on military training and exercises (i.e., BASH).	Hire technician to conduct predator and nuisance animal control, hazing, trapping, and relocation, particularly in T&E species habitats. Individual to arrive with all required equipment, vehicles, traps, license, guns, and training required to perform assigned duties. Individual to provide education and outreach services to housing residents, Security Forces, and geographically separated work areas on Tyndall range. Coordinate preventive nuisance animal control actions by removing attractants. Target species include Florida black bears, alligators, osprey, bats, feral hogs, constrictors, felines, canines, and nutria.
MGT, HABITAT, FISH AND WILDLIFE	Habitat conservation practices and fuel reduction for Godfrey's butterwort, bear tupelo, Henry's spider lily, and gopher tortoise and ecosystem management IAW Sikes Act, INRMP, ESA, pertinent species Recovery Plans**, and gopher tortoise CCA. Also repair public access and storm damage per Sikes Act, DoDI 4715.3, and AFI 32-7064.	Conduct mechanical vegetation removal to mimic fire in habitats that are difficult to burn (i.e., urban interface, fire suppressed areas), and other ecosystem restoration projects as needed. May also improve habitat for upland game birds by establishing native groundcover.
MGT, HABITAT, T&E	Protection and restoration of habitats for piping plovers, shorebirds, beach mice, sea turtles, Godfrey's butterwort, bear tupelo, Henry's spider lily, bald eagle, and RCW IAW ESA* (including BO 4-P-00-211 and BO 4-9-98-020), pertinent species Recovery Plans**, BGEPA; MBTA, Sikes Act, and INRMP.	In 2015, hire leader to coordinate rehabilitation crew activities to preserve and enhance beach mouse, piping plover, sea turtle, and shorebird beach habitat through construction and maintenance of trails, boardwalks, and sand fencing and the restoration of sea oats. In 2016, hire technician to conduct surveys, monitor, protect, and restore human and storm damaged habitat for piping plovers, shorebirds, beach mice, sea turtles, Godfrey′s butterwort, bear tupelo, Henry′s spider lily, bald eagle, and RCW. Assist with recreation, fishing and hunting programs, and conduct upland forested habitat management for bird species.
MGT, SPECIES, RCW	Management of piping plover, red knot, bald eagle, RCW, state listed shorebirds, and gopher tortoise IAW ESA* (including BO 4-P-00-211 and piping plover CH, pertinent species Recovery Plans**, Sikes Act, INRMP, MBTA, BGEPA, and gopher tortoise CCA.	Inventory, monitor, and manage bald eagle, RCW, Purchase tools, traps, and rental/use of heavy equipment for gopher tortoise surveys, monitoring, and relocations.

MGT, SPECIES, VIOLET (GODFREY'S) BUTTERWORT	Management of listed plants and their habitat IAW ESA, Sikes Act, INRMP.	Contract to FNAI in 2019 to inventory, monitor, map, and manage Godfrey's butterwort, bear tupelo, Henry's spider lily, and any other listed plant species that may be found during surveys. Inventory to be completed by FY 2018, with future efforts on habitat improvement and maintenance.
MGT, SPECIES, RCW	Surveying, monitoring, and management activities for piping plover, red knot, bald eagle, RCW, gopher tortoise, indigo snake, and shorebirds IAW Sikes Act, INRMP, MBTA, BGEPA, gopher tortoise CCA, ESA* (including BO 4-P-00-211 and piping plover CH, and pertinent species Recovery Plans**).	Monitor bald eagle, RCW foraging habitat and conduct protection and management activities. Also conduct surveys and relocations of gopher tortoises as necessary for construction projects, military training exercises, and other ground disturbing activities, including purchase of tools, vehicle, traps, and rental/use of heavy equipment for relocations.
MGT, HABITAT, COASTAL DUNE	Habitat protection and restoration for beach mice, piping plover, sea turtles, and shorebirds, and beach access maintenance along 18 miles of Tyndall Gulf beaches IAW Sikes Act, INRMP, ESA *(including BO 4-P-98-020 and 4-P-00-211, and CH for two species of beach mice and the piping plover), pertinent species Recovery Plans**, and MBTA.	Hire labor and purchase materials to re-establish sand dunes, native vegetation, and overwash areas, including install/replacement of sand fencing and boardwalk, posting, planting dune vegetation, and conducting heavy machinery work (rental) as needed for restoration and beach access maintenance.
MGT, SPECIES, BEACH MICE	Monitor and manage St. Andrew Beach Mouse and Choctawhatchee Beach Mouse on 18 miles of beach plus coastal islands, IAW ESA* (including BO 4-P-00-211, and CH for beach mice), pertinent species Recovery Plans**, Sikes Act, INRMP. Auxiliary benefits to piping plover and its CH.	Hire biologist team and purchase equipment to conduct beach mice population surveys, including traps, transportation, and documentation. Also conduct periodic monitoring of habitat and species health (live trapping). Conduct trash control, light pollution control, enforce boardwalk use, plant native vegetation, and trap out nuisance animals. Restore secondary scrub habitat. Conduct translocation off-site to promote delisting efforts in cooperation with USFWS & FWC. Design/ construct beach mouse friendly (6 ft. elevated) boardwalks over critical dune habitat, with annual and post-storm maintenance, and 100% replacement in 15 years (six boardwalks needed).

MGT, SPECIES, SEA TURTLE	Sea turtle monitoring and management for 18 miles of beaches, shorebird protection, and coordination of beach driving restrictions IAW ESA* (including BO 4-P-98-020 and 4-P-00-211), pertinent species Recovery Plans**, State of Florida permits/ protocols (including sea turtle salvage activities), Sikes Act, and INRMP. Good data are needed to support effective and timely consultations with regulators.	Hire labor and purchase equipment to conduct sea turtle surveys and protection measures from 1 May to 31 October. File reports, post signs, install egg protection screens, conduct post-hatching nest investigations, and coordinate volunteer surveyors. Conduct year-round response for stranding/ salvage activities along 100+ miles of bay and barrier island shorelines.
MGT, WETLANDS/ FLOODPLAIN	Identification and development of restoration plan, and restoration of wetlands to avoid fines and regulatory restrictions to the mission under the CWA, and IAW Sikes Act, INRMP, AFI 32-7064, and ESA.	Contract work to conduct wetlands field investigation, wetlands GIS map data update, and engineer/hydrologist opinion, including executable steps necessary for remediation. Conduct restoration of priority wetlands as outlined in restoration plan.
OUTREACH	Public outreach IAW EO 13423, EO 13514, AFPD 90-8, DoDI 4715.17, AFI 32-7001, AFI 32-7064,AFI 32-7065, AFI 90-803, and AFI 90-201, and/or AF EMS policy/ guidance documents.	Purchase publications and regulatory guidance, to be distributed at community outreach activities such as Earth Day, air shows, and partnering efforts.
CLEO	Required to support installation environmental programs. IAW with 16 U.S.C. 670a (Sikes Act), the Secretary of Defense is required to enforce natural resources laws and regulations, to include state hunting and fishing regulations, on military installations. Additionally, the Sikes Act directs that priority for such enforcement services shall be given to Federal and State conservation agencies.	Support Interagency agreement for USFWS personnel performing Conservation functions over 50% of the time. Personnel will perform AF Conservation Law Enforcement Officer (CLEO) functions at multiple AF facilities. Patrol requirements would consist of enforcement of hunting and fishing regulations, ARPA, dispersed outdoor recreation regs, illegal dumping, forest product monitoring, MBTA and ESA, etc. as appropriate to respective installations.

MONITOR, WETLANDS	General and Specific Conditions of Army Corps of Engineers permits SAJ-2011-02326 (IP-MMW) and SAJ-2011-02326 (SP-LSL) pursuant to Section 401 and 404 of the Clean Water Act (33 U.S.C. 1344) for the Airfield Drainage Project. General and Specific Conditions of Army Corps of Engineers permit SAJ-2014-01746 (SP-LSL) pursuant to Section 401 and 404 of the Clean Water Act (33 U.S.C. 1344) for the FY-14 F-22 Munitions Storage Complex. General and specific conditions of the Florida Department of Environmental Protection Environmental Resource Permits 03-0311562-001-EI and 03-0311562-002-EI pursuant to Part IV of Chapter 373, Florida Statutes and Chapter 62-330, Florida Administrative Code for the Airfield Drainage Project. General and specific conditions of the Florida Department of Environmental Protection Environmental Resource Permit 03-0327261-001 pursuant to Part IV of Chapter 373, Florida Statutes and Chapter 62-330, Florida Administrative Code for the FY-14 F-22 Munitions Storage Complex. If not provided, Tyndall would be in violation of preceding statutory authorities.	Tyndall AFB is required to implement mitigation activities consisting of enhancement of 71 acres (29 ha) of offsite wetlands and uplands in accordance with Tyndall AFB Repair Airfield Drainage Phase 1 and 3 Compensatory Mitigation Plan. Deliverables include: performing a time-zero monitoring event of the wetland mitigation area within 60 days of completion of the compensatory mitigation and construction activities identified in the approved mitigation plan; submittal of the time-zero report to the Army Corps of Engineers within 60 days of completion of the monitoring event depicting baseline conditions, detailed plan view drawings of all created, enhanced and/or restored mitigation areas. Semi-annual monitoring of the wetland mitigation area for the first 2 years and annual monitoring thereafter for a total of no less than 5 years of monitoring. Deliverables include: annual monitoring reports to the Corps within 60 days of completion of the monitoring event. This project requires a minimum of three monitoring transects to be evaluated for 5 years which includes: field data, results, analysis of plant density, recruitment of desirable species, encroachment of undesirable species, hydrologic conditions, wildlife utilization, site photographs, and any maintenance that may have occurred.

INTERAGENCY/INTRAAGENCY, GOVERNMENT, SIKES ACT, USFWS	Funds Sikes Act-driven, interagency/intra-agency agreement, cooperative agreement, or other similar support required to assist the base's normal day-to-day management of inherently governmental functions & operations of the Conservation Program. Tyndall has no GS Natural/Cultural Resource Program Manager, the USFWS support duties include: 1) Report detail proposed actions affecting T&E listed species on Tyndall AFB and potential consequences; 3) Provide USFWS support for implementing the Sikes Act and Endangered Species Act by developing Biological Assessments, developing implementation plans for required terms and conditions of Biological Opinions, developing and coordinating Biological Opinions within Tyndall AFB and USFWS, producing final Biological Assessments and Opinions, assisting in NEPA document preparation and review with respect to T&E species, providing USFWS coordination and input for Sikes Act mandated Integrated Natural Resources Management Plan development, review and implementation, developing INRMP text and work plans, and assisting in development of INRMP implementation; 4) Conduct QA/QC or COR duties for other contract natural and cultural resources work; 5) Plan NR and CR projects and assist with execution of funds and oversight of execution; 6) Negotiating with regulators on behalf of the USAF or representing the USAF in official meetings for both Natural and Cultural program. USFWS expertise to accomplish Biological Assessments and Biological Opinions will avoid delays during the consultation process as well as ensure the Air Force properly and adequately meets the Sikes Act and Endangered Species Act requirements. Failure to ensure rapid completion of consultations and Biological Opinion implementation would jeopardize Tyndall AFB ability to ensure mission activities are completed on a timely basis, thus ensuring continued access and sustainability.	Required to support installation Environmental Programs. AFI 32-7064, 3.9.1: 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. If not funded Tyndall will not comply with AFI32-7064 and achieve INRMP implementation. Cost is based on IGE for USFWS support.

11.0 REFERENCES

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

- AFI 32-7064, *Integrated Natural Resources Management*
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook – a Internal AF reference available at https://cs1.eis.af.mil/sites/ceportal/CEPlaybooks/NRM2/Pages/

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all AF installations)

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

12.2 Installation Acronyms

- **325 CES** - 325th Civil Engineer Squadron
- **325 CES/CEIE** - 325th Civil Engineer Squadron, Environmental Element
- **325 CES/CEIEC** - 325th Civil Engineer Squadron, Environmental Element, Compliance
- **325 CES/CEIEA** - 325th Civil Engineer Squadron, Environmental Element, Natural Resources
- **325 FSS** - Force Support Squadron
- **325 FW/SEF** - Flight Safety
- **ACC** - Air Combat Command
- **ACES** - Automated Civil Engineer System
- **AETC** - Air Education Training Command
- **AF** - Air Force
- **AFB** - Air Force Base
- **AFCEC** – Air Force Civil Engineer Center
- **AFI** – Air Force Instruction
- **AFM** – Air Force Manual
- **AFPD** – Air Force Policy Directive
- **AFWFB** – Air Force Wildland Fire Branch
- **AICUZ** - Air Installation Compatible Use Zone
- **ARSA** - Apalachicola Regional Stewardship Alliance
- **ATV** – All-terrain Vehicle
- **BASH** – Bird/Wildlife Aircraft Strike Hazard
- **BGEPA** - Bald and Golden Eagle Protection Act
- **BMP** – Best Management Practices
- **BO** – Biological Opinion
- **C** - Candidate Species
- **CBD** - Center for Biological Diversity
- **CC**A - Candidate Conservation Agreement
- **CFA** – Code of Federal Regulations
- **CH** - Critical Habitat
- **CIE** - Crooked Island East
- **CIW** - Crooked Island West
- **CN** - Cultural Natural
- **DoD** – Department of Defense
- **DoDD** - Department of Defense Directive
- **DoDI** – Department of Defense Instruction
- **E** – Endangered
- **EA** – Environmental Assessment

- **EC** - Environmental Compliance
- **EFH** – Essential Fish Habitat
- **EIAP** – Environmental Impact Analysis Process
- **EIS** – Environmental Impact Statement
- **EMS** – Environmental Management System
- **EO** – Executive Order
- **EQ** – Environmental Quality
- **ERP** – Environmental Restoration Program
- **ESA** – Endangered Species Act
- **ESOH** - Environment, Safety, and Occupational Health
- **ESOHCAMP** - Environment, Safety, and Occupational Health Compliance Assessment Management Program
- **°F** - degrees Fahrenheit
- **FAC** - Florida Administrative Code
- **FBBCR** - Florida Black Bear Conservation Rule
- **FCMP** - Florida Coastal Management Program
- **FDACS** - Florida Department of Agriculture and Consumer Services
- **FDEP** - Florida Department of Environmental Protection
- **FNAI** - Florida Natural Areas Inventory
- **FSS** - Force Support Squadron
- **FSU** - Florida State University
- **FW** - Fighter Wing
- **FWC** - Florida Fish and Wildlife Conservation Commission
- **FWRI** - Florida Fish and Wildlife Research Institute
- **FY** - Fiscal Year
- **GEBF** - Gulf Environmental Benefit Fund
- **GIS** – Geographic Information System
- **GOM** – Gulf of Mexico
- **GS** – Grade Series
- **GSA** – General Services Administration
- **ha** – Hectare
- **H.R**. - House Resolution
- **IAW** – In Accordance with
- **ICRMP** – Integrated Cultural Resources Management Plan
- **IDP** – Installation Development Plan
- **INRMP** – Integrated Natural Resources Management Plan
- **IPCC** – Intergovernmental Panel on Climate Change
- **IRP** – Installation Restoration Program
- **km** - kilometers
- **m** - meters
- **MAJCOM** - Major Command
- **MBTA** – Migratory Bird Treaty Act
- **MGT** – Management
- **MMPA** – Marine Mammal Protection Act

- **MOA** – Memorandum of Agreement
- **MOU** – Memorandum of Understanding
- **MS4** – Municipal Separate Storm Sewer System
- **NCAR** – National Center for Atmospheric Research
- **NCO** - Noncommissioned Officer
- **NEPA** – National Environmental Policy Act
- **NFPA** – National Fire Protection Association
- **NFWF** – National Fish and Wildlife Foundation
- **NHPA** – National Historic Preservation Act
- **NMFS** – National Marine Fisheries Service
- **NOAA** – National Oceanic and Atmospheric Administration
- **NPDES** – National Pollutant Discharge Elimination System
- **NPLD** - National Public Land Day
- **NRDA** – Natural Resource Damage Assessment
- **NRHP** - National Register of Historic Places
- **NRM** – Natural Resource Manager
- **NWCG** – National Wildfire Coordinating Group
- **NWTF** - National Wild Turkey Federation
- **P** - Petitioned for listing under the federal Endangered Species Act
- **PT** - Proposed Threatened
- **PRECIP** - Precipitation
- **RCW –** Red-cockaded Woodpecker
- **RED HORSE –** Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers
- **SAM –** Sample
- **SSC –** Species of Special Concern
- **STARS –** Striving Toward Achieving Real Success
- **SSURGO –** Soil Survey
- **T –** Threatened
- **T&E –** Threatened and Endangered
- **TBD –** To be determined
- **TNC –** The Nature Conservancy
- **TOA –** Table of Allowances
- **TSI –** Timber stand improvement
- **U.S.** – United States
- **UF –** University of Florida
- **USACE –** U.S. Army Corps of Engineers
- **USAF –** U.S. Air Force
- **USC –** United States Code
- **USDA –** U.S. Department of Agriculture
- **USEPA –** U.S. Environmental Protection Agency
- **USFS –** U.S. Forest Service
- **USFWS –** U.S. Fish and Wildlife Service
- **USGS –** U.S. Geological Survey
- **WMA –** Wildlife Management Area

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all AF installations)

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- Not applicable.

14.0 APPENDICES

Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP

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

Federal Public Laws and Executive Orders	
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, Exotic and 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 U.S. Fish and Wildlife Service (USFWS) has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401– 7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet Federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (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.

Federal Public Laws and Executive Orders	
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.

Federal Public Laws and Executive Orders	
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.

Federal Public Laws and Executive Orders	
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 Integrated Natural Resources Management Plan 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 Management Program dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Instruction (DODI) 4715.03, Natural Resources Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
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

Federal Public Laws and Executive Orders	
	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	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 32-7062, Air Force Comprehensive Planning	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled lands.
AFI 32-7064, Integrated Natural Resources Management	Implements AFPD 32-70, Environmental Quality; DODI 4715.03, Natural Resources Conservation Program; and DODI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-7065, Cultural Resources Management	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
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.

Federal Public Laws and Executive Orders	
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.

15.0 ASSOCIATED PLANS

Tab 1 – Forest Management Component Plan

Tab 2 – Nuisance and Invasive Species Component Plan

Tab 3 – Threatened and Endangered Species Component Plan

Tab 4- Wildland Fire Management Plan

Tab 5 – Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

Tab 6 – Integrated Cultural Resources Management Plan (ICRMP)

Tab 7 – Integrated Pest Management Plan (IPMP)