A Summary of Currently Identified Priority Amphibian and Reptile Areas (PARCAs) that Overlap with Department of Defense Installations

A report prepared by The Amphibian and Reptile Conservancy (ARC)
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Introduction:

As the threats facing our natural resources continue to increase at an exponential rate, conservation organizations, state and federal agencies, and land managers must quickly evolve to meet these challenges. The increasing complexity and difficulty of these threats coupled with limited conservation resources has created the need to make difficult decisions on where to focus conservation efforts (reviewed in Margules and Pressey 2000; Cabeza and Moilanen 2001; Margules and Sarkar 2007). The question of where and how to focus these resources has been one of the most heavily debated topics in conservation biology for over 30 years (reviewed in Margules and Pressey 2000; Cabeza and Moilanen 2001; Margules and Sarkar 2007). As a result, several indirect shortcut methods (such as richness, endemism, etc.) have been developed to describe the biodiversity value of a given locality and to identify economically efficient reserve networks (Noss 1990; Ricketts et al. 1999). While these methods have been effective at identifying global targets, they have failed to cope with the discordance between biodiversity and protected areas at a local scale (Pressey et al. 1993; Scott et al. 1993; Rodrigues et al. 1999; Margules and Pressey 2000; Maiorano et al. 2006). Consequently, the percentage of species that remain unprotected ("gap" species) continues to be extremely high (Rodrigues et al. 2004; Ceballos 2007; Vimal et al. 2011), raising the question of how do we appropriately identify areas that will effectively reach the ultimate goal of preserving all biodiversity.

One of the most effective approaches to preserving biodiversity at the local scale is the protection of viable populations for priority species and protection of areas that contain viable populations for a high number of species (Balmford et al., 1996; Redford and Richter, 1999). By focusing on these areas, conservation agencies can protect regions that are responsible for preserving a disproportionate amount of biodiversity. However, this approach requires a great deal of knowledge about priority species' distributions as well as a framework that assures that the limited resources available to conservation efforts are efficiently distributed amongst target species.

Despite the need for this type of selection criteria across all taxa, the only taxonomic group that has previously had an effective framework in place has been birds (e.g. Important Bird Areas; Osieck and Mörzer Bruyns, 1981; Fishpool and Evans 2001). Recently, Partners for Amphibian and Reptile Conservation (PARC) created a framework for amphibians and reptiles through the development of model criteria for identifying and ranking Priority Amphibian and Reptile Conservation Areas (PARCAs – Sutherland and deMaynadier 2012). The PARCA model selection criteria are a valuable conservation tool, especially when combined with the expert knowledge available through the PARC network.

So far, PARCAs have been identified for just over half of all relevant states. Here, PARCAs have been identified that are either found within or partially contain a Department of Defense

(DoD) installation. Additionally, for each PARCA, set of data crucial to the implementation of a PARCA conservation strategy has been created. This includes habitat descriptions, focal species, threats, opportunities, research needs, species diversity, and habitat management suggestions. This dataset is envisioned to serve as the foundation for the identification of future conservation needs and strategies and the local, state, and regional level and will assist the DoD with developing conservation and management strategies and partnerships that benefit herpetofaunal biodiversity in support of military readiness.

An inventory of herpetofauna on military lands in 2018 revealed that DoD installations are home to 66% of all native U.S. amphibian and reptile species, including approximately 40% of all federally listed herpetofaunal species (Petersen et al, 2018). During 2020, the DoD, through its Partners in Amphibian and Reptile Conservation (PARC) network, developed an at-risk herpetofaunal species priority list for military lands within the continental U.S. Species on the priority list have confirmed populations on DoD lands, and are currently petitioned or under review for Endangered Species Act (ESA) listing by the U.S. Fish and Wildlife Service (USFWS). The DoD at-risk priority species are: Spotted Turtle (*Clemmys guttata*); Gopher Tortoise (*Gopherus polyphemus*); Eastern Diamond-backed Rattlesnake (*Crotalus adamanteus*); Northern Red-bellied Cooter (*Pseudemys rubriventris*); Alligator Snapping Turtle (*Macrochelys temminckii*); Gopher Frog (*Lithobates capito*); Wood Turtle (*Glyptemys insculpta*); Western Pond Turtle (*Actinemys marmorata/pallida*); Blanding's Turtle (*Emydoidea blandingii*); Western Spadefoot (*Spea hammondii*); and Florida Pinesnake *(Pituophis melanoleucus mugitus*). Proactive conservation and management actions performed within PARCAs and military lands may assist with precluding the listing of these at-risk species under the ESA.

Methods:

Identification of Potential PARCAs

The first step in the identification of PARCAs was to identify all habitat that could possibly fit the PARCA criteria (see Sutherland and deMaynadier 2012-Figure 1). To accomplish this task, a spatial model was created (hereafter referred to as the PARCA Metric-PM). The objective of the PM is to show the potential herpetological conservation value of any site on the map. It also helps to objectively compare the conservation value of multiple sites. It is important to note that PM at the larger scale is only able to display the prospective conservation value of an area (reviewed in Moilanen et al. 2009), indicating the importance of pairing the PM with direct expert knowledge on the local scale to identify the true conservation value of an area. The PM value for all land area within each state was calculated as follows:

$PM = (\sum \delta_{i-j}) + \alpha_a + \rho_a$

δ_{i-j} = imperiled species presence/ absence

α_a= amphibian richness at point a- scaled to each ecoregion within a state (a value of 0-4 based on minimizing variance within groups, i.e. natural breaks)
ρa= reptile richness at point a- scaled to each ecoregion

Given that the first component of the PARCA criteria is the long-term viability of the habitat (i.e. landscape integrity), any highly fragmented and/or disturbed areas were removed from the spatial model described above. To evaluate the level of anthropogenic modification on the assessed landscape, the compositional and structural aspects of the landscape (e.g. natural cover type) were calculated at varying neighborhood scales following the methodology of Theobald (2010). This approach is an efficient way to quickly identify and remove any habitat that is unsuitable, either at the local or broad scale (Theobald 2010). Any habitat below a value of 0.6 was removed from consideration as a PARCA. To identify areas that represented a disproportionate amount of potential herpetological conservation value (PARCA hotspots) within each state from the full PM layer, areas that had clusters of values higher than what you would expect to find by random chance by using a Getis Ord Gi* analysis were identified (Getis and Ord 1992) in ArcGIS Pro (2.0.1).

Landscape Viability. All PARCAs must meet this criteria and at least one of the following:

1. Presence of imperiled species- ESA Listed Threatened or Endangered, IUCN Critically Imperiled, Endangered, or Vulnerable.
   a. Area must host a moderately significant population of the rare species in question.
2. Presence of narrowly distributed species, subspecies, or phylogenetically distinct populations.
3. Presence of exceptionally high diversity of amphibian or reptile species.

Figure 1. A brief description of PARCA criteria from Sutherland and deMaynadier 2012.

Expert Review:
Effective conservation requires a successful partnership between conservation scientists, land managers, and other stakeholder groups. Without such partnerships, it is impossible to advance from the assessment stage to the implementation stage (Knight et al. 2006; Biggs et al. 2011). This project required us to develop strong relationships with local experts that will help guide, implement, and ground-truth the PARCAs. Creating a diverse working group will help ensure that PARCAs are selected on the best available knowledge and that they are established as a long-term conservation solution. Furthermore, the diversity of experts included also helped to address the conservation of multiple taxonomic groups. Each state's expert group was presented with the PARCA metric and several other pieces of relevant data, such as richness, endemism, imperiled species richness, public lands, landscape integrity, corridors, etc. After the introduction, the experts created a list of priority species for the state. This list included federal and state listed species, as well as species that were agreed upon by the panel to be of concern within the state. PARCAs were then selected by the experts using the following criteria:

- Identify PARCAs to protect the most viable populations of target species
- Identify a PARCA in each ecoregion that has a high PARCA metric value (i.e. high richness)
- Meet previous two goals with the fewest PARCAs possible

A summary of the PARCA identification process can be found in Figure 2.

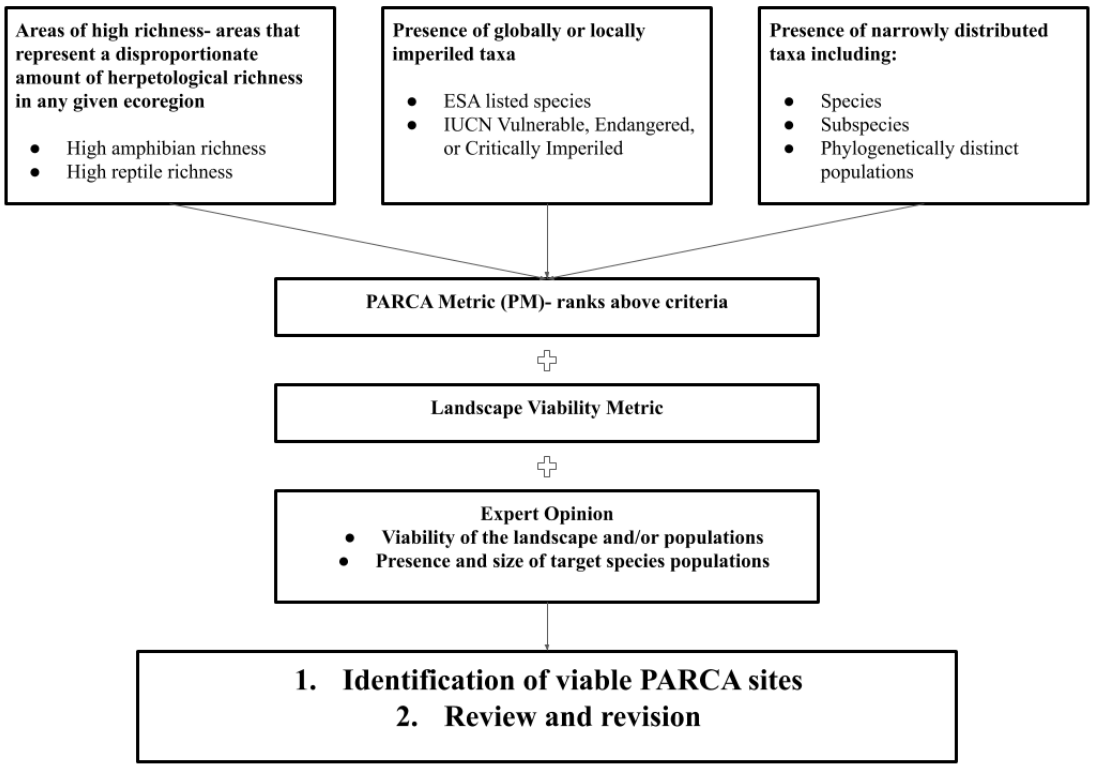


Figure 2. A flow chart of the PARCA identification process used to identify each state's PARCAs

The experts were then asked to help facilitate the creation of a conservation "road map" for each PARCA, that contains the most pertinent and up to date data available. For each PARCA, the following sections were included: General Description, Habitat Description, Focal Species, Threats, Opportunities, Research and Conservation Needs, Species Diversity, and Habitat Management Recommendations. Below is a description of each category and what was asked of the panel.

1. General Description: Includes a basic description of the habitat, the geology, the region, bounding geographies, important notes about focal species, and any other notes of interest or importance.
2. Habitat Description: A detailed description of the habitat, especially the habitat types that are important to the focal species within a PARCA.
3. Focal Species: A list of the focal species (as defined by the expert panel) found or potentially found within the PARCA
4. Threats: A list of the threats to the important habitat and focal species within each PARCA. These threats are intended to document threats that are tangible and can potentially lead to habitat management recommendations and/or other conservation actions. We tried to limit general threats to all taxa if there are not specifics (e.g. general statements about climate change, disease, etc.).
5. Opportunities: A list of potential partners, programs, or other general opportunities for a PARCA. This is intended to help align conservation priorities with other organizations and agencies and to help leverage efforts and resources.
6. Research and Conservation Needs: A list of research and conservation action needs for each PARCA. Generally, these focus on either focal species or habitat types that support a high diversity.
7. Species Diversity: All amphibians and reptiles that are found or potentially found in a PARCA.
8. Habitat Management Recommendations: Habitat recommendations for each PARCA, focused on important habitat types for amphibians and reptiles. Generally focused on habitat for focal species or habitat types that support a high diversity.

After PARCAs were identified, overlapping DoD installations were determined on ArcGIS Pro (2.0.1) by overlaying the PARCA layer with DoD land ownership layers (esri_landscape2 (2020) https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/USA_Department_of_Defense_Lands/FeatureServer; ESRI (2020) https://landscape10.arcgis.com/arcgis/services/USA_Federal_Lands/ImageServer). Multiple layers were used to ensure all installations, including inactive ones owned by the DoD, were included. If any discrepancies existed between layers, such as an installation being included in one and not another, government military websites were consulted to validate the ownership of the site. Installations without Integrated Natural Resource Management Plans (INRMPs) were also removed.

Results:

In total, 317 PARCAs have been identified across the country in 26 states. Of these PARCAs, 68, or 21%, partially or fully overlap with a total of 103 DoD installations, indicating the

importance of DoD installations to herpetofauna conservation and the PARCA effort. The individual PARCA reports highlight the importance of some of these overlapping regions as herpetofauna conservation areas and as some of the last remaining strongholds for numerous imperiled species.

Results for each PARCA that overlaps with DoD land are provided in the remainder of this report. Table 1 below lists these PARCAs along with their associated state and installation name(s).

Table 1. All identified PARCAs that overlap with DoD installations, with associated state and installation name(s). DoD installation names linked to corresponding location in document.

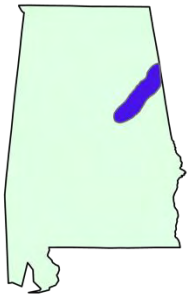
State	PARCA	DoD Installations
AL	Talladega	**Fort McClellan Army National Guard Training Center**
AL	Choctawhatchee Pea	**Fort Rucker**
AL	Mobile Bay	**Naval Air Station Whiting Field Naval Outlying Field Barin** **Naval Air Station Whiting Field Naval Outlying Field Summerdale** **Naval Air Station Whiting Field Naval Outlying Field Silverhill**
AR	Arkansas River Valley	**Fort Chaffee**
AR	Bell Slough	**Camp Robinson Maneuver Training Center**
AZ	Cochise West	**Fort Huachuca**
AZ	Komatke/ White Tank	**Buckeye Training Area**
AZ	Tohono	**Luke Air Force Base- Barry M Goldwater East Range**
AZ	Southwestern Sonoran	**Marine Corps Air Station Yuma- Barry M Goldwater West Range** **Luke Air Force Base- Barry M Goldwater East Range**
CA	Channel Islands	**Naval Base Ventura County- San Nicolas Island** **Naval Base Coronado- San Clemente**
CA	Borderlands	**Naval Base Coronado- Naval Air Station North Island** **Naval Base Coronado- Camp Monsoor** **Naval Base Coronado- Camp Morena** **Naval Base Coronado- Imperial Beach** **Naval Base Coronado- Silver Strand Training Complex** **Naval Base Point Loma** **Naval Base San Diego**
CA	Peninsular Ranges	**Naval Base Coronado- Remote Training Site Warner Springs** **Marine Corps Air Station Camp Pendleton** **Naval Weapons Station Seal Beach Fallbrook Detachment**
CA	South Bay	**Parks Reserve Forces Training Area** **Pillar Point Air Force Base** **Military Ocean Terminal Concord**
CA	Point Conception	**Vandenberg Air Force Base**
CA	Northern Deserts	**Naval Air Weapons Station China Lake**
CA	Central Coast Range	**Fort Hunter Liggett** **Camp San Luis Obispo**

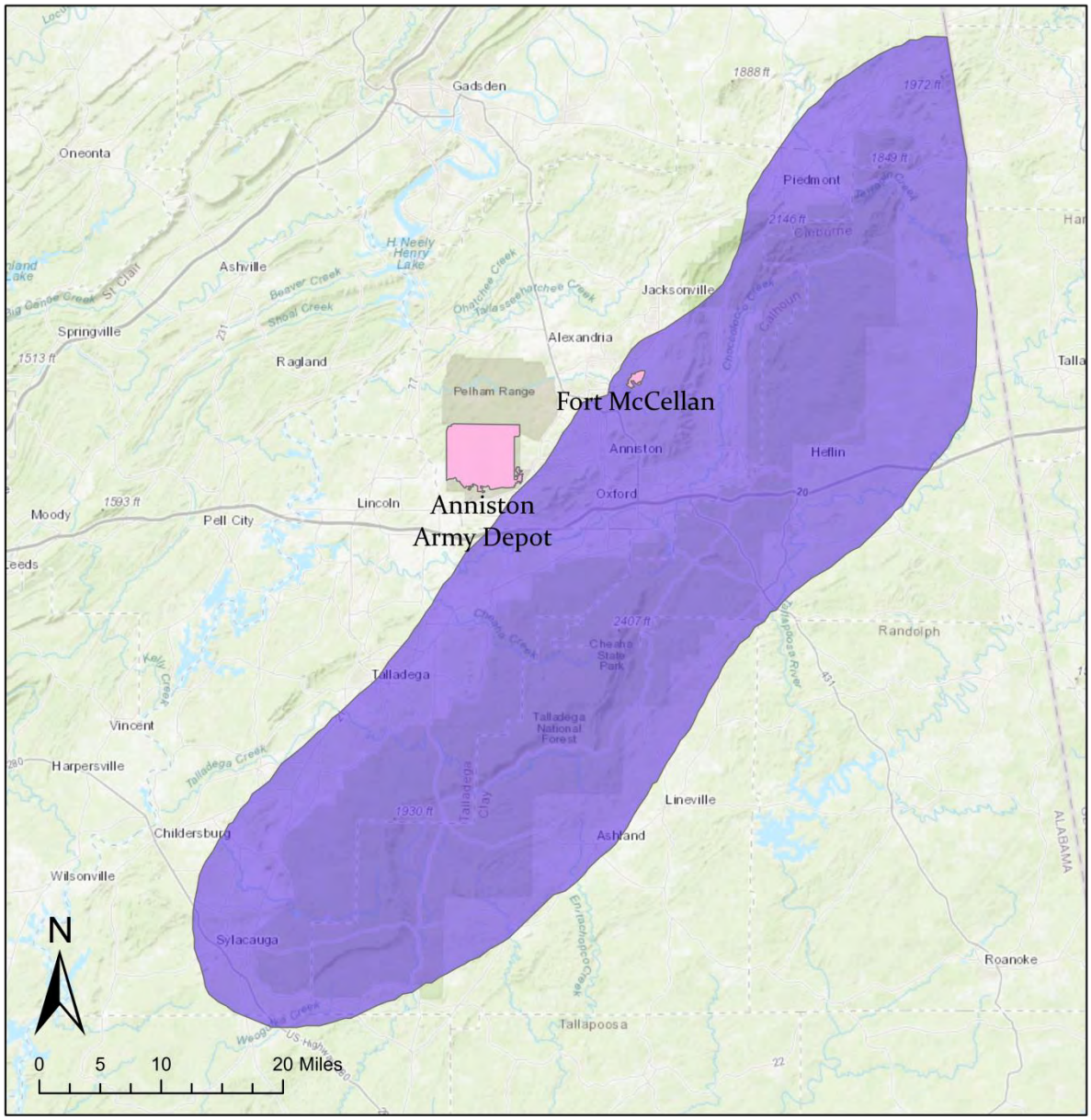
CA	Colorado Desert	**Marine Corps Air Station Yuma- Chocolate Mountain Aerial Gunnery Range**
CA	Los Angeles Basin	**Naval Base Ventura County- Point Mugu** **Naval Weapons Station Seal Beach- Defense Fuel Support Point San Pedro**
CO	Southeast Canyon Lands	**Fort Carson- Pinon Canyon Maneuver Site**
CO	Arkansas River	**Fort Carson- Main Base** **Pueblo Chemical Depot**
FL	Eglin Blackwater	**Eglin Air Force Base** **Hurlburt Field** **Naval Air Station Whiting Field- Holley Naval Outlying Field** **Naval Air Station Whiting Field- Harold Naval Outlying Field** **Naval Air Station Whiting Field- Santa Rosa Naval Outlying Field** **Naval Air Station Pensacola- Main Base** **Naval Air Station Pensacola- Corry Station**
FL	Merritt Island	**Cape Canaveral Air Force Station**
FL	Lower Keys	**Naval Air Station Key West** **Naval Air Station Key West Saddlebunch Annex**
FL	Camp Blanding	**Camp Blanding Joint Training Center**
FL	Ocala	**Naval Air Station Jacksonville- Pinecastle Impact Range** **Naval Air Station Jacksonville- Rodman Bombing Target Range**
GA	Altamaha Ocmulgee	**Marine Corps Air Station Beaufort- Townsend Range**
GA	Fort Gordon	**Fort Gordon**
GA	Fort Stewart	**Fort Stewart**
GA	Barrier Islands and Marshes	**Naval Submarine Base Kings Bay**
IA	Leopold	**Iowa Army Ammunition Plant**
IL	Upper Des Plaines	**Naval Station Great Lakes**
IL	Shawnee	**Sparta Training Area**
IN	Brown County Hills	**Camp Atterbury Joint Maneuver Training Center**
KS	Flint Hills	**Fort Riley**
LA	No Man's Land	**Camp Beauregard** **Fort Polk**
LA	Pearl River Basin	**Camp Villere**
MI	NW Michigan	**Camp Grayling Joint Maneuver Center**
MO	Big Piney	**Fort Leonard Wood**
MO	Osage Plains	**Camp Clark Training Site**
NC	Croatan	**Marine Corps Air Station Cherry Point**
NC	South Brunswick	**Military Ocean Terminal Sunny Point** **Seymour Johnson Air Force Base- Fort Fisher Recreation Area**
NC	Green Swamp	**Military Ocean Terminal Sunny Point**
NC	Holly Shelter	**Marine Corps Base Camp Lejeune**
NC	Pamlico Outerbanks	**Marine Corps Air Station Cherry Point- Point of Marsh Target Airfield** **Marine Corps Air Station Cherry Point- Outlying Field Atlantic**

NC	Sandhills	**Fort Bragg** **Pope Air Force Base**
NC	Pam Albemarle	**Dare County Bombing Range**
NM	White Sands	**White Sands Missile Range** **Holloman Air Force Base**
NM	Sacramento Mountains	**Fort Bliss**
NM	Middle Rio Grande	**Kirtland Air Force Base**
OH	Western Lake Erie Basin	**Camp Perry Training Site**
OH	Northeast Ohio Glacial Wetlands	**Camp Ravenna Joint Military Training Center**
OK	Wichita Mountains	**Fort Sill**
OK	Thunderbird	**Tinker Air Force Base**
OK	Ozarks	**Camp Gruber Training Center**
OR	North Coast	**Camp Rilea**
SC	Savannah River Low Country	**Marine Corps Air Station Beaufort** **Marine Corps Recruit Depot Parris Island**
SC	Upper Wateree	**Fort Jackson** **McCrady Training Center**
SC	Francis Marion	**Naval Weapons Station Charleston**
TN	The Bonnaroo Barrens	**Arnold Air Force Base**
TX	Texas Bays and Marshes	**Naval Air Station Corpus Christi- Main Base** **Naval Air Station Corpus Christi- Naval Outlying Field Waldron** **Naval Air Station Corpus Christi- Naval Outlying Field Cabaniss** **Naval Air Station Corpus Christi- Peary Place Transmitter Site** **Marine Corps Reserve Center Galveston**
TX	Sugar Sands	**Camp Swift**
TX	Pronatura	**Laughlin Air Force Base**
TX	Caddoan	**Red River Army Depot**
TX	Balconian	**Joint Base Antonio- Camp Bullis** **Camp Mabry**
TX	Western Cross Timbers and Prairies	**Fort Wolters**
WA	Nisqually	**Joint Base Lewis-McChord**
WA	Wanapum	**Yakima Training Center**
WV	Cow Knob	**Navy Information Operations Command Sugar Grove**

Alabama

TALLADEGA, ALABAMA





PARCA: Talladega

Overlapping DoD Installation: Fort McClellan Army National Guard Training Center

General Description: The Talladega PARCA contains the northeast portion of the Talladega National Forest and the surrounding area in eastern Alabama. Overall, the PARCA is largely forested and although fragmented, still has abundant deciduous forest habitats to support herpetofauna. The higher elevation region in the PARCA falls within the Talladega Upland ecoregion and contains the higher elevations of the Alabama-Georgia Piedmont and is dissected, mountainous, and heavily forested. To the south is the Southern Inner Piedmont ecoregion, which is lower with less relief and different soils than the Talladega Upland. The region is now mostly forested, with major forest types of oak-pine and oak-hickory. Open areas are mostly in pasture, although there are some small areas of cropland. Hay, cattle, and poultry are the main agricultural products.

In the northern portion of the PARCA is the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion, characterized by undulating valleys and rounded ridges and hills, with many caves and springs. Land cover includes oak-hickory and oak-pine forests, pasture, intensive agriculture, and urban and industrial. Dispersed throughout this ecoregion are sandstone ridges that are steep and forested with narrow crests. The soils are typically stony, sandy, and of low fertility.

Habitat Description: The natural vegetation of the Talladega Upland and Southern Inner Piedmont Ecoregion is oak-hickory-pine forest. Land uses include mixed forest; pine plantations; deciduous forest; large areas of public land; recreation; forestry; and pasture, hay, cattle, and poultry production.

The Southern Limestone/ Dolomite Valleys and Low Rolling Hills ecoregion contains mostly mixed oak forest, oak-hickory-pine forest, bottomland oak forest, and some cedar glades. Land use includes mixed and deciduous forest; pasture and cropland with hay, corn, soybeans, cotton, beef, poultry, and hogs; and rural, residential, urban, and industrial. Caves and springs occur. The vegetation of the Southern Sandstone Ridges is mixed oak forest and oak-hickory-pine forest.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:

- Alabama Department of Conservation and Natural Resources (ADCNR)
- State Parks
- Alabama Land Trust
- NRCS
    - Farm and Ranch Lands Protection Program
- USFS
- USFWS
- DoD

Research/ Conservation Needs:

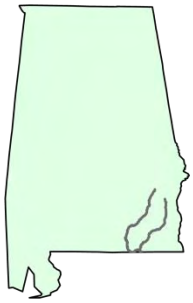
Information Needed

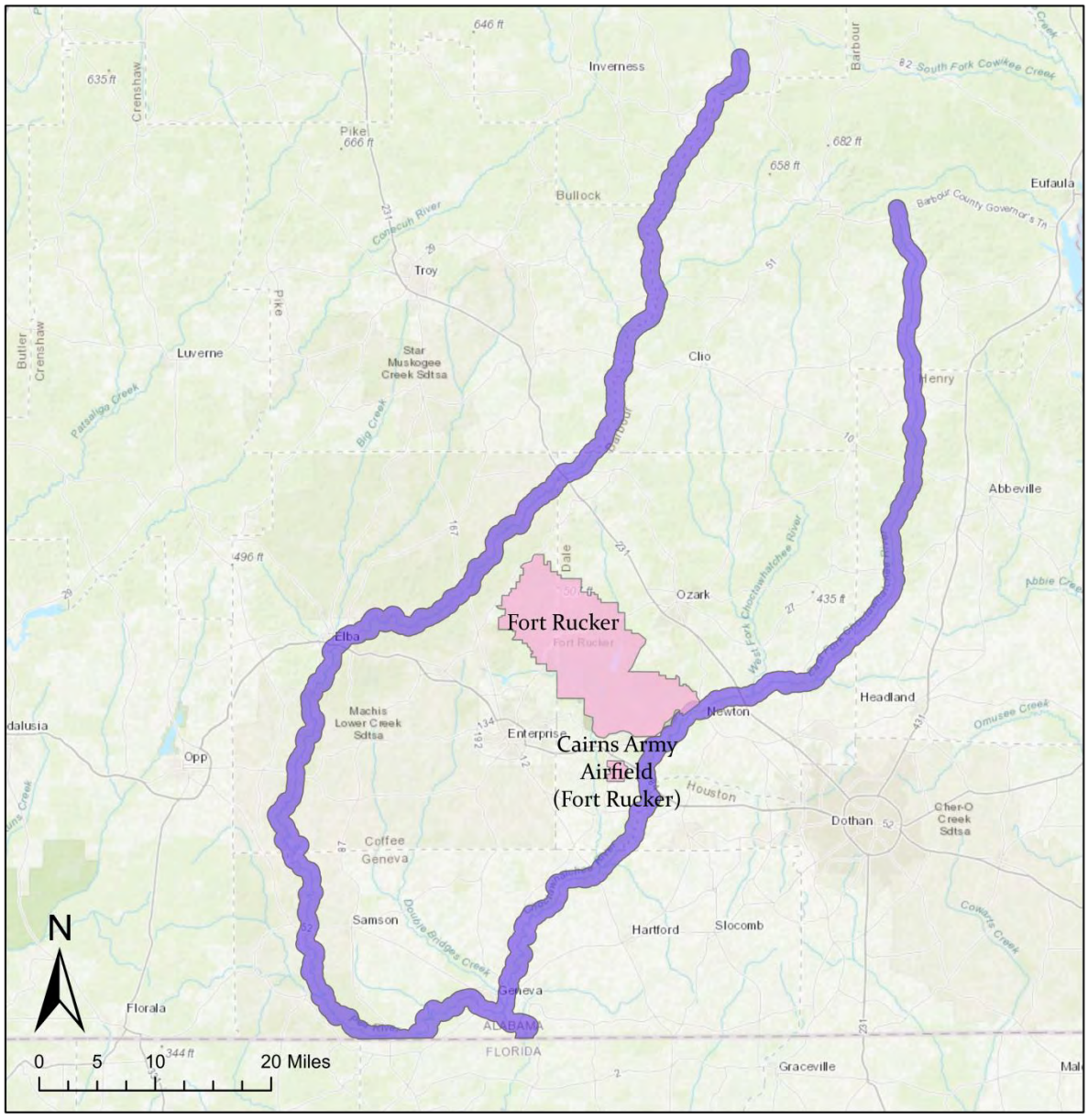
Habitat Management Recommendations:

- Meet or exceed forestry and agricultural Best Management Practices (BMP)s, including recommendations for Streamside Management Zones (SMZs)
- Favor mature forest stands but maintain a mixture of forest types and ages, including openings
- Maintain and, where necessary, restore the natural fire regime in forests
- Direct foot traffic and trails away from sensitive embedded habitat features in forests such as vernal pools, seeps, ravines, and caves
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools
    - Allow natural flood regimes
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Restore or protect native stream bank vegetation and structure
- Limit human cave access to times of low seasonal fauna activity/ presence
- Maintain and restore forested buffers around cave and sinkhole openings
- Exclude point-source and nonpoint-source water pollution throughout the surface recharge area of caves
- Exclude and remove invasive exotic plant species, woody encroachment, and woody succession from glades
- Maintain and restore natural fire frequency, intensity, and seasonality in glades, including landscape-scale fire in surrounding, complementary habitats where appropriate
- Protect and buffer any remaining natural areas in agricultural landscapes
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall
- Include existing natural areas in the design of new neighborhoods

- Protect and maintain riparian and wetland areas, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) of streams and wetlands
- Install and protect existing special habitat features in residential areas such as streams, wetlands, and rock outcroppings

CHOCTAWHATCHEE PEA, ALABAMA





PARCA: Choctawhatchee Pea

Overlapping DoD Installation: Fort Rucker

General Description: The Choctawhatchee Pea PARCA follows the Pea River and Choctawhatchee Rivers to their convergence near the southern border of Alabama. The main goal of this PARCA is to maintain Barbour's map turtles. This is also key land for eastern kingsnakes, river frogs, and the eastern version of the greater siren.

Habitat Description: The southern region of this PARCA falls within the Dougherty Plain ecoregion, which is mostly flat to gently rolling and influenced by the near-surface limestone. The karst topography contains sinkholes, springs, and fewer streams in the flatter part of the plain. Many of the limesink ponds and marshes act as biological oases in the mostly agricultural landscape. Natural vegetation is mostly southern mixed forest. The northern region of this PARCA falls within the Southern Hilly Gulf Coastal Plain ecoregion, which contains broad cuestas with gentle south slopes; steeper north-facing slopes are common. In this region, oak-hickory-pine forest grades into southern mixed forest to the south. Land cover is mostly forest and woodland with some cropland and pasture.

Focal Species:
Information Needed

Threats:
Information Needed

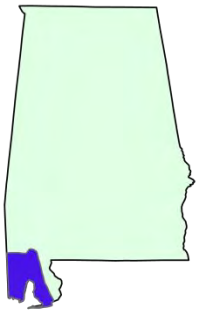
Opportunities:
- Alabama Department of Conservation and Natural Resources
- Department of Defense

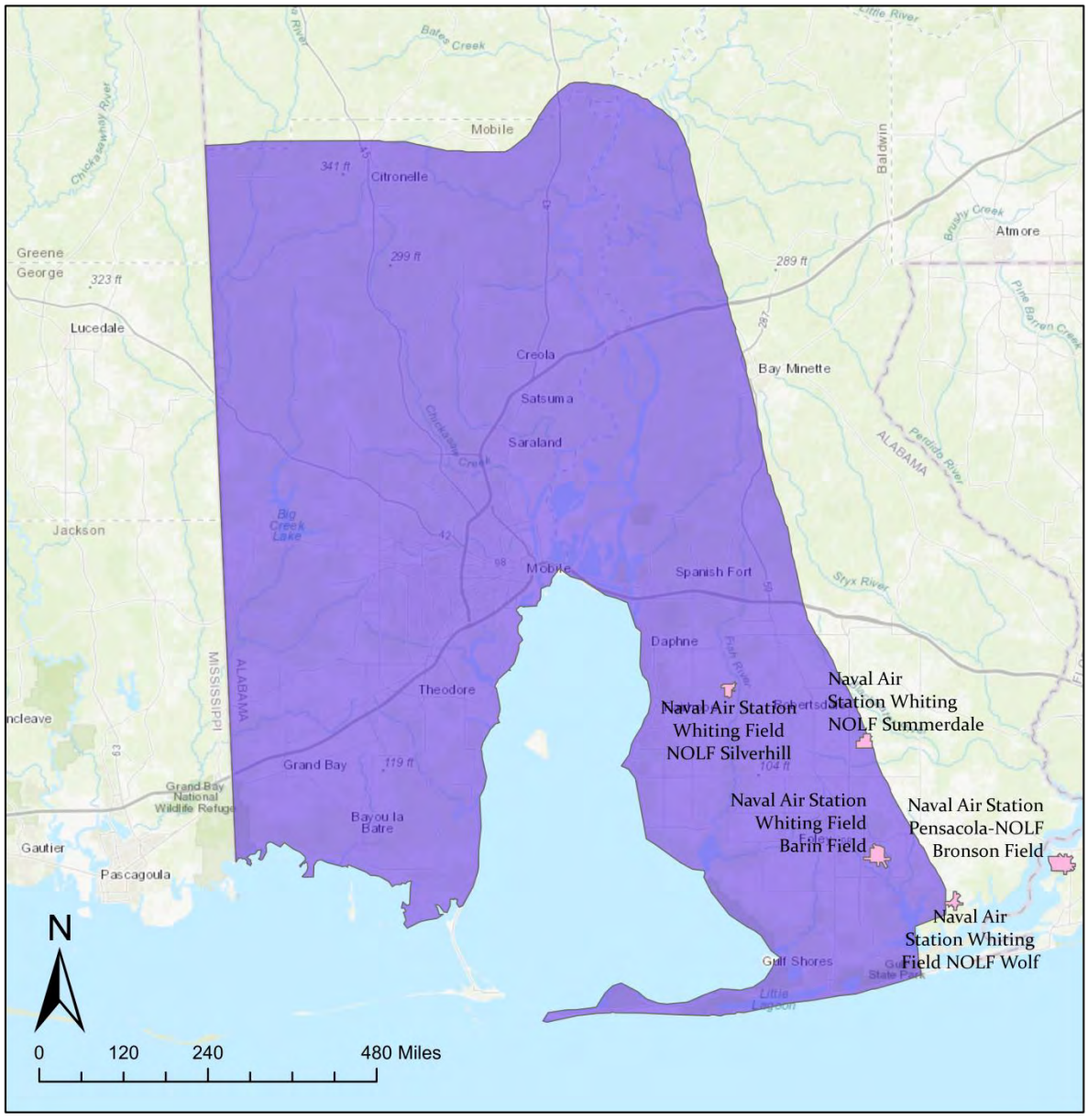
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Maintain or restore connectivity between floodplain forest stands
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Retain large trees and canopy cover where possible in floodplain wetlands
- Use BMPs to minimize erosion and excessive runoff containing sediments, silt, and/or nutrients that may alter water quality, hydrologic processes, and flooding regimes
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in floodplain forests

- Minimize activities that alter flow or temperature regimes of rivers
- Stabilize eroded and steep banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Enforce existing regulations. Strongly discourage indiscriminate killing of amphibian and reptile species
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore native stream bank vegetation composition and structure
- Restore processes that allow the development of channel meanders, oxbows, and sandbars
- Exclude point source pollution. Restrict the permitting of additional sewage outfalls

MOBILE BAY, ALABAMA





PARCA: Mobile Bay

Overlapping DoD Installations:
Naval Air Station Whiting Field Naval Outlying Field Barin
Naval Air Station Whiting Field Naval Outlying Field Summerdale
Naval Air Station Whiting Field Naval Outlying Field Silverhill

General Description: The Mobile Bay PARCA extends from the northern border of Mobile County down to the coast of Alabama surrounding Mobile Bay. Undeveloped areas in north Mobile County are likely to be key spots for gopher tortoises, black pinesnakes, eastern diamond-backs, southern hog-noses, pinewoods snakes, oak toads, and likely Mississippi gopher frogs. The coastal areas are prime spots for all sea turtles, diamond-backed terrapins, gulf salt marsh watersnakes, pinewoods snakes, and Florida green watersnakes. The swampy areas in between are prime for rainbow snakes, three-toed amphiumas, green watersnakes, diamond-backed watersnakes, Alabama red-bellied turtles, and southern black-knobbed sawbacks.

Habitat Description: On the coast of Alabama are the Mobile River delta, tidal marshes, bays, lagoons, barrier islands, dunes, and beaches. Vegetation includes live oak-sea oats and cordgrass-saltgrass rushes. Land use includes recreation, fish and shellfish production, and urban. Farther inland are the Gulf Coast Flatwoods which include flat to gently undulating plains, southern mixed forest, forested wetlands, low gradient streams with sandy and silty substrates, and some cropland and pastures on well drained areas.

The floodplain and terraces of the Mobile River contain low gradient streams with sandy and silty substrates, oxbow lakes, ponds, swamps. Land use includes deciduous forest, forested wetlands, and pine plantations on floodplains. Cropland and pine plantations occur on terraces. River swamp forests of bald cypress and water tupelo- and oak-dominated bottomland hardwood forests may occur and provide important wildlife corridors and habitat.

Further inland and upland from the Mobile River is the Southern Pine Plains and Hills ecoregion, characterized by Southern mixed forest and longleaf pine forest; acidic, tea-colored streams; and loblolly and slash pine plantations. The wide areas of longleaf pine forest provided habitat for now rare or endangered species such as the red-cockaded woodpecker, gopher tortoise, eastern indigo snake, and Florida pine snake.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- ADCNR
- State Parks
- USFWS
- DoD
- NRCS
    - Wetlands Reserve Program
- Alabama Land Trust
- Municipal Parks

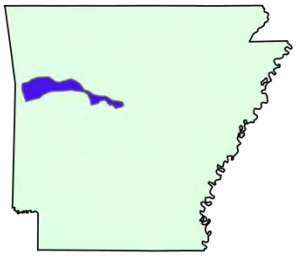
Research/ Conservation Needs:
Information Needed

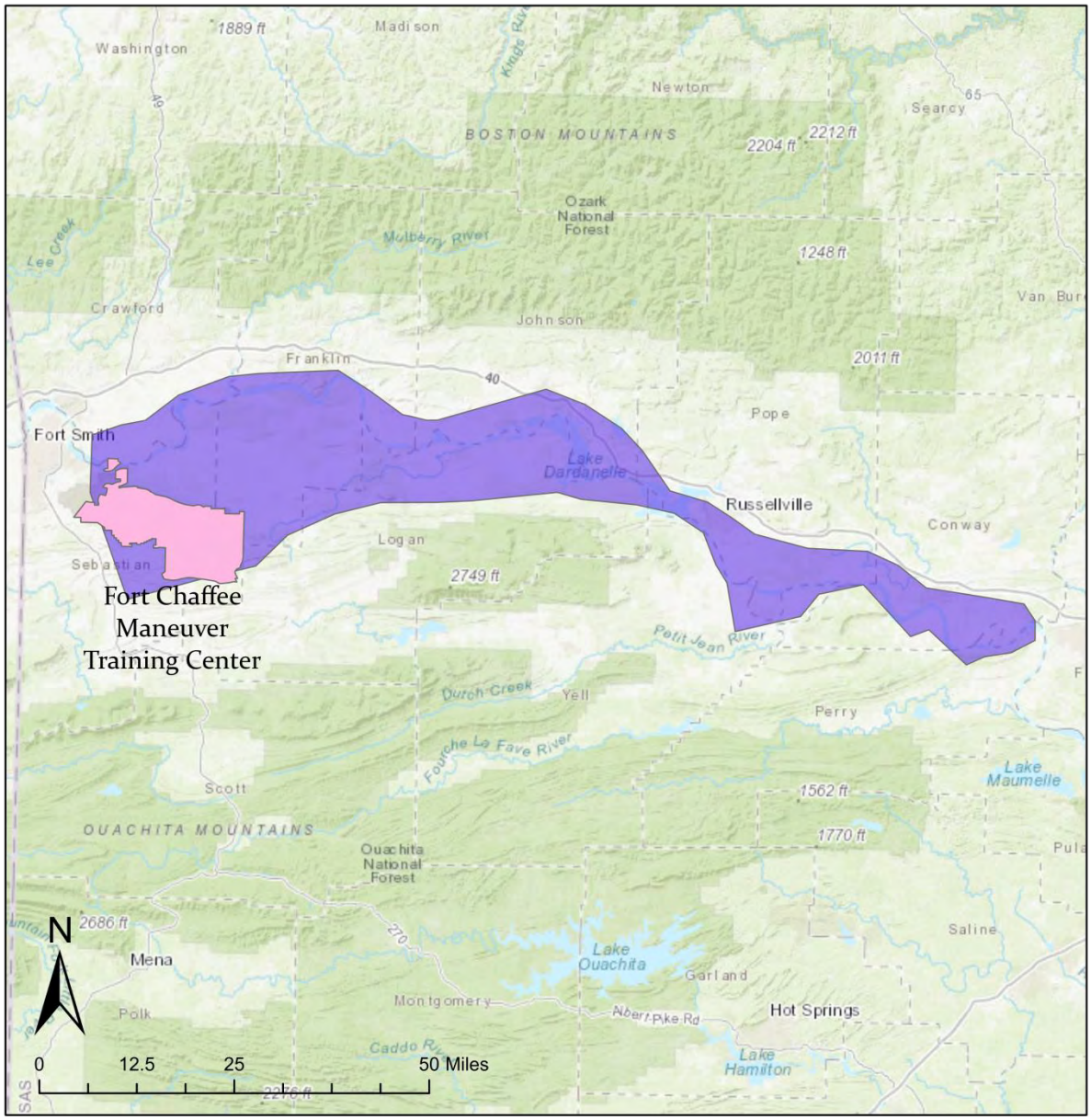
Habitat Management Recommendations:
- Meet or exceed forestry and agricultural BMPs, including recommendations for SMZs
- Limit shorelines development and minimize use of riprap and bulkheads in marshes
- Restore natural shoreline integrity and submerged native vegetation
- Increase awareness of turtle crossing areas by installing signs on roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- Limit foot traffic and motorized vehicles, including ATVs, on beaches and dunes , especially during sea turtle nesting season
    - Keep foot traffic on boardwalks
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers and implement predator controls when necessary
    - Exclude dogs, coyotes, raccoons, foxes, and other predators
    - Strictly enforce poaching laws
- Determine nesting and hatching periods so that monitoring so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Favor mature stands but maintain a mixture of forest types and ages, including openings
- Maintain and, where necessary, restore the natural fire regime in forests

- Identify, protect, and manage embedded habitats in forests such as seasonal wetlands, rock outcroppings, and sandhills
- Direct foot traffic and trails away from sensitive embedded habitat features in forests such as vernal pools, seeps, ravines, and caves
- Whenever feasible, thin plantations, extend rotation age, and use prescribed burning to maintain some herbaceous ground cover in pine forests
- On sites where options exist, favor site preparation techniques that minimize soil disturbance, such as fire and chemical site prep
- Maintain or restore connectivity between floodplain forest stands
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Retain large trees and canopy cover where possible in floodplain wetlands
- Use BMPs to minimize erosion and excessive runoff containing sediments, silt, and/or nutrients that may alter water quality, hydrologic processes, and flooding regimes
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in floodplain forests
- Protect and buffer any remaining natural areas on agricultural land
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall
- Follow pesticide/fertilizer directions very carefully; use precisely where needed and minimum amounts necessary to achieve objectives
- Minimize activities that alter flow or temperature regimes of streams
- Restore native stream bank vegetation composition and structure
- Restore processes that allow the development of channel meanders, oxbows, and sandbars

Arkansas

ARKANSAS RIVER VALLEY, ARKANSAS





PARCA: Arkansas River Valley

Overlapping DoD Installation: Fort Chaffee

General Description: This region consists of a synclinal and alluvial valley lying between the Ozark Highlands and the Ouachita Mountains. The Arkansas Valley contains plains, hills, floodplains, terraces and scattered mountains. It is largely underlain by interbedded Pennsylvanian sandstone, shale and siltstone. Less rugged upland areas have been cleared for pastureland or hayland. Water quality is generally good and influenced more by land use activities than by soils or geology. There are 4 ecoregions within the Arkansas Valley: Scattered High Ridges and Mountains, Arkansas River Floodplain, Arkansas Valley Hills, and Arkansas Valley Plains.

Habitat Description: The Scattered High Ridges and Mountains ecoregion is more rugged and wooded than other ecoregions in the Arkansas Valley. It is characteristically covered by savannas, open woodlands, or forests dominated or codominated by upland oaks, hickory and shortleaf pine; loblolly pine occurs but is not native. It is underlain by Pennsylvanian sandstone and shale. Magazine Mountain, the highest point in Arkansas at 2,753 feet, is distinguished by diverse habitats. Its flat top is covered with xeric, stunted woodlands. Mesic sites also occur and may contain beech–maple forests.

The Arkansas River Floodplain is characteristically veneered with Holocene alluvium and includes natural levees, meander scars, oxbow lakes, point bars, swales and backswamps. Mollisols, Entisols, Alfisols and Inceptisols are common. Potential natural vegetation is southern floodplain forest. Bottomland oaks including bur oak, American sycamore, sweetgum, willows, eastern cottonwood, green ash, pecan, hackberry and elm were once extensive. They have been widely cleared for pastureland, hayland and cropland. However, some forest remains in frequently flooded or poorly-drained areas.

The Arkansas Valley Hills are underlain by Pennsylvanian sandstone and shale. Ultisols are common and support a potential natural vegetation of oak– hickory forest or oak–hickory–pine forest. Today, pastureland is extensive, but rugged areas are wooded.

The Arkansas Valley Plains are in the rainshadow of the Fourche Mountains and were once covered by a distinctive mosaic of prairie, savanna and woodland. It is mostly undulating, but a few hills and ridges occur. Westward, it becomes flatter, drier, more open, and has fewer topographic fire barriers. Prior to the 19th century, frequently burned western areas had extensive prairie on droughty soils; scattered pine–oak savanna also occurred. Elsewhere, potential natural vegetation is primarily oak–hickory forest or oak–hickory– pine forest. Today,

pastureland and hayland are extensive but remnants of prairie, particularly the Cherokee Prairie near Fort Smith and woodland occur.

Focal Species:
Information Needed

Threats:
Information Needed

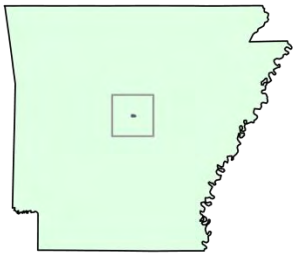
Opportunities:
- Arkansas Natural Resources Commission (ANRC)
- Arkansas Game and Fish Commission (AGFC)
- DoD
- NRCS
    - Wetlands Reserve Program
    - Emergency Watershed Protection Program
- USFWS
- Municipal Parks

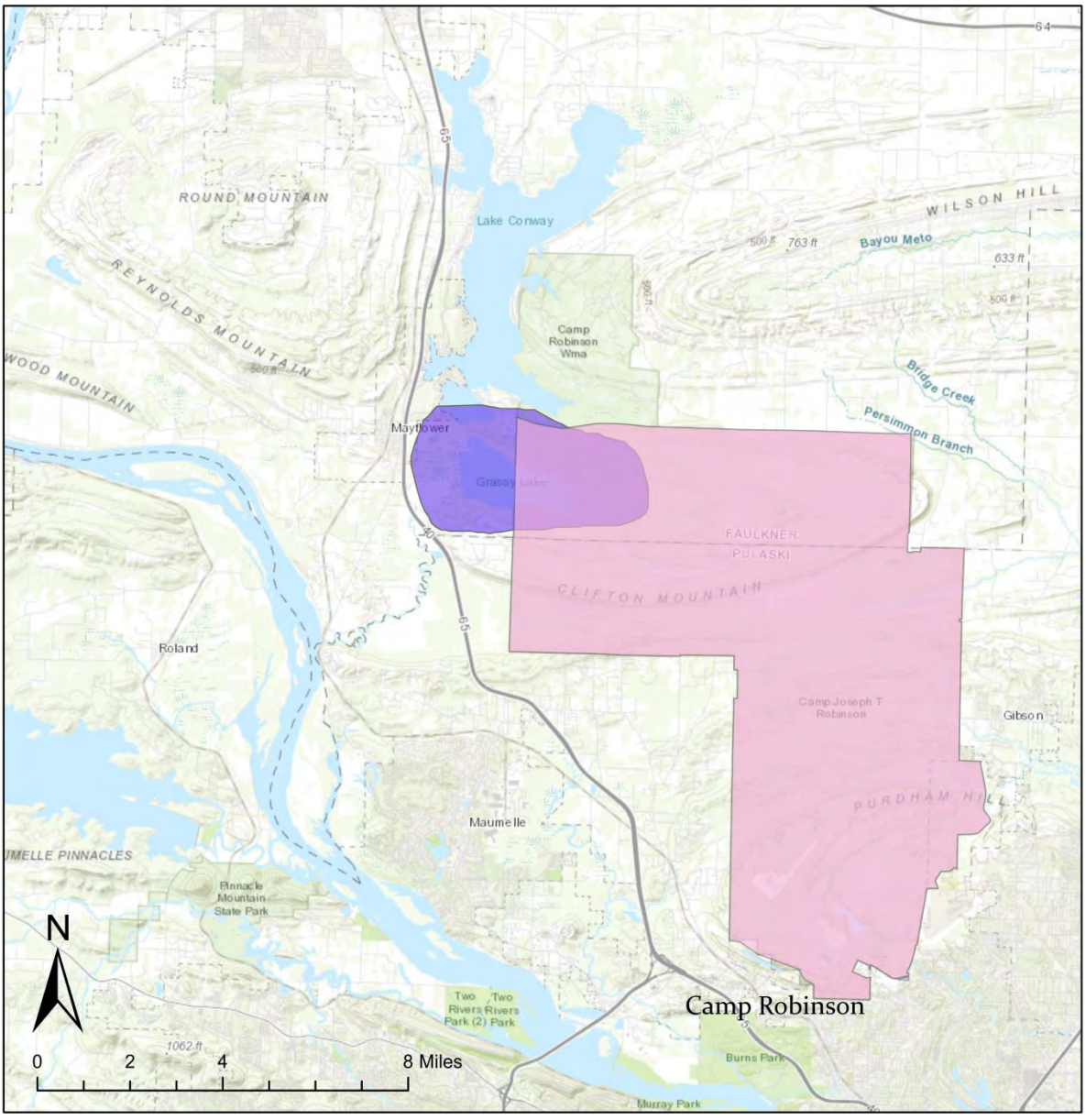
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Meet or exceed forestry and agricultural Best Management Practices (BMPs), including Stream Management Zones (SMZs)
- Retain snags, logs, rocks, and other structures in wetlands
- Provide open-canopy, well-drained upland terrestrial areas around wetlands for turtle nesting
- Maintain or restore connectivity between floodplain forest stands
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Retain large trees and canopy cover where possible in floodplain wetlands
- Use BMPs to minimize erosion and excessive runoff containing sediments, silt, and/or nutrients that may alter water quality, hydrologic processes, and flooding regimes
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in floodplain forests
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools
    - Allow natural flood regimes
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt

- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- Restore or protect native stream bank vegetation and structure
- Minimize activities that alter flow or temperature regimes of streams
- Stabilize eroded and steep banks to allow turtles access to nesting sites
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Keep snag removal activities to the minimum necessary for boat traffic
- Exclude point-source pollution from streams and rivers
- Protect and buffer any remaining natural areas in agricultural landscapes
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall
- Favor mature stands but maintain a mixture of forest types and ages, including openings
- Identify, protect, and manage embedded habitats in forests such as seasonal wetlands, rock outcroppings, and sandhills
- Direct foot traffic and trails away from sensitive embedded habitat features in forests such as vernal pools, seeps, ravines, and caves
- Maintain and, where necessary, restore the natural fire regime in forests
- Whenever feasible, thin plantations, extend rotation age, and use prescribed burning to maintain some herbaceous ground cover
- On sites where options exist, favor site preparation techniques that minimize soil disturbance, such as fire and chemical site prep

BELL SLOUGH, ARKANSAS





PARCA: Bell Slough

Overlapping DoD Installment: Camp Robinson Maneuver Training Center

General Description: The Bell Slough PARCA is a small area that encompasses the entirety of Grassy Lake and the northeast corner of Camp Joseph T Robinson in central Arkansas. This PARCA falls within the Arkansas River Floodplain ecoregion, characteristically veneered with Holocene alluvium and includes natural levees, meander scars, oxbow lakes, point bars, swales and backswamps. Mollisols, Entisols, Alfisols and Inceptisols are common.

Habitat Description: The potential natural vegetation of the Arkansas River Floodplain is southern floodplain forest. Native vegetation is mixed deciduous forest containing bottomland oak where bur oak is most extensive. American sycamore, sweetgum, willows, eastern cottonwood, green ash, pecan, hackberry and elm were once extensive. They have been widely cleared for pastureland, hayland and cropland. However, some forest remains in frequently flooded or poorly-drained areas.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- Arkansas Natural Resources Commission (ANRC)
- Arkansas Game and Fish Commission (AGFC)
- DoD
- NRCS
    - Wetlands Reserve Program

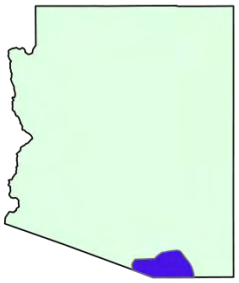
Research/ Conservation Needs:
Information Needed

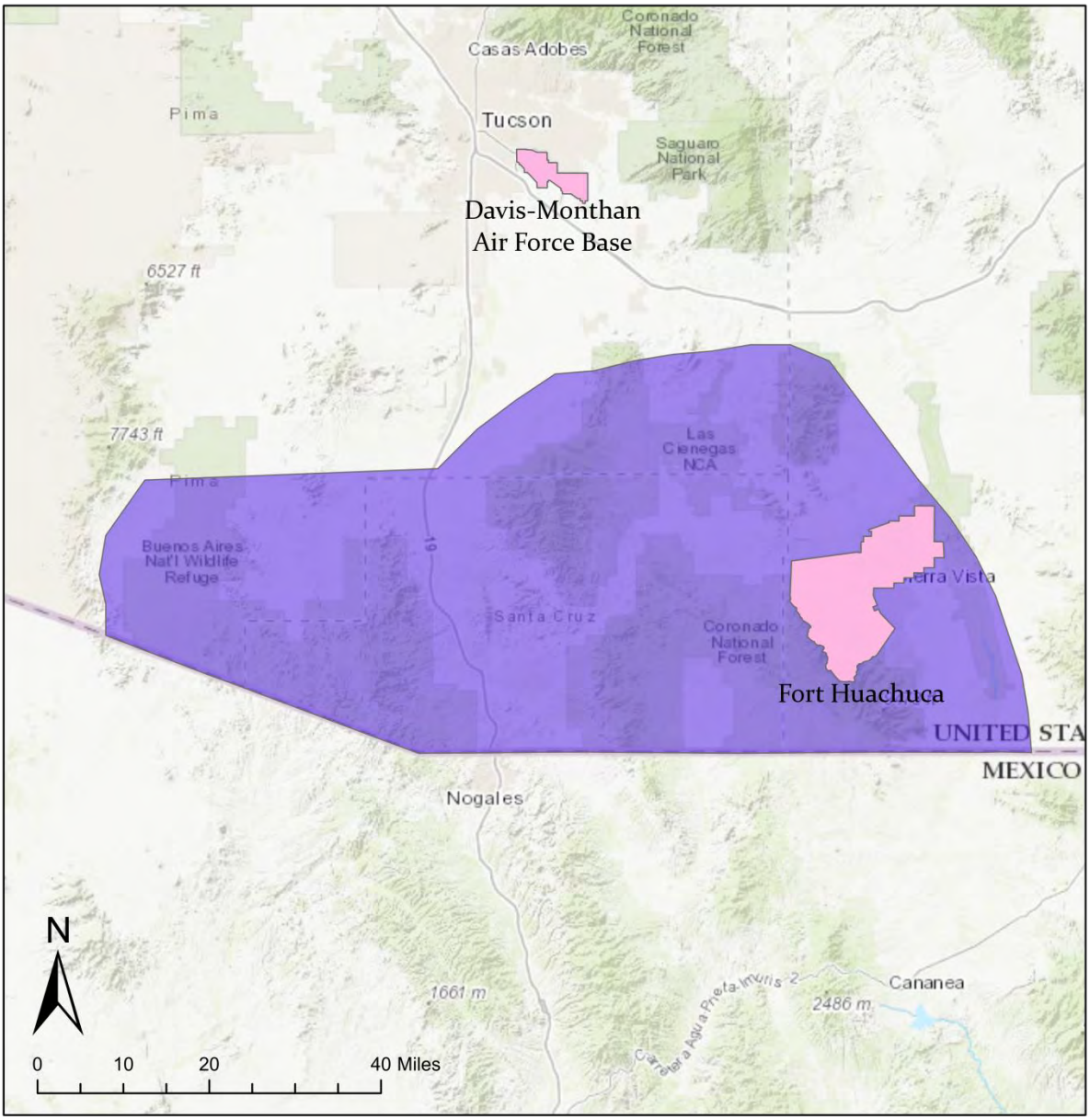
Habitat Management Recommendations:
- Maintain or restore connectivity between floodplain forest stands
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Retain large trees and canopy cover where possible in floodplain wetlands
- Use BMPs to minimize erosion and excessive runoff containing sediments, silt, and/or nutrients that may alter water quality, hydrologic processes, and flooding regimes

- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in floodplain forests
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools
    - Allow natural flood regimes
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- Restore or protect native stream bank vegetation and structure
- Minimize activities that alter flow or temperature regimes of streams
- Stabilize eroded and steep banks to allow turtles access to nesting sites
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Keep snag removal activities to the minimum necessary for boat traffic
- Exclude point-source pollution from streams and rivers
- Protect and buffer any remaining natural areas in agricultural landscapes
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall

Arizona

COCHISE WEST, ARIZONA





PARCA: Cochise West

Overlapping DoD Installment: Fort Huachuca

General Description: The Cochise West PARCA encompasses portions of Pima, Santa Cruz, and Cochise Counties bordered to the south by the international border with Mexico. It extends west to the east slopes of the Baboquivari Mountains, east to include the San Pedro River, and northward to I-10. Mountain ranges included in the area are: Huachucas, Whetstone, Patagonia, Santa Rita, Pajarito/ Atascosa, and Sierrita. Valleys include San Rafel, Las Cienegas, and southern Altar. Major water courses and wetlands include San Pedro River, Bobocomari Cienega, Cienega Creek, Sycamore Creek, and Arivaca Creek. Coronado National Forest dominates the PARCA but also includes La Cienegas National Conservation Area, Fort Huachuca, and Buenos Aires National Wildlife Refuge.

Habitat Description: The Apachian Valleys and Low Hills ecoregion is characterized by valley plains, alluvial fans, and some low hills, with desert scrub and semi-desert grassland being typical, although shrub and cacti encroachment and exotic species have greatly altered historical grassland areas. A variety of human and natural influences over the past 100 to 150 years has caused significant landscape changes. Droughts and precipitation events, livestock overgrazing, agricultural clearing and irrigation, fire suppression, road and residential construction, and introduction of exotic plants have altered the ecological patterns in this area. In comparison, the semi-desert and plains grassland areas found in the Madrean Basin within the PARCA have minimal shrub encroachment and few invasive species.

The Lower Madrean Woodlands occur at intermediate elevations, generally above 4500 or 5000 feet. It is a mild winter/wet summer woodland that can be shrubby in places. The Madrean encinal, or evergreen oak woodlands, have a mosaic of savannas, denser woodlands, and grassy openings. Emory, silverleaf, and Arizona white oaks occur, along with some scattered pinyon, juniper, mesquite, and chaparral species. Understory grasses can include blue grama, sideoats grama, hairy grama, little bluestem, and plains lovegrass. Pinyon-juniper woodland, with a few scattered oaks, occupies some parts of the region. Riparian areas of cottonwood, sycamore, and willow are valuable to the neotropical birds and other wildlife of the area. At higher elevations are ponderosa pine-oak forests, ponderosa pine forests, montane fir forests, and mixed conifer forests. Ponderosa pine, Southwestern white pine, Apache pine, Chihuahuan pine, and some Douglas-fir occur. Gambel oak and alligator juniper are also components of these pine forests. Some pine is also found in the cool microclimates of lower elevation canyons. At the highest elevations, small areas of subalpine forest occur. Aspen occur in the mixed conifer and subalpine zones.

Focal Species:

- Reptiles
    - Ridge-nosed Rattlesnake (*Crotalus willardi*)
    - Rock Rattlesnake (*Crotalus lepidus*)
    - Twin-spotted Rattlesnake (*Crotalus pricei*)
    - Western Diamond-backed Rattlesnake (*Crotalus atrox*)
    - Black-tailed Rattlesnake (*Crotalus molossus*)
    - Mohave Rattlesnake (*Crotalus scutulatus*)
    - Green Ratsnake (*Senticolis triaspis*)
    - Brown Vinesnake (*Oxybelis aeneus*)
    - Ring-necked Snake (*Diadophis punctatus*)
    - Thornscrub Hook-nosed Snake (*Gyalopion quadrangulare*)
    - Yaqui Black-headed Snake (*Tantilla yaquia*)
    - Western Threadsnake (*Leptotyphlops humilis*)
    - Sonoran Mountain Kingsnake (*Lampropeltis pyromelana*)
    - Gophersnake (*Pituophis catenifer*)
    - Western Patch-nosed Snake (*Salvadora hexalepis*)
    - Chihuahuan Black-headed Snake (*Tantilla wilcoxi*)
    - Plains Hog-nosed Snake (*Heterodon nasicus*)
    - Mexican Gartersnake (*Thamnophis eques*)
    - Black-necked Gartersnake (*Thamnophis cyrtopsis*)
    - Sonoran Desert Tortoise (*Gopherus morafkai*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Arizona Mud Turtle (*Kinosternon arizonense*)
    - Gila Monster (*Heloderma suspectum*)
    - Tiger Whiptail (*Aspidoscelis tigris*)
    - Canyon Spotted Whiptail (*Aspidoscelis stictogramma*)
    - Desert Grassland Whiptail (*Aspidoscelis uniparens*)
    - Elegant Earless Lizard (*Holbrookia elegans*)
    - Zebra-tailed Lizard (*Callisaurus draconoides*)
    - Long-nosed Leopard Lizard (*Gambelia wislizenii*)
    - Western Banded Gecko (*Coleonyx variegatus*)
    - Slevin's Bunchgrass Lizard (*Sceloporus slevini*)
    - Madrean Alligator Lizard (*Elgaria kingii*)
    - Eastern Collared Lizard (*Crotaphytus collaris*)
    - Clark's Spiny Lizard (*Sceloporus clarkii*)
    - Desert Spiny Lizard (*Sceloporus magister*)
    - Ornate Tree Lizard (*Urosaurus ornatus*)
    - Great Plains Skink (*Plestiodon obsoletus*)

- Amphibians
    - Sonoran Tiger Salamander (*Ambystoma mavortium stebbinsi*)
    - Tarahumara Frog (*Lithobates tarahumarae*)
    - Barking Frog (*Craugastor augusti*)
    - Chiricahua Leopard Frog (*Lithobates chiricahuensis*)
    - Lowland Leopard Frog (*Lithobates yavapaiensis*)
    - Lowland Burrowing Treefrog (*Smilisca fodiens*)
    - Sonoran Green Toad (*Anaxyrus retiformis*)

Threats:

- Border impacts
    - Infrastructure
    - Transportation impacts
    - Artificial lighting
- Changes in water availability
    - Groundwater drawdown
    - Long-term drought
    - Changes in rainfall patterns
- Mining
    - Leaching from mines and other water quality issues
    - Habitat loss
- Fire regime
    - Non-native grasses
    - Increased ignition points
- Invasive species
    - Bullfrogs
    - Non-native fish
    - Crawfish
    - Feral animals
- Unsustainable land use practices
    - Damage to riparian areas
- Impacts from recreational herping, overcollection, and poaching
- Disease
    - Bd
    - Ranavirus
- Expansion of urban areas and
    - Habitat conversion
    - Fragmentation effects
    - Increased traffic patterns
    - Illegal OHV use

- Habitat transitions from climate change effects on sky island species

Opportunities:

- DHS
- Army Compatible Use Buffer - REPI
- Arizona Land and Water Trust
- NRCS
    - EQIP
    - Other programs
- USFWS
- BLM
- USFS
- NPS
- DoD
- Sky Island Alliance
- TNC
- Audubon Society
- Tucson Herpetological Society
- Arizona Game and Fish Department (AZGFD)
- Sonoran Joint Venture
- Altar Valley Conservation Alliance
- Cochise, Pima, Santa Cruz Counties
- Mining companies
- Cattlemen's Associations
- Wineries and associations
- Friends of the San Pedro
- Quail Forever
- Arizona Antelope Foundation
- National Wild Turkey Federation (NWTF)
- Phoenix Zoo
- Arizona-Sonora Desert Museum
- Private landowners
- Arizona State Parks
- Arizona State Land Department (ASLD)

Research/ Conservation Needs:

- Conservation and restoration of grasslands for herpetofauna
- Research on alterations to the landscape that are altering surface water flow
- Conservation and research on surface water availability
- Research on effects of fire on A&R communities in component biotic communities

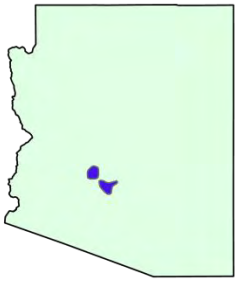
- Erosion control
- Research on effects of fragmentation (e.g. roads) on A&R populations/communities
- Establish frog populations for gartersnake recovery
- Bullfrog control and removal
- Research on effects of recreational herping/ collection/ poaching
- Community/ population trend monitoring with permanent plots in representative habitats using presence/absence surveys for detection rates
- Vegetation and plant community monitoring - to detect shifts in landscape cover related to fires, drought, shrub encroachment, and other factors

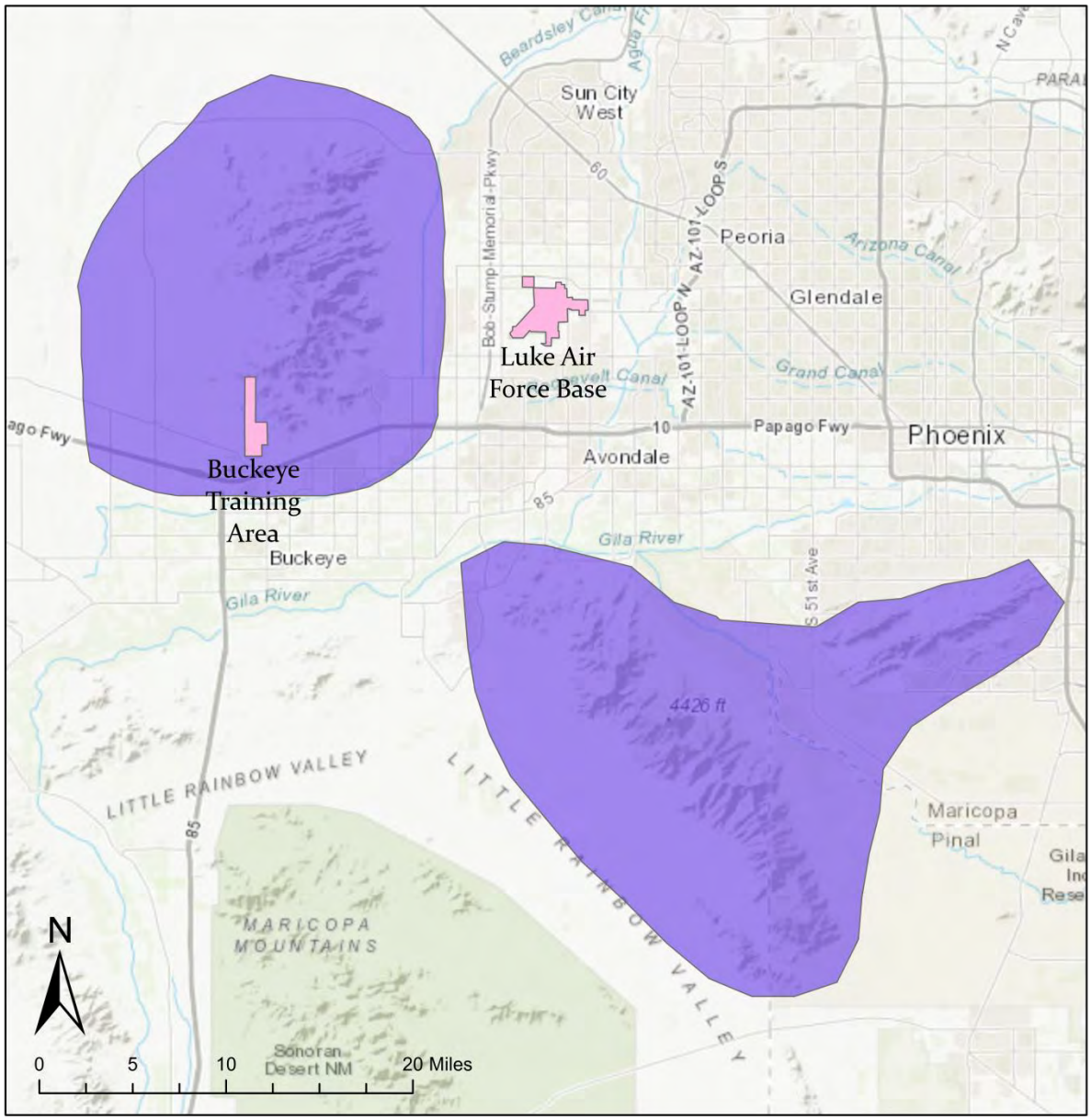
Habitat Management Recommendations:

- Grassland/ woodland management
- Best management practices for stock tank, cattle guards, and other agriculture production
- Diversionary infrastructure along roadways in A&R diversity hotspots
- Erosion control
- Maintain healthy and diverse natural habitats characteristic of the management area
- Restore and enhance riparian areas to promote native amphibian recovery

Other Comments: Historic record of desert massasauga from Fort Huachuca and “reliable sightings” in 70’s for southern San Pedro Valley.

KOMATKE/ WHITE TANK, ARIZONA





PARCA: Komatke / White Tank

Overlapping DoD Installation: Buckeye Training Area

General Description: The Komatke/ White Tank PARCA is made of three major mountain regions: South Mountain (2708'), White Tank Mountains (4079'), and Estrella Mountains (4426'), and adjacent low desert (1000'). These mountains border the western and southern ends of the Phoenix metro area, entirely within Maricopa County. South Mountain is designated as a recreational preserve and managed by the City of Phoenix Natural Resources Division, and is entirely surrounded by development (including the nearly-completed State Route 202 freeway). The White Tank Mountains are largely managed as White Tank Mountains Regional Park and Skyline Regional Park, bordered by BLM and private land. The Estrella Mountains are managed as the BLM Sierra Estrella Wilderness in the west, and Estrella Mountains Regional Park to the north; the south and eastern regions are part of the Gila River Indian Community.

Habitat Description: The ecotypes of this PARCA include Sonoran Desertscrub in mountain regions to Colorado River Desertscrub in bordering bajadas and flat areas. It includes a section of the Gila River and an IBA at the base of the Estrella Mountains.

Focal Species:

- Reptiles
    - Sonoran Desert Tortoise (*Gopherus morafkai*)
    - Gila Monster (*Heloderma suspectum*)
    - Red-backed Whiptail (*Aspidoscelis xanthonota*)
- Amphibians
    - Lowland Leopard Frog (*Lithobates yavapaiensis*)

Threats:

- Development
    - Fragmentation
    - Near-complete elimination of bordering Colorado River Desertscrub habitat due to urban sprawl
    - Heavy use as recreational areas
    - Future feasibility study for tunnel through White Tanks at Northern
- Recreational Activity
    - Recreational herping habitat damage and collection
    - Hikers and trail construction
    - OHV activity in White Tanks
- Non-native species - Rio Grande leopard frog, American bullfrog

Opportunities:

- City of Phoenix, Natural Resources Division
- Maricopa County Parks
- AZGFD
- Arizona Herpetological Association
- Phoenix Herpetological Sanctuary
- Rattlesnake Solutions LLC
- Gila River Indian Community
- BLM
- Audubon Arizona
- Friends of White Tank park

Research/ Conservation Needs:

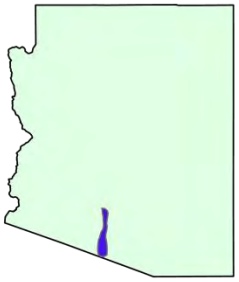
- Research effects of urbanization and habitat loss
- Impacts of invasive salt cedar on herpetofauna habitat use

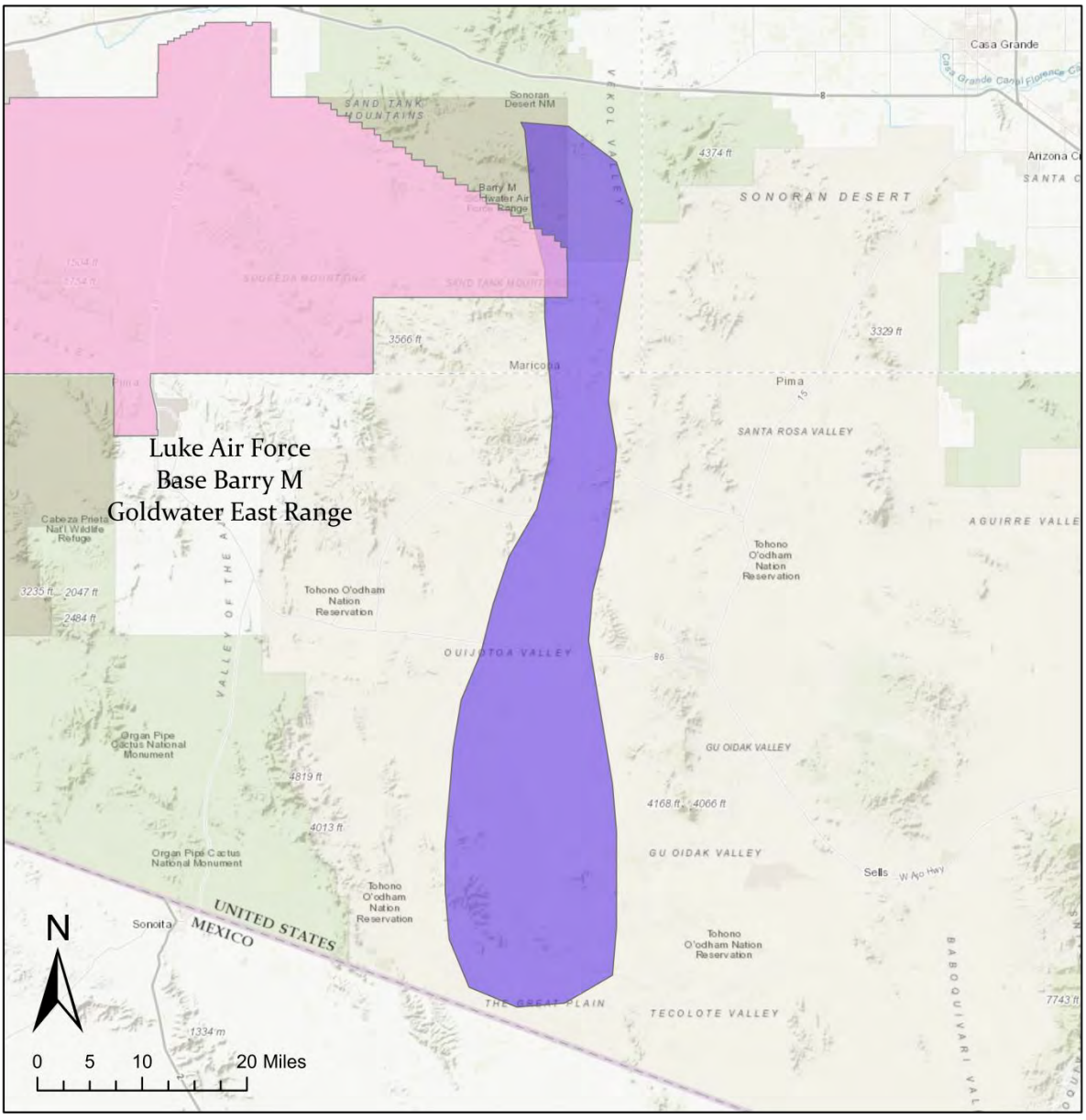
Habitat Management Recommendations:

- Maintain connectivity with future development
- Public education and outreach regarding recreational uses
    - Risk of fire
    - Destructive herping
- Control spread of non-native grasses
- Continued management of fire ignition risks

Other Comments: The high number of visitors to regional parks and heavy urbanization around the Phoenix metro area make this PARCA significant for public outreach and awareness.

TOHONO, ARIZONA





PARCA: Tohono

Overlapping DoD Installation: Luke Air Force Base- Barry M Goldwater East Range

General Description: The Tohono PARCA is located within Pima and Maricopa counties and is situated on mostly Tohono O'odham Nation Reservation, Bureau of Land Management (Sonoran Desert National Monument), and US Air Force (Barry M. Goldwater Range East) land. The biotic communities within this PARCA are AZ Upland Subdivision - Sonoran Desertscrub, Lower Colorado River Subdivision - Sonoran Desertscrub, and (to a lesser extent) Semidesert Grassland. Elevation ranges from ~1700 ft in the Quijotoa Valley to ~3800 ft in the Mesquite Mountains. Mountain ranges include the Mesquite, Sand Tank, and a small portion of the Castle and Sierra Blanca Mountains. The sparsely distributed mountain ranges are separated by large expanses of valley floors including the Quijotoa, La Quituni, Vekol, and Window Valley. Watersheds within this PARCA include the Upper San Simon Wash, Middle San Simon Wash, Lower San Simon Wash, Chukut Kuk Wash, Lower Vamori Wash, Kohatk Wash, Upper Vekol Wash, and a small portion of Sand Tank Wash.

Habitat Description: Important habitats of this PARCA comprise the valley floors, which contain relictual grasslands (tobosa) on clay soils in the Vekol and Quijotoa Valleys, and the adjacent mountains, which contain elements of biotic communities associated with more mesic regions outside of the Sonoran Desert (e.g., chaparral, grassland). A number of anurans use the valley floors for breeding during the summer monsoon, and a number of squamates are locally restricted to the adjacent mountains. A number of plant and animal species reach their northern range limits in this general region, identifying it as a unique portion of the Sonoran Desert in the USA.

Focal Species:

- Reptiles
    - Sonoran Desert Tortoise (*Gopherus morafkai*)
    - Arizona Mud Turtle (*Kinosternon arizonense*)
    - Red-backed Whiptail (*Aspidoscelis xanthonota*)
    - Gila Monster (*Heloderma suspectum*)
- Amphibians
    - Sonoran Green Toad (*Anaxyrus retiformis*)
    - Lowland Burrowing Treefrog (*Smilisca fodiens*)

Threats:

- Border infrastructure and activities
- Feral livestock

- Invasive species
- OHV

Opportunities:

- Tohono O'odham Nation
- BLM
- US Air Force
- US Border Patrol
- Sonoran Desert National Monument

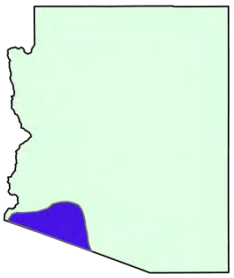
Research/ Conservation Needs:

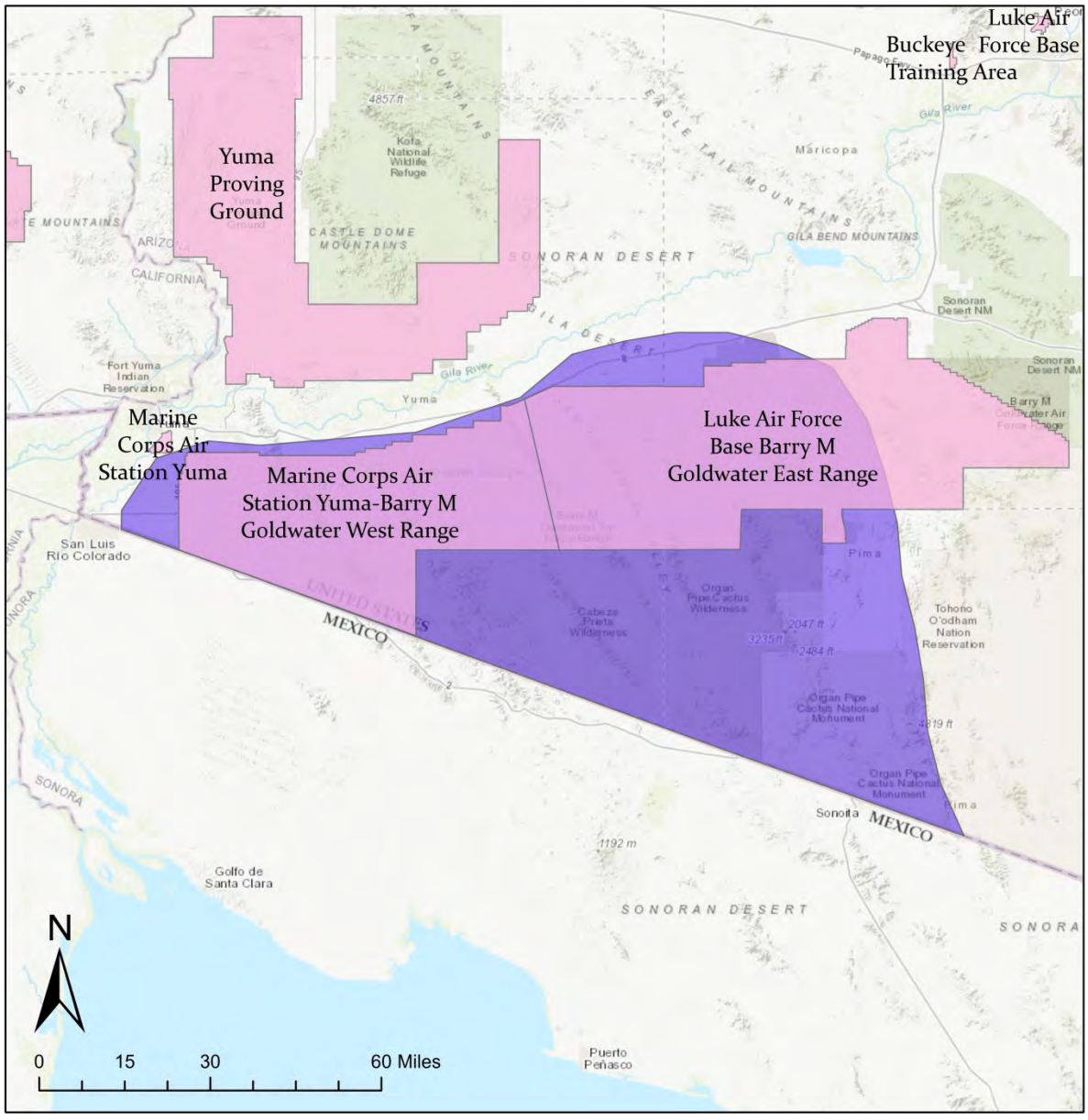
- Inventory and monitoring
- Restoration (includes road reclamation)
- Sonoyta mud turtle nesting ecology
- Habitat requirements
- Herpetofauna collecting effects
- Invasive species management

Habitat Management Recommendations:

- Maintain surface waters
- Invasive plant control (schismus, buffelgrass, Saharan mustard)
- Road reclamation
- Enforce OHV regulations
- Improve agency coordination

SOUTHWESTERN SONORAN, ARIZONA





PARCA: Southwestern Sonoran

Overlapping DoD Installations:
Marine Corps Air Station Yuma- Barry M Goldwater West Range
Luke Air Force Base- Barry M Goldwater East Range

General Description: This largely intact, undeveloped, and unfragmented PARCA encompasses Organ Pipe Cactus National Monument (in its entirety), Cabeza Prieta National Wildlife Refuge (in its entirety), and the Barry Goldwater Range East and West Units.

Habitat Description: Organ Pipe Cactus National Monument exhibits an extraordinary collection of plants and animals of the Sonoran Desert. Twenty-six species of cactus have mastered the art of living in this place, including the park's namesake and the giant saguaro.

Cabeza Prieta National Wildlife Refuge and Barry M. Goldwater Range contains Arizona's largest Wilderness area. Comprising some of the most pristine and isolated desert landscape in America, the various plant communities contained within the refuge provide vital habitat to many native bird species, including species of special status. Creosote flats, bursage dotted bajadas, alluvial valleys of desert scrub vegetation, and Sonoran desert uplands with saguaro, mesquite, paloverde, ironwood, ocotillo, and cholla characterize the vegetative landscape and provide essential habitat for many bird species.

Focal Species:

- Reptiles
    - Yuma Fringe-toed Lizard (*Uma rufopunctata*)
    - Mohawk Dunes Fringe-toed Lizard (*Uma sp.*)
    - Flat-tailed Horned Lizard (*Phrynosoma mcallii*)
    - Gila Monster (*Heloderma suspectum*)
    - Sonoran Desert Tortoise (*Gopherus morafkai*)
    - Sonoran Shovel-nosed Snake (*Chionactis palarostris*)
    - Sonoyta Mud Turtle (*Kinosternon sonoriense longifemorale*)
- Amphibians
    - Sonoran Green Toad (*Anaxyrus retiformis*)

Threats:

- Border infrastructure and activities
- Feral livestock
- Invasive species
- OHV
- Fire

- Land use changes (loss of aquatic sites)

Opportunities:

- DoD
    - USMC
    - USAF
- USFWS
- Fort Yuma Quechan Tribe
- AZGFD
- ASLD
- Defenders of Wildlife
- DHS
- NPS
- BLM
- Cabeza Prieta Natural History Association
- Flat-tailed Horned Lizard Interagency Coordinating Committee (FTHL ICC)
- Yuma Rod and Gun Club
- Big Horn Sheep Society
- Western Regional Partnership

Research/ Conservation Needs:

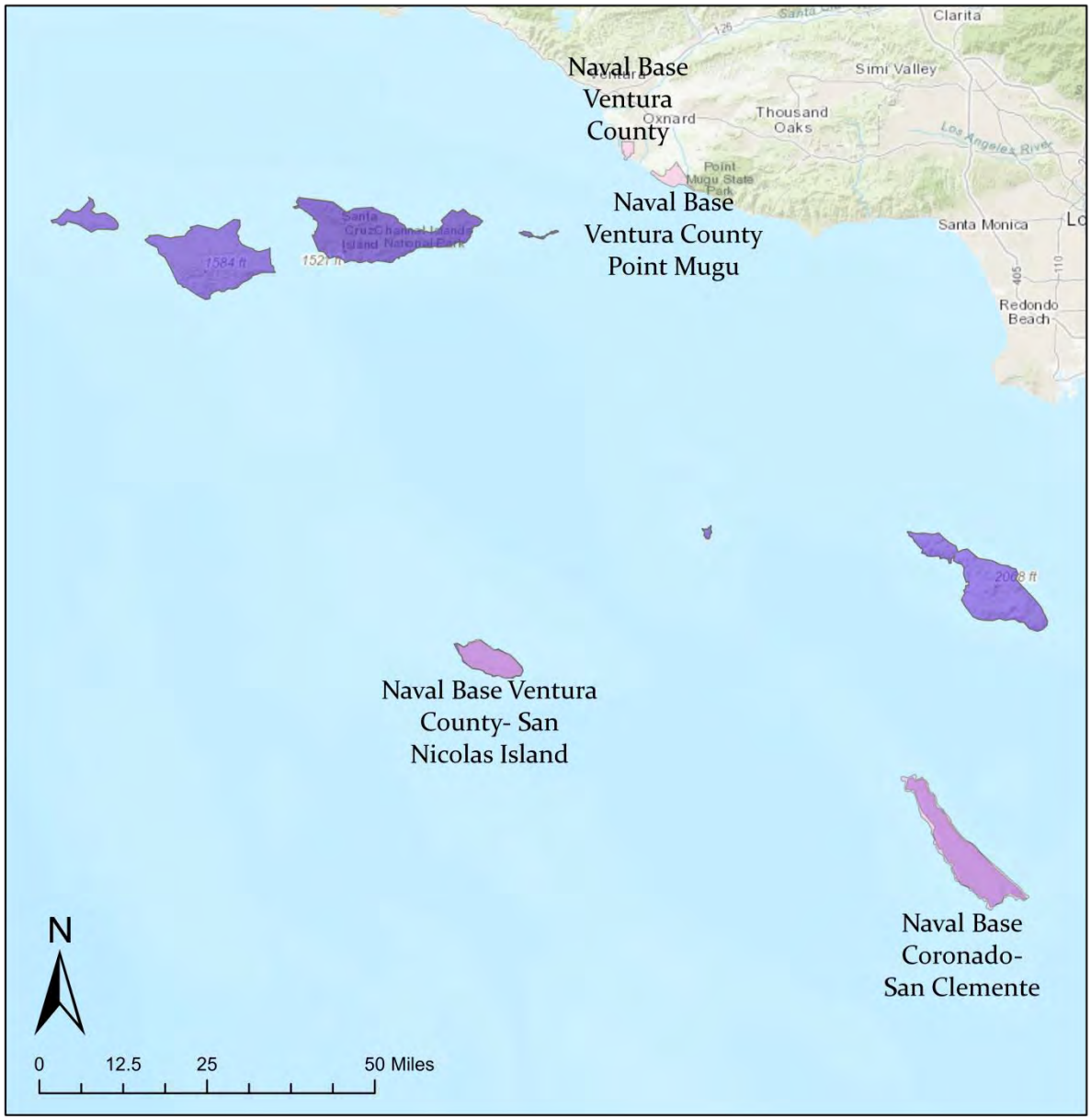
- Inventory and monitoring
- Restoration (includes road reclamation)
- Sonoyta mud turtle nesting ecology
- Habitat requirements
- Herpetofauna collecting effects
- Invasive species management

Habitat Management Recommendations:

- Maintain surface waters
- Invasive plant control (schismus, buffelgrass, Saharan mustard)
- Road reclamation
- Enforce OHV regulations
- Improve agency coordination

California

CHANNEL ISLANDS, CALIFORNIA



PARCA: Channel Islands

Overlapping DoD Installations:
Naval Base Ventura County- San Nicolas Island
Naval Base Coronado- San Clemente

General Description: The Channels Island PARCA consists of the 8 channel islands off the coast between Santa Barbara and San Diego, which together make up the Channel Islands National Park. Together, the islands cover 130,884 hectares. They are all are oceanic islands with diverse geologic histories. The islands are heavily influenced by fog.

Habitat Description: The Channel Islands host a large number of unique, endemic plant and animal species. The four Northern, east-west trending Channel Islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands) are characterized by steep mountains and hills with some gently sloping plateaus and dissected marine terraces where the maritime climate is mostly frost-free except at high elevations. Vegetation includes annual grassland, coastal sage scrub, and chaparral with some scattered mixed broadleaf woodland, island oak and coastal live oak woodland, and a few Bishop and Torrey pine stands on sheltered slopes, canyons, and ridges exposed to frequent fog. The four Southern, north-west trending Channel Islands (San Nicholas, Santa Barbara, Santa Catalina, and San Clemente Islands) are similar to the Northern Channel Islands, but receive warmer ocean currents and generally have higher average air temperatures, slightly less precipitation, less woodland, and more open xeric scrub vegetation. The distance between the Southern islands is also greater, and therefore the flora is more diverse with more xeric components. Steep mountains and hills and dissected marine terraces with the highest elevation occur at 2,123 feet on Santa Catalina Island.

Focal Species:

- Reptiles
    - Western Yellow-bellied Racer (*Coluber constrictor mormon*)
    - Island Fence Lizard (*Sceloporus occidentalis becki*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)
    - Island Night Lizard (*Xantusia riversiana*)

Threats:

- Invasive species
- Lack of biosecurity in some places
- Recreational impacts
- Poaching of rare species
- Bombing on San Nicholas and San Clemente
- Climate change and sea level rise

- Disease threats
- Small populations

Opportunities:

- TNC
- NPS
- Catalina Island Conservancy
- DoD
- University of California Natural Reserve System
- California State University Channel Islands

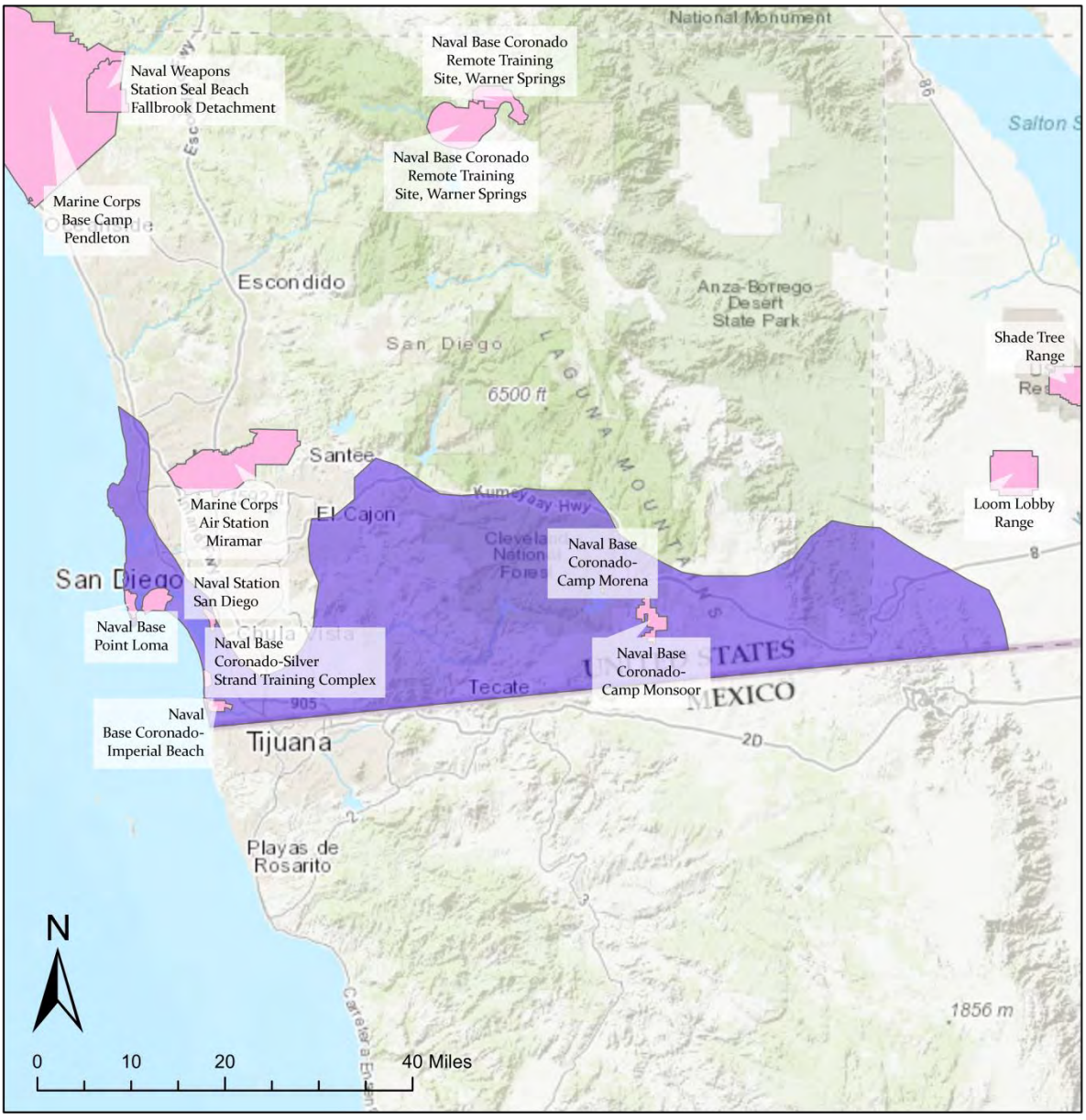
Research/ Conservation Needs:

- We know very little about any of the herpetofauna
- Research on population/species recovery after removal of invasive species
- Very little is known about the genetics of species
- Herpetofauna community dynamics
- Invasive alligator lizard/ island night lizard dynamics
- Explorations into the possible endemics

Habitat Management Recommendations:

- Manage fire
- Restore natural vegetation

BORDERLANDS, CALIFORNIA



PARCA: Borderlands

Overlapping DoD Installations:
Naval Base Coronado- Naval Air Station North Island
Naval Base Coronado- Camp Monsoor
Naval Base Coronado- Camp Morena
Naval Base Coronado- Imperial Beach
Naval Base Coronado- Silver Strand Training Complex
Naval Base Point Loma
Naval Base San Diego

General Description: The Borderlands PARCA falls on the western border between California and Mexico, extending up the coastline to the Torrey Pines State Reserve. It covers 362,091 hectares over San Diego and Imperial Counties and contains the northern half of the Tijuana watershed and a gradient from the coast to the desert and a transition from peninsular fauna to more Californian fauna. Major features include the San Ysidro Mountains, Hauser Canyon, and the San Diego Bay.

Habitat Description: Habitat within this region varies from estuarine through coastal sage scrub to chaparral and includes a unique cypress forest and ends in the desert scrubland. The Diegan Coastal Terraces are heavily modified by marine influence and is characterized by nearly level to gently sloping dissected marine terraces, a narrow strip of beach and sand dunes from Baja to the northern extent of the PARCA, a few vernal pools, and a small coastal stand of the rare Torrey pine. Coastal sage scrub; maritime succulent, Diegan coastal sand scrub, and chaparral communities; and California sagebrush, California buckwheat, black sage, ceanothus, coast live oak, and annual grasslands occur. Farther inland, mid-elevation low granitic hills occur that are characterized by rounded summits, moderately steep to steep sides, a few broad valleys, and mild influence by marine air, with typical vegetation including foothill needlegrass, coast live oak, chamise, mixed chaparral, and California sagebush. Farther east still in the area surrounding the Morena Reservoir, the elevation is slightly higher and mixed chaparral and some chamise dominate.

The western part of this PARCA includes the Western Sonoran Mountains and lower elevation woodlands and scrublands. The Western Sonoran Mountains are characterized erosional highlands of exposed bedrock with rocky terrain dissected by dry washes that flash flood during infrequent rain events. There is some Mojavean and Peninsular Range influence. Vegetation here is mostly creosotebush scrub transitioning to succulent scrub with ocotillo, white bursage, teddy bear cholla, range ratany, barrel cactus, brittlebush, staghorn cholla, beavertail cactus, yucca, jojoba, Mormon tea, a few juniper, and spring annuals fiddleneck, popcorn flower, desertbells,

and desert mariposa lily. At the western edge of the Sonoran Desert, desert chaparral, singleleaf pinyon, and California juniper occur amongst the granitic boulders with some canyon live oaks occurring far west. In some steep canyons, fan palm oases occur.

Focal Species:

- Reptiles
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - San Diegan Legless Lizard (*Anniella stebbinsi*)
    - California Glossy Snake (*Arizona elegans occidentalis*)
    - Orange-throated Whiptail (*Aspidoscelis hyperythra*)
    - Switak's Banded Gecko (*Coleonyx switaki*)
    - San Diego Banded Gecko (*Coleonyx variegatus abbotti*)
    - Western Yellow-bellied Racer (*Coluber constrictor mormon*)
    - Baja California Coachwhip (*Coluber fuliginosus*)
    - Red Diamond Rattlesnake (*Crotalus ruber*)
    - Baja California Collared Lizard (*Crotaphytus vestigium*)
    - Cope's Leopard Lizard (*Gambelia copeii*)
    - Blainville's Horned Lizard (*Phrynosoma blainvillii*)
    - Coast Patch-nosed Snake (*Salvadora hexalepis virgultea*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)
- Amphibians
    - California Red-legged Frog (*Rana draytonii*), extirpated but a target for reintroduction
    - Western Spadefoot (*Spea hammondii*)
    - Arroyo Toad (*Anaxyrus californicus*)
    - Large-blotched Mountain Salamander (*Ensatina eschscholtzii klauberi*)

Threats:

- Border wall
- Wildfire
- Rapid urbanization
- Fragmentation
- Sea level rise at Torrey pines and other coastal areas
- Xerification from wildfire
- Effects of transportation infrastructure
- Poaching
- Alternative energy footprints
    - Wind
    - Solar

Opportunities:

- BLM
- NPS
- USFS
- USFWS
- NOAA
- NRCS
- DoD
- Border Patrol
- State Parks
- California Department of Fish and Wildlife (CADFW)
- City of San Diego
- County Parks
- Tribes

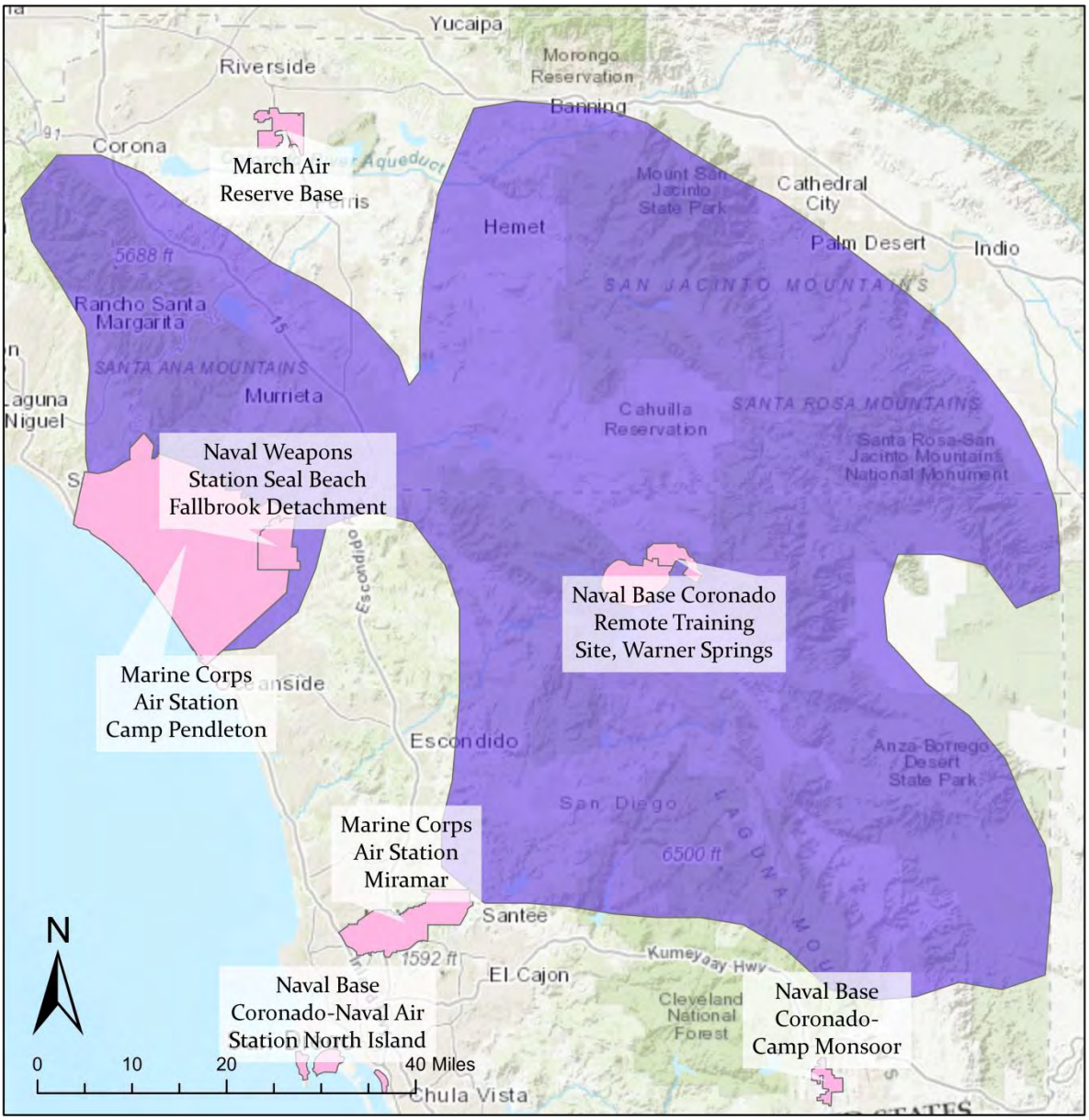
Research/ Conservation Needs:

- I & M
- Systematics work and species boundaries for several species
- Better monitoring of the municipal lands
- Effects of fuel modification (for fire protection and border security) on herpetofauna communities

Habitat Management Recommendations:

- Manage invasive species
- Restore creek function

PENINSULAR RANGES, CALIFORNIA



PARCA: Peninsular Ranges

Overlapping DoD Installations:
Naval Base Coronado- Remote Training Site Warner Springs
Marine Corps Air Station Camp Pendleton
Naval Weapons Station Seal Beach Fallbrook Detachment

General Description: The Peninsular Ranges cover 1,563,673 hectares over San Diego, Riverside, and Orange Counties. It extends to the coast in the east, encompassing the Santa Ana Mountains and the Camp Pendleton Marine Corps Base and extends to the eastern edge of San Diego County in the east, encompassing the Santa Rosa Mountains, Anza-Borrego Desert State Park, and Vallecito Mountains. It extends north to include the Mount San Jacinto State Park and south to include the Cuyamaca Rancho State Park. Habitat is Mediterranean chaparral, coastal sage scrub, grassland, oak woodland, pine forest, and Sonoran Desert scrub. The PARCA contains a high amount of locally abundant nonnative vegetation. Other major features include the Elsinore Mountains, the Santa Rosa- San Jacinto Mountains National Monument, and the San Mateo Canyon. This PARCA also encompasses the Soboba, Santa Rosa, Cahulla, Pechanga, Pawma and Yuima, Rincon, La Jolla, Captain Grande, Inaja and Cosmit, Mesa Grande, Santa Ysabel, Los Coyotes, and Ewiiaapaayp Reservations.

Habitat Description: The coastal region of this PARCA is heavily modified by marine influence and characterized by marine terraces and a narrow strip of beach and sand dune. Coastal sage scrub; maritime succulent, Diegan coastal sand scrub, and chaparral communities; and California sagebrush, California buckwheat, black sage, ceanothus, coast live oak, and annual grasslands occur along the coast. Moderately steep foothills cut by canyons and wide valleys occur farther inland with vegetation including coastal scrub and chaparral, annual and perennial grasslands, and small pockets of coastal oak woodlands. Farther west still are the Diegan Western Granitic Foothills that are influenced mildly by marine air and characterized by inland low hills at intermediate elevations with narrow to rounded summits and moderately steep to steep sides and some narrow to broad valleys; vegetation includes foothill needlegrass, coast live oak, chamise, mixed chaparral, and California sagebrush.

The Santa Ana Mountains occur in the northern part of this PARCA, ranging in elevation from 700 to 5,687 feet. The mountains are steep with rounded summits and narrow canyons. The inland side of the mountains is dry and hot compared to the eastern side which is mildly influenced by marine air. Vegetation includes mixed and chamise chaparral, coastal sage scrub, coast live oak, and areas of annual grassland. The Santa Rosa Plateau hosts vernal pools, native grasslands, and some Engelmann oak woodlands.

The mountains in the eastern part of this PARCA reach elevations of up to 10,815 feet. At elevations between 3,000 and 5,000 feet, the landscape is dominated by chaparral with patches of mixed evergreen woodland (consisting mostly of bigcone Douglas-fir and canyon live oak) occurring in deep canyons and on steep, north-facing slopes and some areas of coastal sage scrub occurring at lower elevations. At elevations between 5,000 and 8,500 feet, vegetation includes mixed conifer forests with ponderosa pine, Jeffrey pine, sugar pine, white fir, and incense cedar; hardwoods such as canyon live oak and black oak; and montane chaparral. Fires are very common in this region. At the highest elevation areas between 8,500 and almost 11,000 feet are subalpine and alpine environments. The disjunct high peaks contribute to distinct flora on each peak with a few endemic alpine species occurring. The subalpine area supports lodgepole pine, limber pine, white fir, and some areas of Sierra juniper and montane chaparral scrub. Scattered krummholz trees grow in some areas.

Focal Species:

- Reptiles
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - San Diegan Legless Lizard (*Anniella stebbinsi*)
    - California Glossy Snake (*Arizona elegans occidentalis*)
    - Orange-throated Whiptail (*Aspidoscelis hyperythra*)
    - Southern Rubber Boa (*Charina umbratica*)
    - Switak's Banded Gecko (*Coleonyx switaki*)
    - San Diego Banded Gecko (*Coleonyx variegatus abbotti*)
    - Western Yellow-bellied Racer (*Coluber constrictor mormon*)
    - Red Diamond Rattlesnake (*Crotalus ruber*)
    - Baja California Collared Lizard (*Crotaphytus vestigium*)
    - Mohave Desert Tortoise (*Gopherus agassizii*)
    - Coast Mountain Kingsnake (*Lampropeltis multifasciata*)
    - Blainville's Horned Lizard (*Phrynosoma blainvillii*)
    - Flat-tailed Horned Lizard (*Phrynosoma mcallii*)
    - Coast Patch-nosed Snake (*Salvadora hexalepis virgultea*)
    - Common Chuckwalla (*Sauromalus ater*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)
    - California Red-sided Gartersnake (*Thamnophis sirtalis infernalis*)
    - Coachella Valley Fringe-toed Lizard (*Uma inornata*)
    - Colorado Desert Fringe-toed Lizard (*Uma notata*)
    - Sandstone Night Lizard (*Xantusia gracilis*)
- Amphibians
    - California Red-legged Frog (*Rana draytonii*), extirpated
    - Western Spadefoot (*Spea hammondii*)
    - California Newt (*Taricha torosa*)

    - Arroyo Toad (*Anaxyrus californicus*)
    - Desert Slender Salamander (*Batrachoseps major aridus*)
    - Southern Mountain Yellow-legged Frog (*Rana muscosa*)
    - Large-blotched Ensatina (*Ensatina eschscholtzii klauberi*)

Threats:

- Fire
- Nonnative vegetation
- ORV
- Poaching
- Xerification from wildfire
- Effects of transportation infrastructure
- Poaching
- fragmentation
- Urbanization
- Altered hydrology
- Habitat conversion
- Nitrogen deposition

Opportunities:

- Habitat conservation planning already occurring
- DoD
- USFS
- BLM
- Municipalities
- NPS
- TNC
- Tribes
- CADFW

Research/ Conservation Needs:

- Conservation planning
- I & M
- Systematic work and range identification
- Identify impacts of fire on herpetofauna communities

Habitat Management Recommendations:

- Remove invasive species
- Reintroductions
- Restore habitat

SOUTH BAY, CALIFORNIA

PARCA: South Bay

Overlapping DoD Installation:
Parks Reserve Forces Training Area
Pillar Point Air Force Base
Military Ocean Terminal Concord

General Description: South Bay is the largest PARCA in California, covering 1,576,315 hectares. It encompasses the entirety of Santa Cruz County; the majority of Santa Clara (south of San Jose and Santa Clara), San Mateo (south of San Francisco), and Alameda Counties (east of Oakland and Fremont); the northern tip of San Benito and Monterey Counties; the western edges of Mercis, Stanislaus, and San Joaquin Counties extending to Interstate 580; and Contra Costa County south of Concord. Major features include the Santa Cruz Mountains, Mount Diablo State Park, Henry W. Coe State Park, Soquel Demonstration State Forest, Forest of Nisene Marks State Park, Big Basin State Park, and San Luis Reservoir State Recreation Area.

Habitat Description: The South Bay PARCA falls within the Central California Coast and far west edge of the Central California Coast Ranges ecoregions. The Central California Coast contains the mountains, hills, valleys, and plains in the southern Coast Ranges of California. The Central California Coast Ranges is inland from the coast far enough that the climate is modified only slightly by marine influence.

The low elevation San Mateo Coastal Hills in the west are characterized by marine terraces, coastal benches, and small valleys; coastal scrub vegetation; foggy summers; and cool, moist winters. Slightly inland are the Santa Cruz Mountains that were heavily logged from the late 1800's to early 1960's. Vegetation is typically redwood, Douglas fir, tanoak, coast live oak, Santa Cruz cypress, Shreve oak, California bay, chaparral, and coastal scrub; forest under-canopy shrub layers are generally sparse. Streams on the northeast side of the range typically dry out during the summer but those on the southwest are perennial. Alluvial plains, terraces, estuaries, and some newly formed dunes occur around Monterey Bay where vegetation is typically coast live oak and California oatgrass. Fog is heavy around the bay.

Hills, valleys, plains, and terraces are common in the central and eastern portions of the PARCA, where vegetation is typically coast live oak, blue oak, valley oak, grasslands, and chamise. All but the largest streams tend to dry out during the summer. The low elevation Livermore Hills and Valleys in the north have large flat areas that are heavily developed, but grasslands and areas of blue oak and coast live oak occur. The Diablo Range is typically wet with elevations reaching over 4,000 feet and is characterized by rounded ridges with steep sides and narrow valleys and canyons; blue oak woodlands, savannahs, chamise (on shallow soils), and black oak and mixed

conifers (on north-facing slopes at high elevations) occur. In the southern region of the PARCA, the alluvial plain of the Upper Santa Clara Valley is mostly used for cropland, although valley oak, coast live oak, California oatgrass, and needlegrass grasslands occur. The Leewald Hills range from elevations of 200 feet to 3,700 feet and are characterized by hills with rounded ridges, steep sides, and narrow canyons; grassland, live oak, California bay, and chaparral occur.

Focal Species:

- Reptiles
    - Northwestern Pond Turtle (*Actinemys marmorata*)
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - San Francisco Gartersnake (*Thamnophis sirtalis tetrataenia*)
    - Alameda Striped Racer (*Coluber lateralis euryxanthus*)
    - Blainesville's Horned Lizard (*Phrynosoma blainvillii*)
    - San Joaquin Coachwhip (*Coluber flagellum ruddocki*)
    - Forest Sharp-tailed Snake (*Contia longicauda*)
    - Northern Legless Lizard (*Anniella pulchra*)
    - California Glossy Snake (*Arizona elegans occidentalis*), occurrence uncertain
- Amphibians
    - California Tiger Salamander (*Ambystoma californiense*)
    - Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*)
    - Foothill Yellow-legged Frog (*Rana boylii*)
    - California Red-legged Frog (*Rana draytonii*)
    - Western Spadefoot (*Spea hammondii*)
    - Santa Cruz Black Salamander (*Aneides flavipunctatus niger*)
    - California Giant Salamander (*Dicamptodon ensatus*)

Threats:

- Urbanization
- Invasive aquatic species (hybridization with barred tigers, American bullfrogs)
- Road mortality and infrastructure
- Poaching
- B sal proximity to SF port
- Drought/ climate change and water availability or pond hydroperiod/stream impermanence
- Unsustainable recreation impacts
- Fertilizers/ pesticides
- Cannabis production
    - Water contamination
    - Water diversion
    - Pesticides/ herbicides

Opportunities:

- East Bay Regional Park District
- NRCS
- Mid Peninsular Regional Open Space District
- Peninsular Open Space Trust
- NPS
- State Parks
- BLM
- TNC
- Tri Valley Conservancy
- Stanford
- San Jose State
- US Navy
- SF State University
- SF Airport
- CADFW

Research/ Conservation Needs:

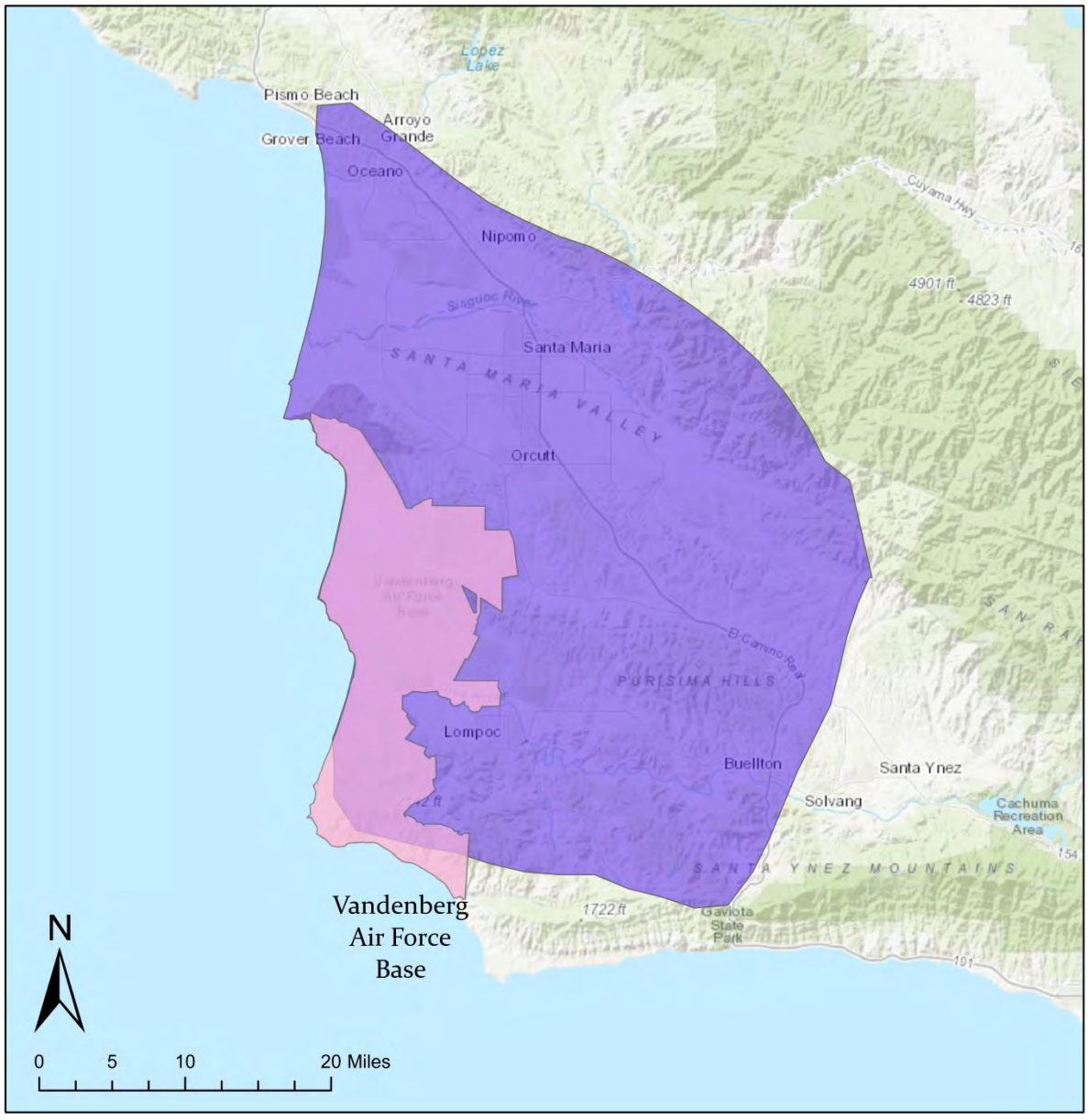
- Water management
    - Diversions
    - Dams
    - Pollution
- Wildlife corridors and habitat acquisition
- Population /conservation genetics for long toed salamanders
- More data on the Santa Cruz black salamander
- Identify suitable habitat for reintroductions of SF gartersnake and long toed
- Distribution and life history data for *Spea*

Habitat Management Recommendations:

- Protect and maintain riparian and wetland areas in urban settings, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) of streams and wetlands
- Identify and protect existing special habitat features in urban areas such as streams, wetlands and rock outcroppings
- Encourage landscaping with native species
- Encourage and support public education programs about the values of local wildlife (keeping cats indoors, not killing snakes, etc.)
- Engage and educate transportation planners at all levels to evaluate road-related impacts and implement solutions

- Identify amphibian and reptile road kill “hotspots” using proven techniques for reliable data collection
- Include barrier fencing on roads to “funnel” animals towards crossing structures in order to maximize structure effectiveness and minimize road kill
    - Monitor crossing structures to document effectiveness in reducing direct road mortality and increasing or maintaining permeability
- Minimize use of contaminants such as salts, petrochemicals, and herbicides on and along roads
- Install educational signage on roads
- Work with law enforcement personnel to prevent unlawful collection of amphibians and reptiles
- Manage coastal scrub and chaparral lands with prescribed fire where possible
    - Plan prescribed burning to avoid times when amphibians and reptiles are active
- Limit off-road vehicle use in sensitive areas to the extent possible
- Maintain or enhance natural corridors between habitat fragments
- Restore coastal scrub and grassland areas dominated by invasive grass with native shrubs and grasses
- Limit shoreline and salt marsh habitat development
- Focus marine/ estuary management on life history needs specifically for target species
- Implement control measures for subsidized predators
- Promote a diversity of habitats within woodlands where possible
    - Buffer zones should be used to protect targeted features and natural habitats
- Minimize habitat fragmentation when converting woodlands to other uses
- Maintain old-growth stands of forests whenever possible
- Prevent and control the spread of invasive species

POINT CONCEPTION, CALIFORNIA



PARCA: Point Conception

Overlapping DoD Installation: Vandenberg Air Force Base

General Description: Point Conception covers 377,785 hectares on the southern California coast within Santa Barbara and San Luis Obispo Counties, extending north to Pismo Beach, south to the north slope of the Santa Ynez Mountains, west to the coast, and east about 7 miles past the Santa Maria River. The PARCA encompasses the Vandenberg Airforce Base. Major features include the Santa Maria Valley, Purisima Hills, Solomon Hills, and the northeast Santa Ynez Mountains. This PARCA contains the Santa Barbara Distinct Population Segment of the California tiger salamander, which is federally listed as endangered.

Habitat Description: The Point Conception PARCA is part of the Southern California Coast ecoregion. The land in this region is close enough to the coast that its climate is modified by marine influence.

The Santa Maria River Valley has cool, coastal temperatures that become warmer further inland. Fog is prevalent during the summer. Runoff is slow across the alluvial plains. Natural vegetation was historically valley oak, coast live oak, grasslands, riparian willows, and other shrubs. Some central maritime or sandhill chaparral occur with endemic plants such as sand mesa manzanita, Purisima manzanita, and coast ceanothus, but most of this habitat has been converted. Most of this region has been converted to agricultural, urban, residential, or military land use.

Surrounding the Solomon, Purisima, and Santa Ynez hills is a hilly mosaic of coastal sage scrub, chaparral, and oak woodland, with some grasslands being used for cattle ranching. Some oil and gas production occur and grape production occurs in the valleys and low hills. The Point Conception PARCA also includes the southernmost part of the Santa Lucia Range, characterized by northwest-trending mountains and hills with rounded ridges, steep sides, and narrow canyons. Vegetation includes coast live oak woodlands, chaparral shrublands, and annual grasslands.

Focal Species:

- Reptiles
    - Blainville's Horned Lizard (*Phrynosoma blainvillii*)
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - Northern Legless Lizard (*Anniella pulchra*)
    - Coast Mountain Kingsnake (*Lampropeltis multifasciata*)
    - Coast Patch-nosed Snake (*Salvadora hexalepis virgultea*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)
    - California Red-sided Gartersnake (*Thamnophis sirtalis infernalis*)

- Amphibians
    - California Tiger Salamander (*Ambystoma californiense*)
    - California Red-legged Frog (*Rana draytonii*)
    - Western Spadefoot (*Spea hammondii*)
    - California Newt (*Taricha torosa*)

Threats:

- Urbanization
- Habitat conversion to agricultural
- Low recruitment for CTS
- Potential hybridization
- Impact of unsustainable agricultural practices

Opportunities:

- Partnering with private landowners
- NRCS
- DoD
- Federal prison system- Lompoc
- FWS
- FWS Partners program
- CADFW

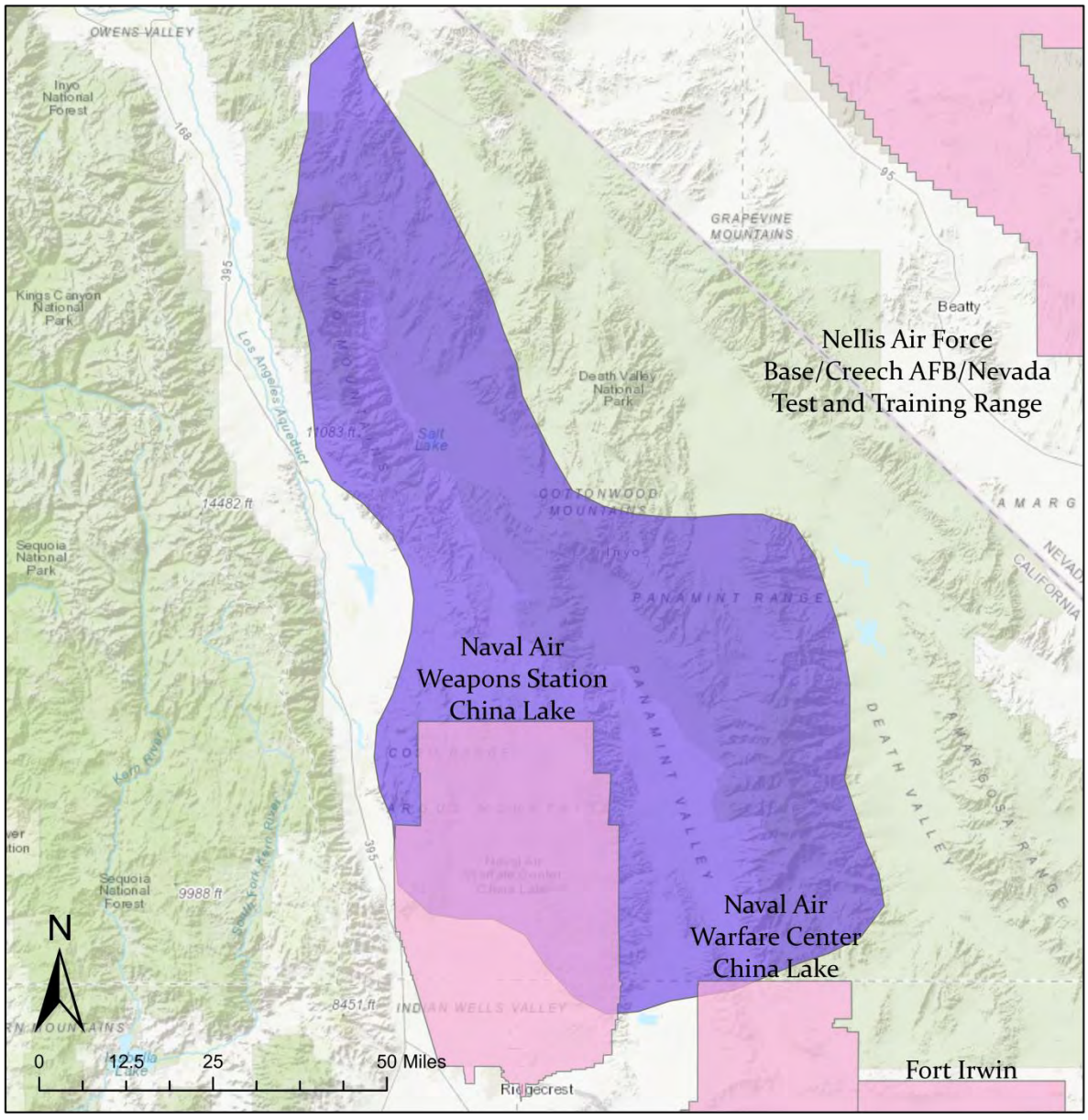
Research/ Conservation Needs:

- Basic population ecology on Santa Barbara CTS
- Systematics of undescribed *Batrachoseps* and skink

Habitat Management Recommendations:

- Maintain adequate hydroperiod for vernal pools
- Remove invasive tiger salamanders
- Riparian restoration for red legged frogs and pond turtles

NORTHERN DESERTS, CALIFORNIA



PARCA: Northern Deserts

Overlapping DoD Installation: Naval Air Weapons Station China Lake

General Description: The Northern Deserts PARCA covers 1,512,780 hectares in Inyo County, encompassing the Northern Mojave Desert, the western part of Death Valley National Park, and the Naval Air Weapons Station- China Lake. The region includes both low valleys and extremely high elevation peaks (over 11,000 feet) and parts of the Panamint, Inyo, Coso, and Argus Mountain ranges.

Habitat Description: In the northwestern part of this PARCA are the Inyo Mountains, where elevations reach over 11,000 feet and the biota and climate are similar to the Sierra Nevadas. These mountains get minimal summer rainfall, so they support pinyon-juniper woodland but no oak or ceanothus species. Scattered ephemeral pools can be found over flat, impermeable volcanic bedrock which host unique assemblages of flora and fauna. Above 9,000 feet in elevation, vegetation is primarily shrubs (such as mountain big sagebrush, low sagebrush, and mountain-mahogany), some aspen groves on moist sites, scattered stands of high elevation conifers (such as limber pine and bristlecone pine), and Sierra Nevada subalpine and alpine forbs. In some areas, substantial perennial streamflow occurs. At the base of the Inyo Mountains are low mountains and foothills with rocky substrate. Great Basin species are common here, although this region is more arid, contributing to more black sagebrush and absent mesic understory species. Mojave Desert species such as blackbrush, Joshua tree, and cholla cactus are also present in the east and south where summers are moister. Streams are ephemeral.

The larger portion of this PARCA falls within the northern portion of the Mojave Basin and Range ecoregion. The low elevation Saline and Panamint Valleys are characterized by alluvial plains, fans, and bajadas with vegetation including creosotebush, white bursage, and some areas of shadscale, fourwing saltbush, and scattered Joshua trees on some upper bajadas and fans. In these valleys, there is very little summer rainfall and all drainage is internal. A few occasionally flooding playas, migrating dunes, vegetation-stabilized dunes, and sand sheets are found within these two valleys. The playas are mostly barren aside from some sparse saltbush that may grow around the margin and woody legumes such as velvet ash and mesquite that grow where moisture is sufficient.

The low ranges and foothills of the mountains in this region consist of erosional highlands of exposed bedrock, where creosotebush scrubland dominates, some areas of Joshua tree occur on footslope, and some areas of blackbrush scrubland and sagebrush occur in the north. Above 6,000 feet in elevation, it becomes cooler and wetter with vegetation consisting of singleleaf pinyon, juniper, and sagebrush. At the high elevation peaks above 8,000 feet, limber pine, mountain-mahogany, big sagebrush, and bristlecone pines occur.

Focal Species:

- Reptiles
    - Great Basin Collared Lizard (*Crotaphytus bicinctores*)
    - Regal Ring-necked Snake (*Diadophis punctatus regalis*)
    - Panamint Alligator Lizard (*Elgaria panamintina*)
    - Mohave Desert Tortoise (*Gopherus agassizii*)
    - Common Chuckwalla (*Sauromalus ater*)
    - Mohave Fringe-toed Lizard (*Uma scoparia*)
- Amphibians
    - Black Toad (*Anaxyrus exsul*)
    - Inyo Mountains Salamander (*Batrachoseps campi*)

Threats:

- ORV
- Invasive ungulate damage
- Fire
- Drying of springs from overdraft/hydrology issues
- Climate change- changes to hydrology

Opportunities:

- DoD
- NPS
- California State Parks
- BLM
- Private land partnerships
- CADFW

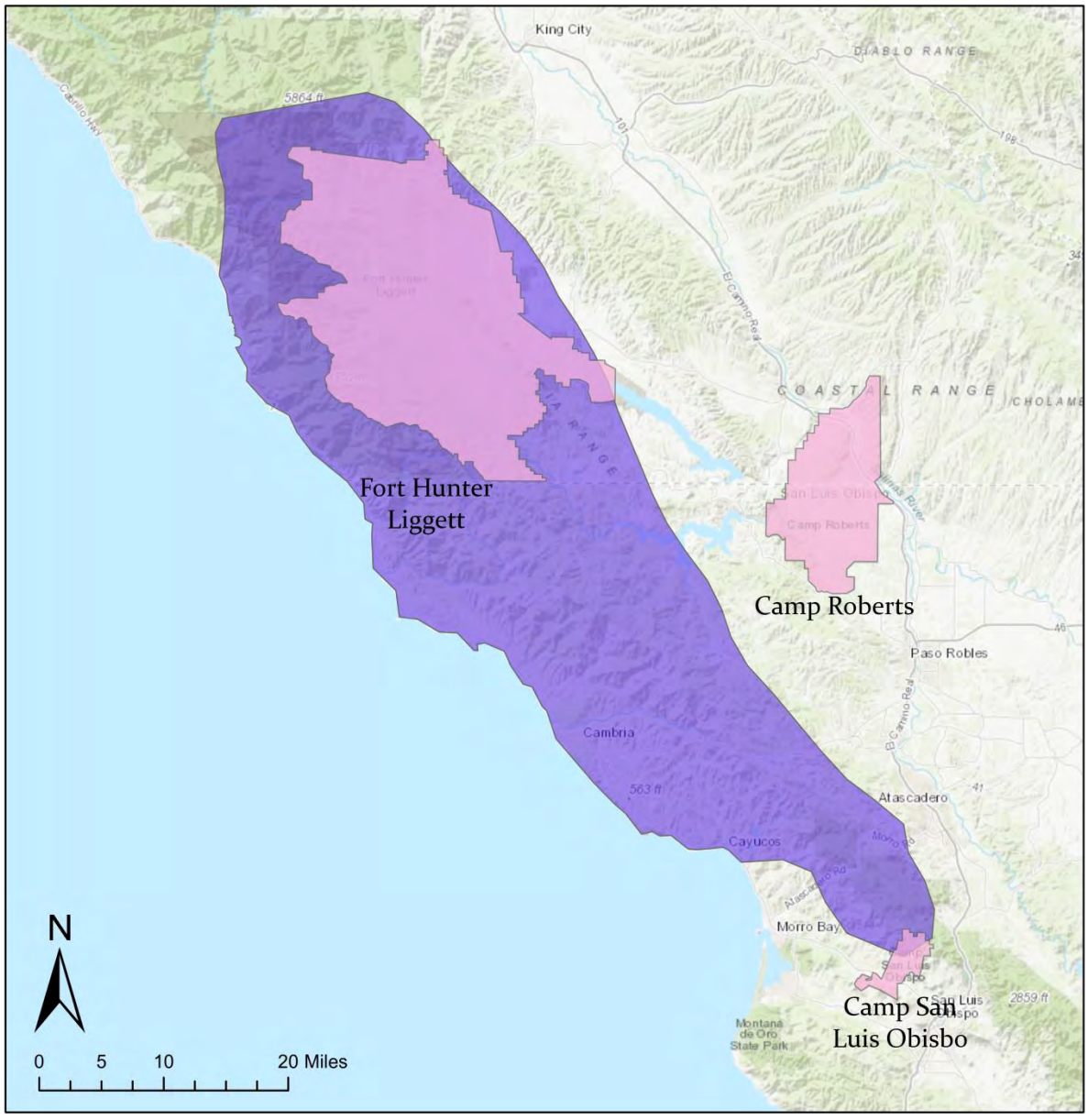
Research/ Conservation Needs:

- Distribution of priority species
- I & M
- Genetic research into systematics and possible hybridization

Habitat Management Recommendations:

- Increase water availability/ reduce overdraft
- Control invasive plants
- Manage invasive ungulates
- ORV management

CENTRAL COAST RANGE, CALIFORNIA



PARCA: Central Coast Range

Overlapping DoD Installations:
Fort Hunter Liggett
Camp San Luis Obispo

General Description: The Central Coast Range covers 375,427 hectares in Monterey and San Luis Obispo Counties. The PARCA contains a series of ridgeline along the central coast and is dominated by forest woodlands and chaparral with interior valleys. Its large federal lands are managed by the Forest Service and Department of Defense.

Habitat Description: The Central Coast Range falls within the Central California Coast ecoregion which contains the mountains, hills, valleys, and plains in the southern Coast Ranges of California. The near-coastal zone in the north of this PARCA is characterized by rain, fog, and steep slopes with Douglas fir, tanoak, redwoods, and dense shrub understories occurring. Slightly inland is the Northern Santa Lucia Range, characterized by rounded ridges, steep sides, and narrow canyons. In this region, coast live oak is common and canyon live oak occurs on steep canyon side slopes. Along the coast in the south is the Southern San Lucia Range, characterized by northwest-trending hills with rounded ridges, steep slope sides, and narrow canyons; narrow benches on marine terraces and some sand dunes occur on the coast. Vegetation in this region includes coast live oak forests, chaparral shrublands, and annual grasslands. Farther inland in the south is the Interior Santa Lucia Range, characterized by steep mountains and a climate that is not impacted by marine effects. Blue oak and coast live oak woodlands, chamise or mixed chaparral shrublands, and annual grasslands occur.

Focal Species:

- Reptiles
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - Northern Legless Lizard (*Anniella pulchra*)
    - Western Yellow-bellied Racer (*Coluber constrictor mormon*)
    - Coast Mountain Kingsnake (*Lampropeltis multifasciata*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)
    - California Red-sided Gartersnake (*Thamnophis sirtalis infernalis*)
    - Blainville's Horned Lizard (*Phrynosoma blainvillii*)
- Amphibians
    - California Tiger Salamander (*Ambystoma californiense*)
    - Foothill Yellow-legged Frog (*Rana boylii*)
    - California Red-legged Frog (*Rana draytonii*)
    - California Newt (*Taricha torosa*)
    - Western Spadefoot (*Spea hammondii*)

    - Arroyo Toad (*Anaxyrus californicus*)
    - San Simeon Slender Salamander (*Batrachoseps incognitus*)
    - San Lucia Mountains Slender Salamander (*Batrachoseps luciae*)
    - Lesser Slender Salamander (*Batrachoseps minor*)

Threats:

- Unsustainable agricultural practices
    - Wineries
- Climate driven fire issues
- Unsustainable timber practices
- BD- *R. boylii*
- Feral hogs
- Cannabis production
    - Water contamination
    - Water diversion
    - pesticides /herbicides
- Xerification related to fire

Opportunities:

- USFS
- DoD
- TNC
- NRCS
- State Parks
- Steelhead restoration opportunities
- Fish passages
- CADFW

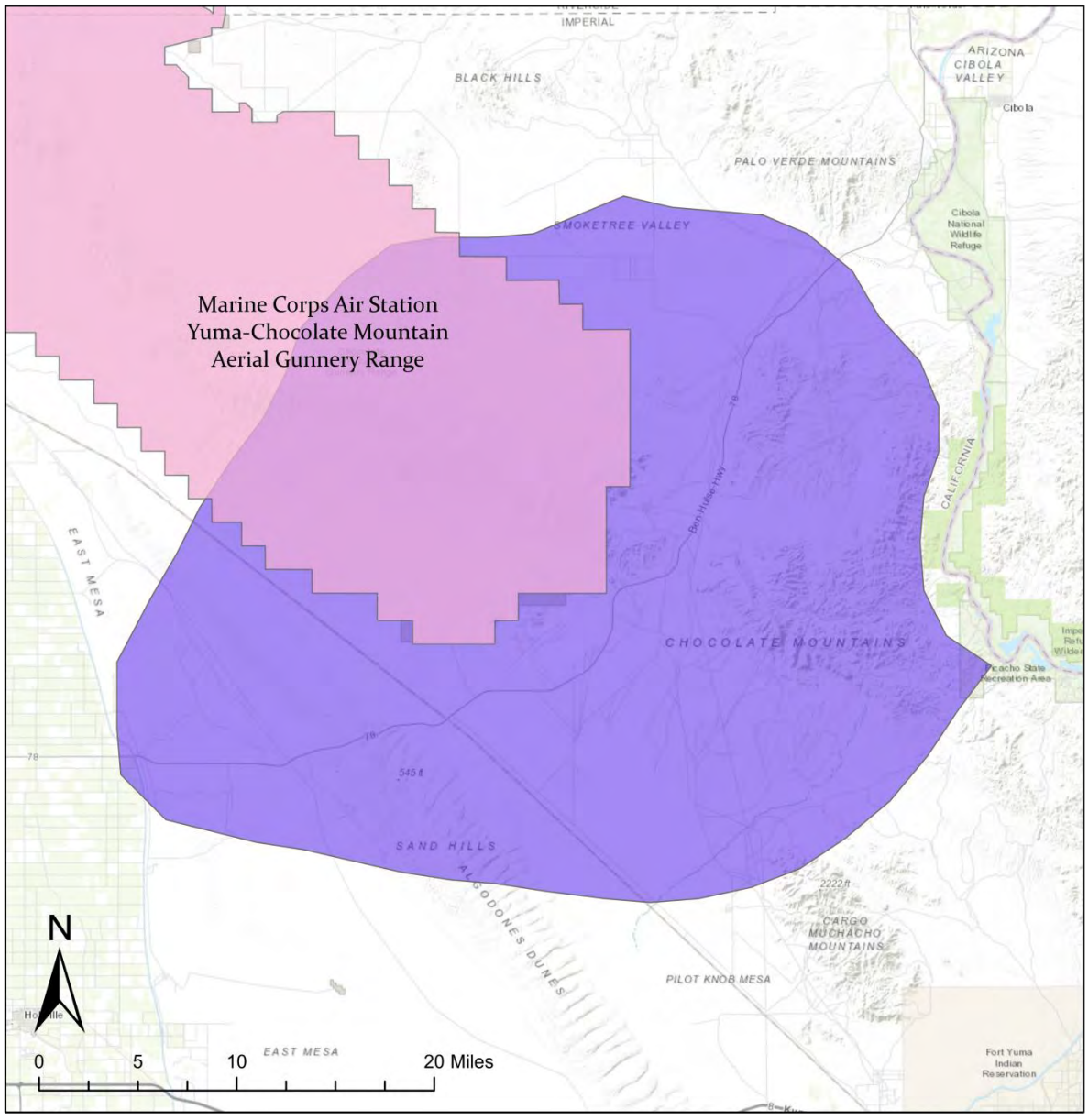
Research/ Conservation Needs:

- Baseline I&M data
- Getting better models for private land habitat
- Understanding the disease dynamics on the landscape
- Resolve species boundaries
- Identify key areas for invasive hog control

Habitat Management Recommendations:

- Control invasive hogs
- Limit burn intensity

COLORADO DESERT, CALIFORNIA



PARCA: Colorado Desert

Overlapping DoD Installation: Marine Corps Air Station Yuma- Chocolate Mountain Aerial Gunnery Range

General Description: The Colorado Desert PARCA covers 302,550 hectares in Imperial County. It encompasses the southern Chocolate Mountains, the North Algodones Dunes and Inkey Barely and Kitty Baggage Range to the west, and the Indian Pass and Picacho Peak to the east.

Habitat Description: The Colorado Desert PARCA falls within the Central Sonoran/ Colorado Desert Mountains and Central Sonoran/ Colorado Basins ecoregions. Major habitat types include lower Sonoran desert and Sonoran desert scrub. The Mountains ecoregion is hot, arid, and continental, characterized by erosional highlands of exposed bedrock and gently sloping sediment-filled basins, where the rugged terrain is dissected by dry washes that flood during infrequent events. This area is driest from May to June and intermittently moist during July-September and December- February. The vegetation is typically Sonoran creosotebush scrub transitioning to succulent scrub with ocotillo and numerous cacti, with species including creosotebush, white bursage, brittlebush, ocotillo, teddy bear and staghorn cholla, range ratany, barrel cactus, and beavertail cactus. The Basins ecoregion includes the broad alluvial plains, fans, and bajadas that lie between the higher relief mountains previously described. Most of the region is dominated by creosotebush and white bursage, but ocotillo, brittlebush, and cholla occur on alluvial fans and coarse soils. Desert saltbush scrub occurs on finer textured, poorly drained soils with high salinity and alkalinity, with plants including allscale, fourwing saltbush, mesquite, and bush seepweed. In washes and ephemeral streams, mesquite and exotic tamarisk are mixed with creosotebush. Microphyll habitat occurs along some dry-wash channels, with plants including blue paloverde, ironweed, smoke tree, and desert willow.

This PARCA also contains the North Algodones Dunes, which is part of the Sand Hills/ Sand Dunes ecoregion. This ecoregion contains the largest number of dune-endemic plants in North America and several specialized animal species. Psammophytic scrub, microphyll woodland, Sonoran desert scrub, and canal-influenced vegetation occur.

Focal Species:

- Reptiles
    - Great Basin Collared Lizard (*Crotaphytus bicinctores*)
    - Mohave Desert Tortoise (*Gopherus agassizii*)
    - Gila Monster (*Heloderma suspectum*)
    - Sonoran Mud Turtle (*Kinosternon sonoriense*)
    - Flat-tailed Horned Lizard (*Phrynosoma mcallii*)

    - Common Chuckwalla (*Sauromalus ater*)
    - Colorado Desert Fringe-toed Lizard (*Uma notata*)
- Amphibians
    - Sonoran Desert Toad (*Incilius alvarius*), extirpated
    - Lowland Leopard Frog (*Lithobates yavapaiensis*), extirpated
    - Couch's Spadefoot (*Scaphiopus couchii*)

Threats:

- ORVs
- Recreation and visitation in winter
- Solar development
- Non native grasses
- Mining impacts
- Feral ungulates

Opportunities:

- BLM
- DoD
- BOR
- Tribes
- California State Parks
- CADFW

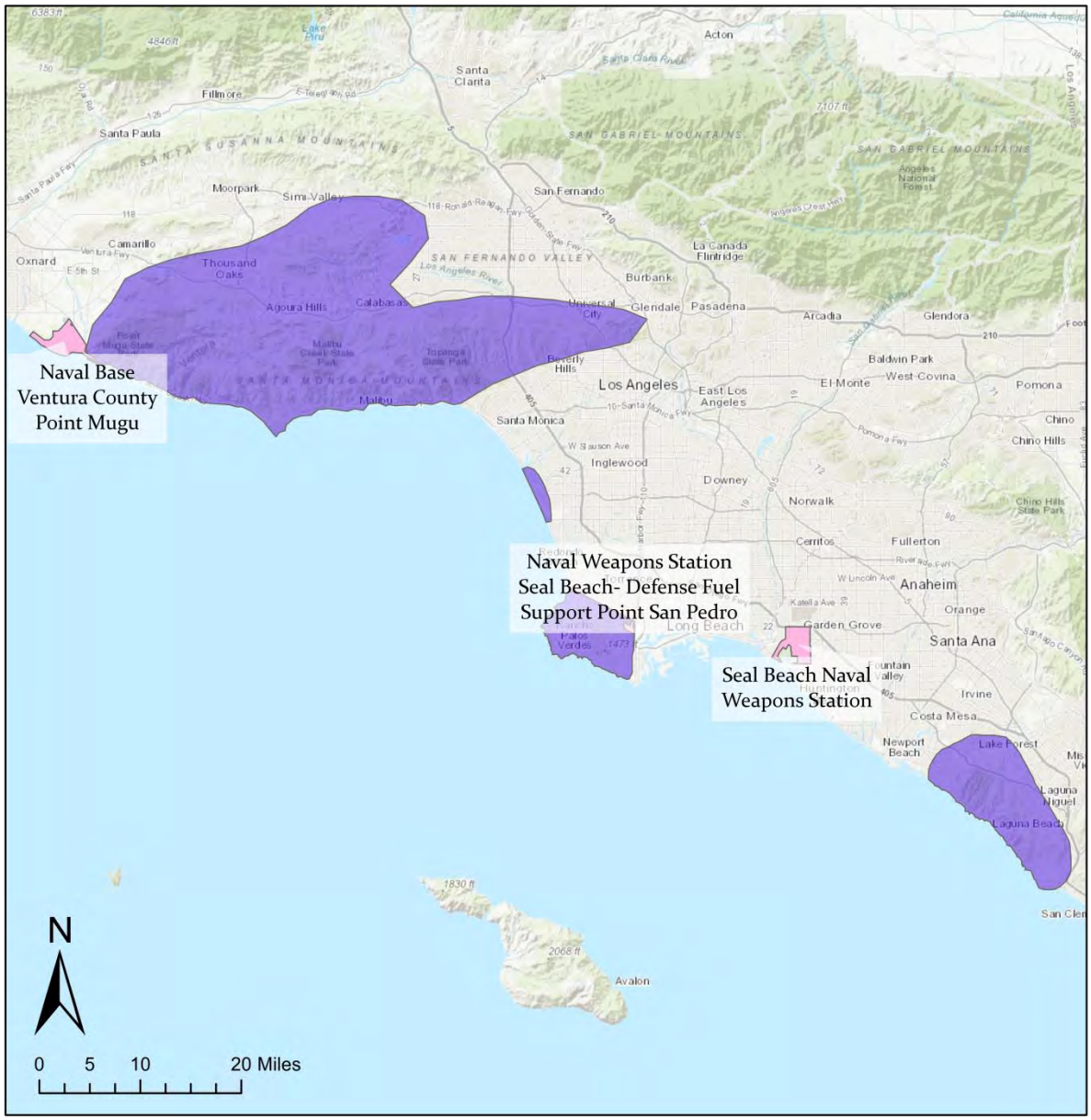
Research/ Conservation Needs:

- I & M
- Understanding how sand transport affects herpetofauna communities
- Better ways to monitor pond breeding amphibians
- Large parts have never had basic inventories

Habitat Management Recommendations:

- Limit ORV use
- Restore damaged habitat
- Remove invasive vegetation

LOS ANGELES BASIN, CALIFORNIA



PARCA: Los Angeles Basin

Overlapping DoD Installations:
Naval Base Ventura County- Point Mugu
Naval Weapons Station Seal Beach- Defense Fuel Support Point San Pedro

General Description: The Los Angeles Basin PARCA encompasses the coastal hills and mountains on relict Pleistocene islands that have been isolated by urbanization from Ventura to Orange County. Urbanization of the second largest city in the United States dominates the area. The PARCA covers 216,273 hectares and includes 4 isolated regions- the Santa Monica Mountains, LAX, Palos Verdes, and San Joaquin Hills.

Habitat Description: The habitat of this PARCA is mostly chaparral and coastal sage scrub with some oak woodland and small patches of grasslands with some dunes occurring. The Santa Monica Mountains and Palos Verdes regions both fall within the Venturan-Angeleno Coastal Hills ecoregion, characterized by shrub-covered hills and mountains, elevations ranging from sea level to almost 3,000 feet, marine air influence, and annual precipitation of 14-26 inches; vegetation includes annual grassland, California sagebush, California buckwheat, mixed sage, chamise chaparral, mixed chaparral, and coast live oak. The LAX region is in the Los Angeles Plain, characterized by nearly level floodplains, terraces, and gently sloping alluvial fans; marine air influence; and annual precipitation of 10-17 inches. Vegetation here includes California sagebrush, California buckwheat, coast live oak, chamise chaparral, and annual grasslands. The San Joaquin Hills region is heavily modified by marine influence and characterized by marine terraces, a narrow strip of beach and sand dune, and moderately steep foothills farther inland. Coastal sage scrub and coastal scrub; maritime succulent, Diegan coastal sand scrub, and chaparral communities; and California sagebrush, California buckwheat, black sage, ceanothus, coast live oak, and annual and perennial grasslands occur.

Focal Species:

- Reptiles
    - Southwestern Pond Turtle (*Actinemys pallida*)
    - San Diegan Legless Lizard (*Anniella stebbinsi*)
    - California Glossy Snake (*Arizona elegans occidentalis*), extirpated
    - Orange-throated Whiptail (*Aspidoscelis hyperythra*)
    - Western Yellow-bellied Racer (*Coluber constrictor mormon*)
    - Red Diamond Rattlesnake (*Crotalus ruber*)
    - Coast Mountain Kingsnake (*Lampropeltis multifasciata*)
    - Blainville's Horned Lizard (*Phrynosoma blainvillii*)
    - Coast Patch-nosed Snake (*Salvadora hexalepis virgultea*)
    - Two-striped Gartersnake (*Thamnophis hammondii*)

    - California Red-sided Gartersnake (*Thamnophis sirtalis infernalis*), extirpated
- Amphibians
    - California Red-legged Frog (*Rana draytonii*)
    - Western Spadefoot (*Spea hammondii*)
    - California Newt (*Taricha torosa*)

Threats:

- Urbanization and fragmentation
- Invasive species
    - Fish
    - Crayfish
- Channelization and urbanization of the streams
- Fire
- Lack of connectivity
- Recreation
- Cats
- Tree mortality from pests
- Road mortality
- Argentine ants
- Invasive herpetofauna - watersnakes and nonnative lizards

Opportunities:

- NPS
- California State Parks
- Mountains Recreation and Conservation Authority (MRCA)
- LAX
- County of LA
- USFWS
- DoD
- Army Corps of Engineers (ACOE)
- California Department of Transportation
- TNC
- City of LA
- Conejo Open Space Conservation Authority
- Mountains Restoration Trust (Land Trust)
- Palos Verdes Peninsula Land Conservancy
- CADFW

Research/ Conservation Needs:

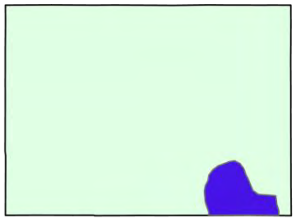
- Land acquisition
- Reintroduction of red legged frogs and pond turtles
- Long term monitoring to assess the effects of urbanization and reintroductions
- Reintroduce red racers to LAX
- Eradicate wall lizards and Sonoran whiptails
- Investigate the impact of Sonoran whiptails
- Control invasive ants

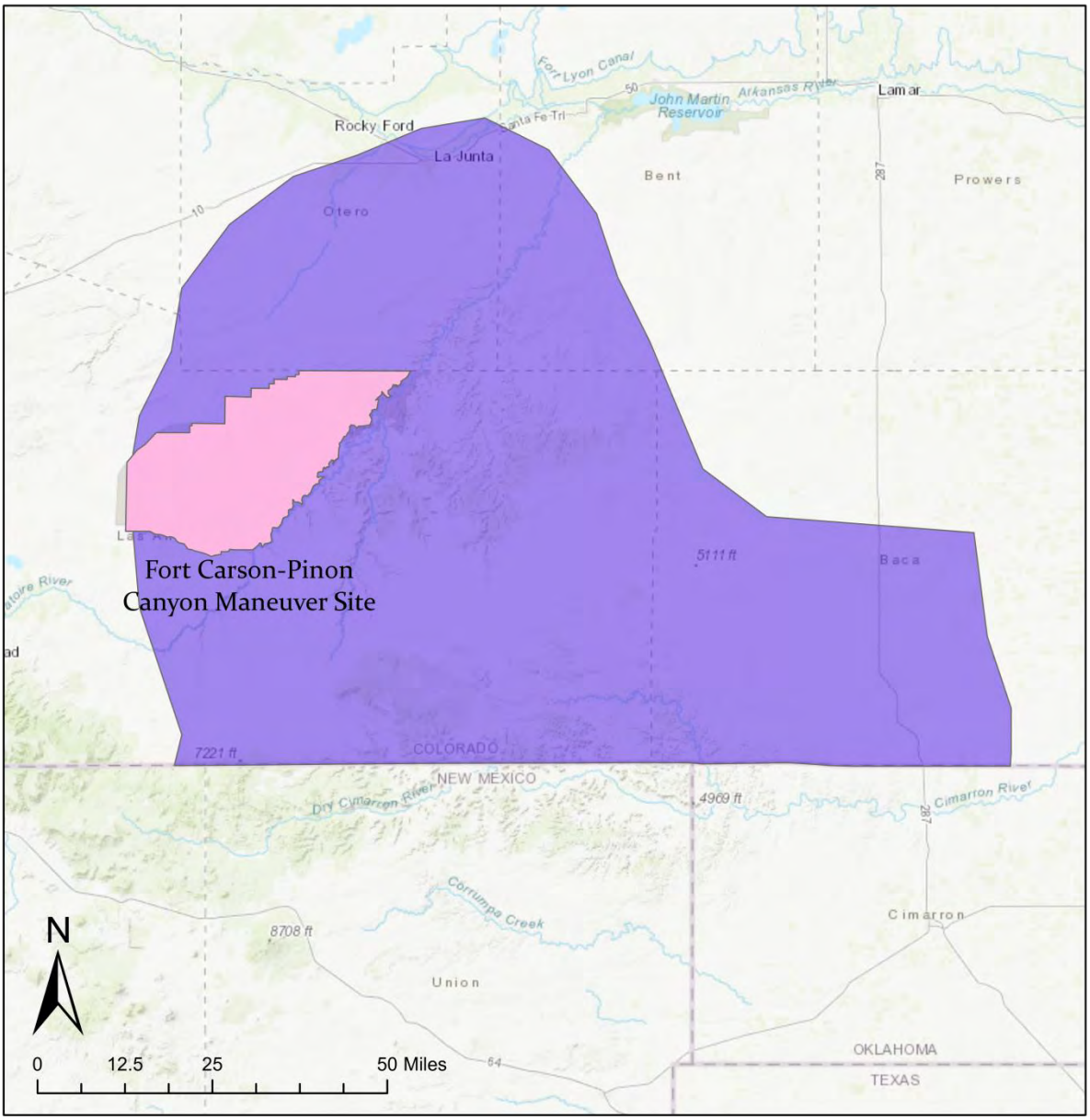
Habitat Management Recommendations:

- Remove invasive plants
- Manage invasive fauna
- Eradicate invasive grasses

Colorado

SOUTHEAST CANYON LANDS, COLORADO





PARCA: Southeast Canyon Lands

Overlapping DoD Installation: Fort Carson- Pinon Canyon Maneuver Site

General Description: The Southeast Canyon Lands PARCA begins on the west end of US Army Pinon Canyon Maneuver Site and continues south to the New Mexico border and encompasses the Purgatoire River and other canyon land streams, and upland mesas. It continues to the East to include the Comanche Grasslands transitioning out of canyon lands to grasslands. Elevations range from 6300 ft on the mesas near Branson, CO to 3900 ft near the lower terminus of the Purgatoire River at its confluence with the Arkansas River. Predominant land uses include large ranches in canyon land habitats transitioning to dry land agriculture and grassland in the eastern area of this PARCA.

Habitat Description: This canyon land on the eastern plains can include barren and sparsely vegetated landscapes. It is characterized by cliffs, outcrops, breaks and barrens, rimrock and erosional remnants of the High Plains escarpment, as well as other isolated buttes and outcrops to the south. Drought and wind erosion are the most common natural dynamics affecting this prairie system. Many cliff and canyon habitats are virtually inaccessible and in excellent condition.

Focal Species:

- Reptiles
    - Colorado Checkered Whiptail (*Aspidoscelis neotesselata*)
    - Common Checkered Whiptail (*Aspidoscelis tesselata*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Black-necked Gartersnake (*Thamnophis cyrtopsis*)
    - Speckled Kingsnake (*Lampropeltis holbrooki*)
    - Long-nosed Snake (*Rhinocheilus lecontei*)
    - Western Milksnake (*Lampropeltis gentilis*)
    - New Mexico Threadsnake (*Rena dissecta*)
    - Texas Nightsnake (*Hypsiglena jani texana*)
    - Round-tailed Horned Lizard (*Phrynosoma modestum*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Yellow Mud Turtle (*Kinosternon flavescens*)
- Amphibians
    - Northern Leopard Frog (*Lithobates pipiens*)
    - Canyon Treefrog (*Hyla arenicolor*)
    - Couch's Spadefoot (*Scaphiopus couchii*)
    - Western Narrow-mouthed Toad (*Gastrophryne olivacea*)
    - Chihuahuan Green Toad (*Anaxyrus debilis*)
    - Plains Leopard Frog (*Lithobates blairi*)

Threats:

- Road development
    - Energy development
- Conversion of unplowed prairie rangeland to cropland
- Water issues
    - Changes in water regime
    - Alteration of natural flow regime
    - Water quality (fertilizers, pesticides, other pollutants)
    - Water depletion
- Invasive species
    - Bullfrogs
    - Non-native plants (e.g., tamarisk, Russian thistle)
    - Non-native invertebrates (e.g., Asian clam)
    - Push for non-native fish introduction to improve fishing recreation in the area
- Disease
    - *Bd,* and other potentials (e.g., Ranavirus, snake fungal disease)
- Maintenance of natural fire regime
- Unsustainable cattle practices
    - Overgrazing
    - Wetland disturbance
    - Water disturbance and quality
    - Cattle guard entrapment
- Climate change
    - Drought
    - Loss of water sources (e.g., springs), leading intermittent systems to becoming completely dry and inhospitable to native herpetofauna
- Unsustainable agricultural operations
    - Haying

Opportunities:

- Coordination with US Army at Pinon Canyon Maneuver Site
- Federal and state agencies
    - USFS Comanche National Grassland
- State Wildlife Areas
- Large private land holdings
- Opportunity to engage the public through outreach programs, needs development
- Lamar, Otero, and Trinidad Community College
- A large number of conservation non-profits from Denver
    - Audubon Society
    - Bird Conservancy of the Rockies

    - Ducks Unlimited
    - The Nature Conservancy
- Consulting agencies with herpetological experience and interests
- CO Partners in Amphibian and Reptile Conservation (PARC)
- Colorado Parks and Wildlife (CPW)
- Great Outdoors Colorado (GOCO) grants
- NRCS/ Pheasants Forever/ Quail Forever Partnership Program based in Lamar
- Colorado Cattlemans, Farm Bureau
- Land Trusts
- NRCS & FSA Offices in Springfield
- Playa Lakes Joint Venture Partnerships and Grants

Research/ Conservation Needs:

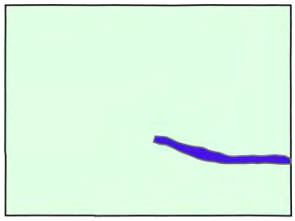
- Impacts of bullfrogs introduction on native species/communities
- Targeted control of bullfrogs
- Occupancy modeling, natural history studies of focal species
- More info needed on changing water usage patterns and its effects on herpetofauna communities
- Restoration of breeding habitats in wetlands
- Connectivity
    - Assess/ develop/ maintain connectivity as streams transition to dry from intermittent
    - Assess/ develop/ maintain connectivity across dryland habitat through road crossings
- Social science research on herpetofauna conservation attitudes
- Explore opportunities and methods for reaching out to ranchers and other private lands
- Coordination with conservation efforts for other taxa (birds, fish, etc.)
- Developing and distributing BMPs for herpetofauna communities/ focal species
- Research on grazing practices to benefit or protect herpetofauna

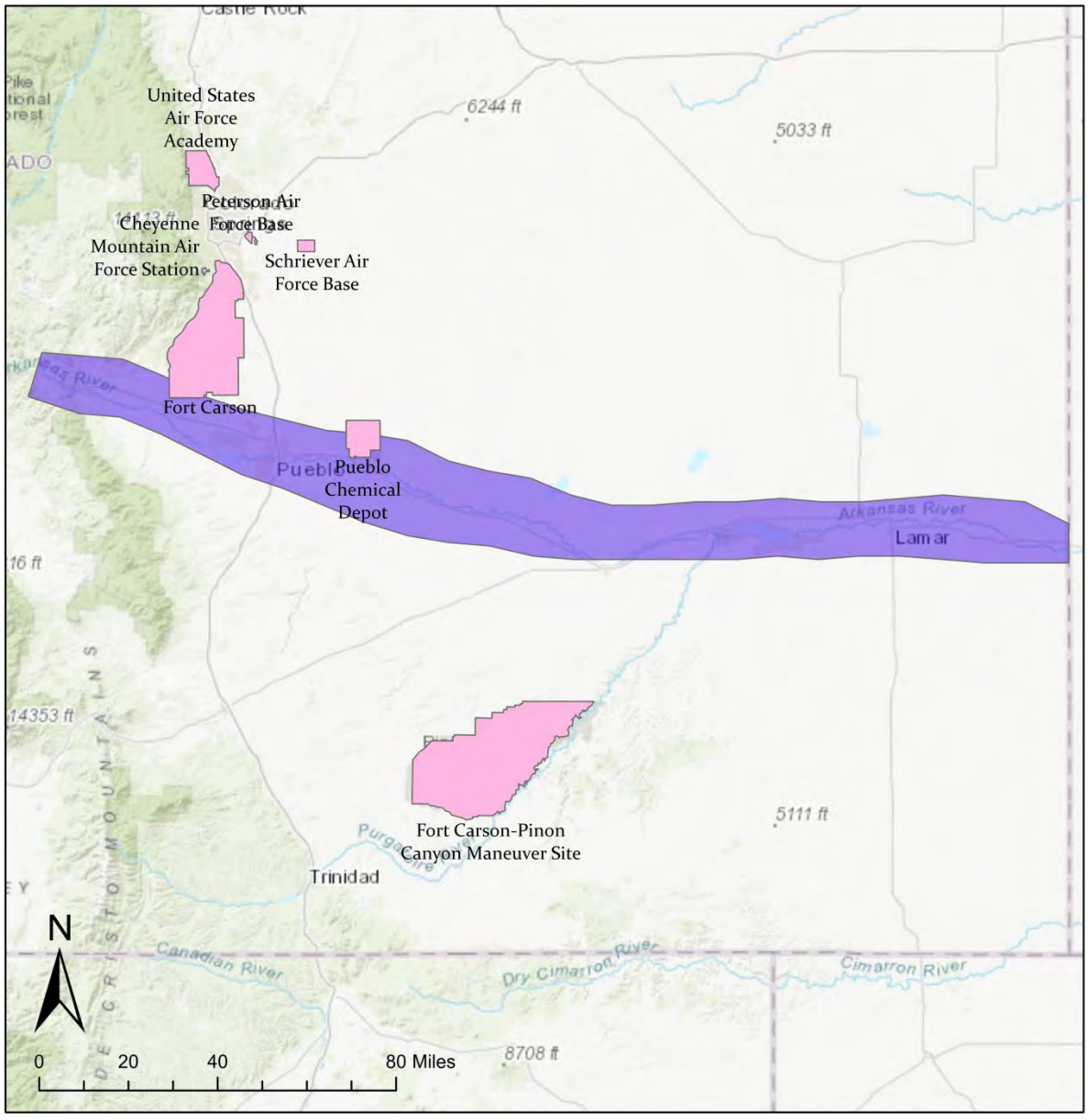
Habitat Management Recommendations:

- Maintain riparian corridors
- Manage wetland vegetation
    - Manage cattails
    - Drain ponds and burn them
- Identify opportunities to connect habitat patches
- Remove non-native species both plant and animal
- Encourage healthy cottonwood/willow communities
- Cattle exclosures around sensitive wetlands
- Minimize contaminants

    - Manage runoff
    - Vegetative buffers
- Increase messaging regarding private land habitat management
    - Habitat creation
    - Removal of habitat for undesired species to avoid conflict
- Avoid landscaping mesh
- Prioritize disproportionately important habitats (hibernacula, breeding ponds, etc.)
- Identify and protect sensitive habitats on the Pinon Canyon Maneuver Site

ARKANSAS RIVER, COLORADO





PARCA: Arkansas River

Overlapping DoD Installations:
Fort Carson- Main Base
Pueblo Chemical Depot

General Description: The Arkansas River PARCA includes parts of Fremont, Pueblo, Otero, Crowley, Bent, and Prowers Counties. Elevation ranges from roughly 3,360 ft. to 5,330 ft. This larger-order river contains habitat features generally not found in smaller plains streams, including occasional deep pools, secondary channels and backwaters, and inundated floodplain areas during high water. Land use is irrigated agriculture supported from water withdrawal and grazed lands adjacent to the Arkansas River. The most important amphibian and reptile habitat is riparian, shoreline, backwaters, tributaries, and wetlands of the floodplain. Two large reservoirs control the river water regime. Land ownership is largely ranches and farms with some small urban areas.

Habitat Description: This PARCA is a comparatively large river habitat for Colorado. On the eastern plains, riparian woodlands and shrublands are generally dominated by plains cottonwood (*Populus deltoide*s) and willow species, but also occur as a mosaic of multiple communities interspersed with herbaceous patches. They are found along small, medium and large streams on the plains, including the wide floodplains of the South Platte and Arkansas Rivers. Hydrologically, smaller rivers tend to have greater seasonal variation in water levels with less developed floodplain than the larger rivers, and can dry down completely for some portion of the year. Plains riparian areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Tamarisk and less desirable grasses and forbs have invaded degraded examples throughout eastern Colorado. Groundwater depletion and lack of fire have created additional species changes.

Focal Species:

- Reptiles
    - Colorado Checkered Whiptail (*Aspidoscelis neotesselata*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Black-necked Gartersnake (*Thamnophis cyrtopsis*)
    - Speckled Kingsnake (*Lampropeltis holbrooki*)
    - Long-nosed Snake (*Rhinocheilus lecontei*)
    - Western Milksnake (*Lampropeltis gentilis*)
    - New Mexico Threadsnake (*Rena dissecta*)
    - Round-tailed Horned Lizard (*Phrynosoma modestum*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Yellow Mud Turtle (*Kinosternon flavescens*)

- Amphibians
    - Northern Leopard Frog (*Lithobates pipiens*)
    - Couch's Spadefoot (*Scaphiopus couchii*)
    - Chihuahuan Green Toad (*Anaxyrus debilis*)
    - Plains Leopard Frog (*Lithobates blairi*)

Threats:

- Road development
    - Energy development
    - Urbanization
- Conversion of unplowed prairie rangeland
- Water issues
    - Use conversion and loss of water rights
    - Changes in water regime
    - Alteration of natural flow regime
    - Channelization
    - Sedimentation leading to dredging activity, and channel instability
    - Water quality (fertilizers, pesticides, other pollutants, i.e. endocrine disruptors)
    - Water depletion
- Invasive species
    - Bullfrogs
    - Red-eared sliders
    - Predacious fishes (in lakes and ponds)
    - Non-native plants
    - Non-native invertebrates
    - Urbanization/ increased industrial use
    - Habitat fragmentation
    - Noise pollution
- Potential disease
    - Snake fungal disease, *Bd,* and Ranavirus
- Unsustainable cattle practices
    - Overgrazing
    - Wetland disturbance
    - Water disturbance and quality
- Climate change
    - Drought
    - Steam de-watering leading to intermittent or no flow
- Succession
- Unsustainable agricultural operations
    - Haying

Opportunities:

- Arkansas River Collaborative
- Large number of federal and state agencies
- State, city, and county parks
- Opportunity to engage the public through outreach programs, needs development
- A large number of conservation non-profits from Denver
    - Audubon Society
    - Bird Conservancy of the Rockies
    - Pueblo Nature Center
    - Ducks Unlimited
- Pueblo Zoo
- Consulting agencies with herpetological experience and interests
- CSU, CU, Otero Junior College
- CO PARC
- CPW
- GOCO grants
- Colorado Cattlemans, Farm Bureau
- Land Trusts
- Bent's Old Fort

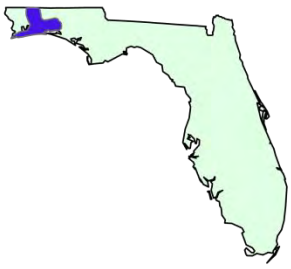
Research/ Conservation Needs:

- Impacts of bullfrogs and red-eared slider introduction on native species/communities
- Targeted control of bullfrogs
- Occupancy modeling, natural history studies of focal species
- More info needed on changing water usage patterns and its effects on herpetofauna communities
- Restoration of breeding habitats in wetlands
- Connectivity
    - Assess/ develop/ maintain connectivity across large reservoirs (how much of a barrier are the large reservoirs to species movement upstream/downstream, esp. large aquatic turtles)
    - Assess/ develop/ maintain connectivity as streams become more intermittent
    - Assess/ develop/ maintain connectivity to the floodplain
- Social science research on herpetofauna conservation attitude
- Explore opportunities and methods for reaching out to ranchers and other private lands
- Coordination with conservation efforts for other taxa (birds, fish, etc.)
- Developing and distributing BMPs for herpetofauna communities/ focal species

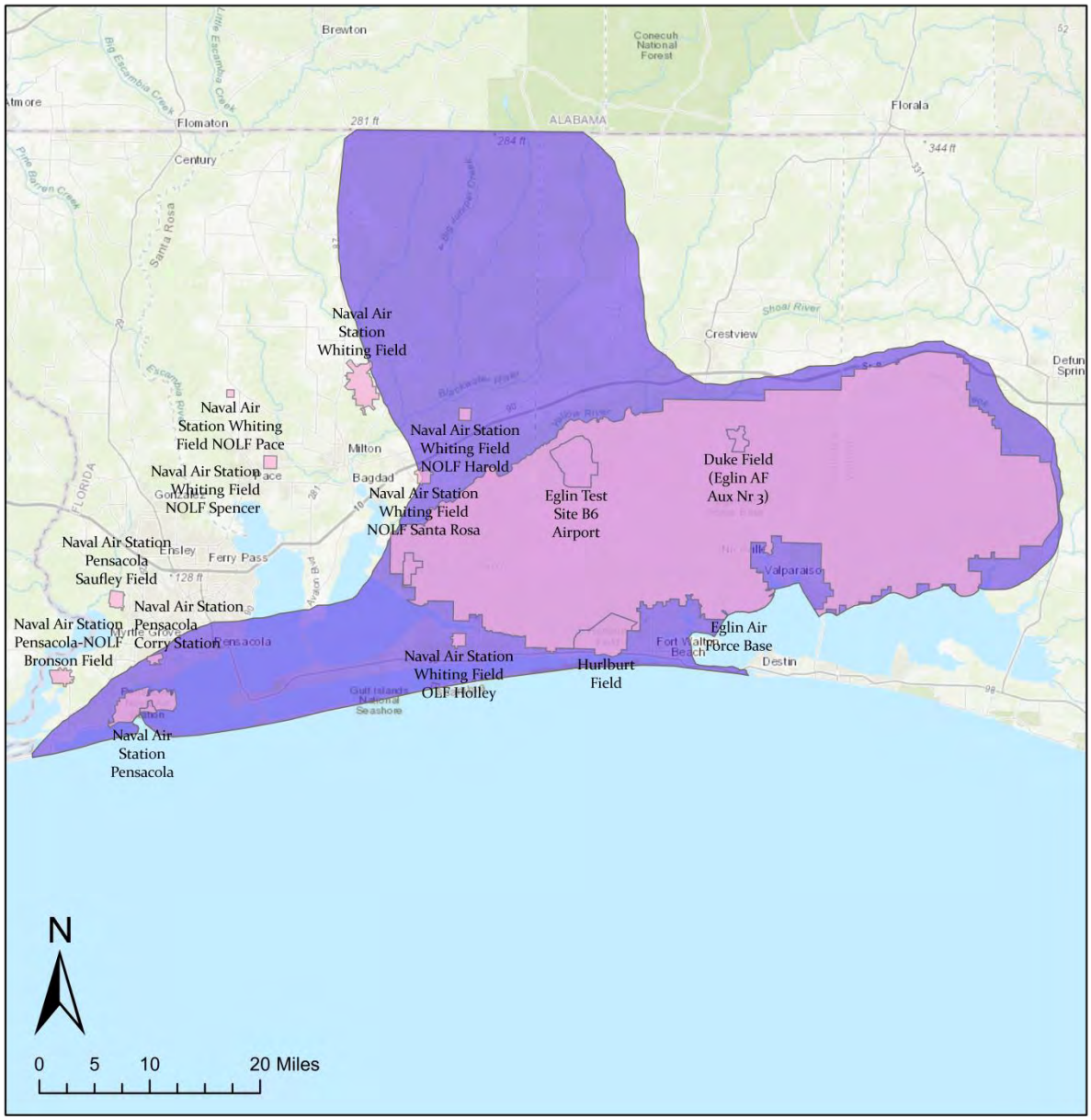
Habitat Management Recommendations:

- Maintain riparian corridors
- Manage wetland vegetation
    - Manage cattails
    - Drain ponds and burn them
- Identify opportunities to connect habitat patches
- Remove non-native species both plant and animal
- Encourage healthy cottonwood/ willow communities
- Cattle exclosures around sensitive wetlands
- Minimize contaminants
    - Manage runoff
    - Vegetative buffers
- Increase messaging regarding private land habitat management
    - Habitat creation
    - Removal of habitat for undesired species to avoid conflict
- Avoid landscaping mesh
- Prioritize disproportionately important habitats (hibernacula, breeding ponds, etc.)

Florida



EGLIN BLACKWATER, FLORIDA



PARCA: Eglin Blackwater

Overlapping DoD Installations:
Eglin Air Force Base
Hurlburt Field
Naval Air Station Whiting Field- Holley Naval Outlying Field
Naval Air Station Whiting Field- Harold Naval Outlying Field
Naval Air Station Whiting Field- Santa Rosa Naval Outlying Field
Naval Air Station Pensacola- Main Base
Naval Air Station Pensacola- Corry Station

General Description: The Eglin Blackwater PARCA is in the far west panhandle and encompasses the entire Eglin Air Force Base, most of the Blackwater River in Florida, and the East Fork Big Coldwater Creek. It stretches west to include the Pensacola Naval Air Station. The region is characterized by extensive areas of sandhill (Eglin) and upland pine forests (Blackwater) with hillside seepage bogs, steephead ravines, and ephemeral ponds. It contains the most Pine Barrens treefrog and Florida bog frog locations and the largest population of the reticulated flatwoods salamander (Eglin). Gopher frogs, one-toed amphiumas, “bog” dwarf salamanders, four-toed salamanders, gopher tortoises, coal skinks, Florida pine snakes, and southern copperheads (Blackwater) all occur here; the last verified sighting of the indigo snake in the panhandle (Eglin) was in this area, and alligator snapping turtles are found in streams.

Habitat Description: The Eglin Blackwater PARCA primarily falls within three ecoregions: the Southern Pine Plains and Hills, the Gulf Coast Flatwoods, and the Gulf Barrier Islands and Coastal Marshes.

In the Southern Pine Plains and Hills ecoregion, the oak hickory-loblolly/shortleaf pine forest of the north is replaced by the Southern mixed forest of beech-sweetgum-magnolia-longleaf/slash pine-oak forest in this ecoregion. Elevations are generally 100-300 feet in the Florida portion, with relief of 100-200 feet between hill and stream bottoms. Most of this region is woodland and forest with some cropland and pasture. This area of the Panhandle receives some of the highest mean annual precipitation totals (generally 60-75 inches) and the coolest mean minimum and mean maximum temperatures in the state.

The Gulf Coast Flatwoods ecoregion predominantly occurs on poorly drained acidic Spodosol soils, which are subject to seasonal inundation as well as droughty conditions. Often called "flatwoods" or "flatlands," they are subject to short fire-return intervals and seasonally high water tables. Overstory vegetation is characterized by *Pinus palustris* and, to a lesser degree, by *Pinus elliottii var. elliottii*. Understory structure ranges from densely shrubby to open and

herbaceous-dominated, with variation in soils and drainage. The variation includes Scrubby Flatwoods, Mesic Flatwoods, Wet Flatwoods, and Maritime Flatwoods. Fire is naturally frequent; many sites have a fire-return time of from one to four years.

The Gulf Barrier Islands and Coastal Marshes ecoregion has coastal depositional systems that include barrier islands, sand spits, mainland beaches, and backbarrier marshes. Coastal habitats of this ecoregion are characterized by a series of barrier islands and beaches that are separated from narrow mainland salt marshes by elongate sounds. Barrier islands and beaches are well developed with relatively large dune fields on which sea oats (*Uniola paniculata*) often dominates. Mainland salt marshes are generally infrequently flooded and black needlerush (*Juncus roemerianus*) is the primary salt marsh plant species, as is the case for the salt marshes of the Florida panhandle. Only one species of mangrove is present, *Avicennia germinans*, which is the most cold tolerant of the four new world mangrove species commonly found in south Florida. Seagrass beds are also limited in this ecoregion because of a lack of clarity in coastal waters.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- Florida Fish and Wildlife Conservation Commission (FWC)
- Florida Department of Environmental Protection (FDEP)
- State Parks
- DoD
- NPS
- USFWS

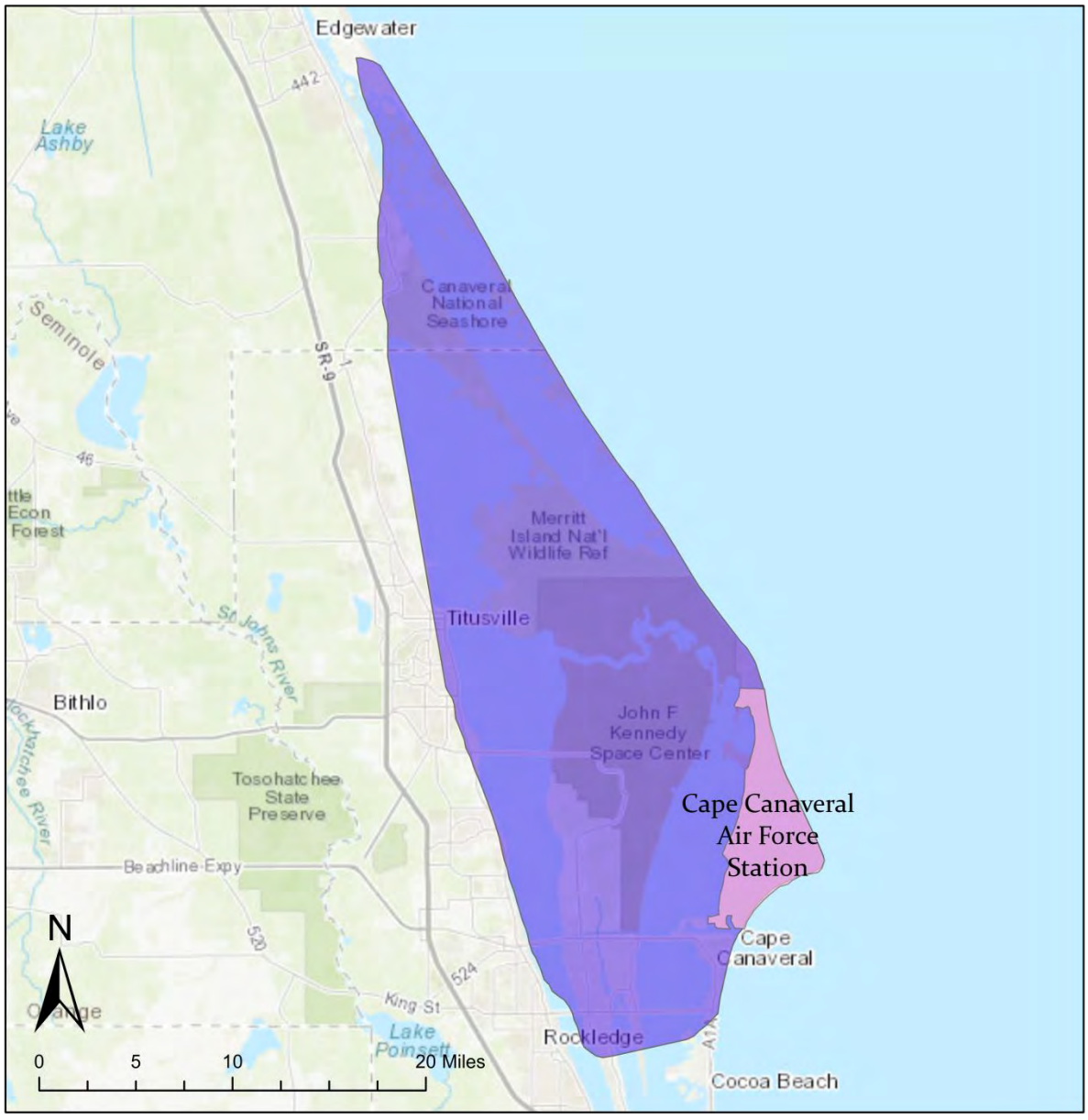
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur

- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Maintain contiguous gradients between wetlands and adjacent complementary habitat types
    - Restore the natural composition and structure of adjacent complementary habitat types where these habitats have been degraded
- Avoid diverting surface water from existing roads or facilities into wetlands
- Permit prescribed fires to burn into wetlands and pond basins when water levels are naturally low
- Restore natural hydroperiod of seasonal wetlands
- Construct artificial wetlands or ponds where natural wetlands have been degraded or lost
- Install culverts or tunnels in conjunction with barriers to direct animals under or away from roads
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions

- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats

MERRITT ISLAND, FLORIDA



PARCA: Merritt Island

Overlapping DoD Installation: Cape Canaveral Air Force Station

General Description: The Merritt Island PARCA is on the Atlantic coast of Florida, extending north to Bottle Island, south to about 2 miles south of Highway 520, and west to the western edge of the Indian River. The region encompasses the Canaveral National Seashore, Merritt Island National Wildlife Refuge, John F. Kennedy Space Center, and Cape Canaveral Air Force Station. This PARCA is characterized by oak scrub, pine flatwoods, and salt marsh. It provides habitat for the indigo snake, gopher frog, gopher tortoise, South Florida mole kingsnake, and coastal dunes crowned snake as well as nesting habitat for sea turtles. The entirety of this PARCA is within the Eastern Florida Flatwoods ecoregion.

Habitat Description: The Eastern Florida Flatwoods ecoregion is a warm, heterogeneous area of low relief and wet soils consisting of flat plains, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic coasts. Historically this region was covered by a variety of forest communities that included trees of longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*), pond pine (*Pinus serotina*), sweetgum (*Liquidambar styraciflua*), southern magnolia (*Magnolia grandiflora*), laurel oak (*Quercus laurifolia*) with forested wetlands of blackgum (*Nyssa sylvatica var. sylvatica*) and cypress (*Taxodium sp.*). Current land cover in this region is primarily slash pine and loblolly pine (*Pinus taeda*) with oakgum-cypress forest in low lying areas, row and field crops, pasture land for beef cattle and horses, and urban.

Focal Species:
Information Needed

Threats:
Information Needed

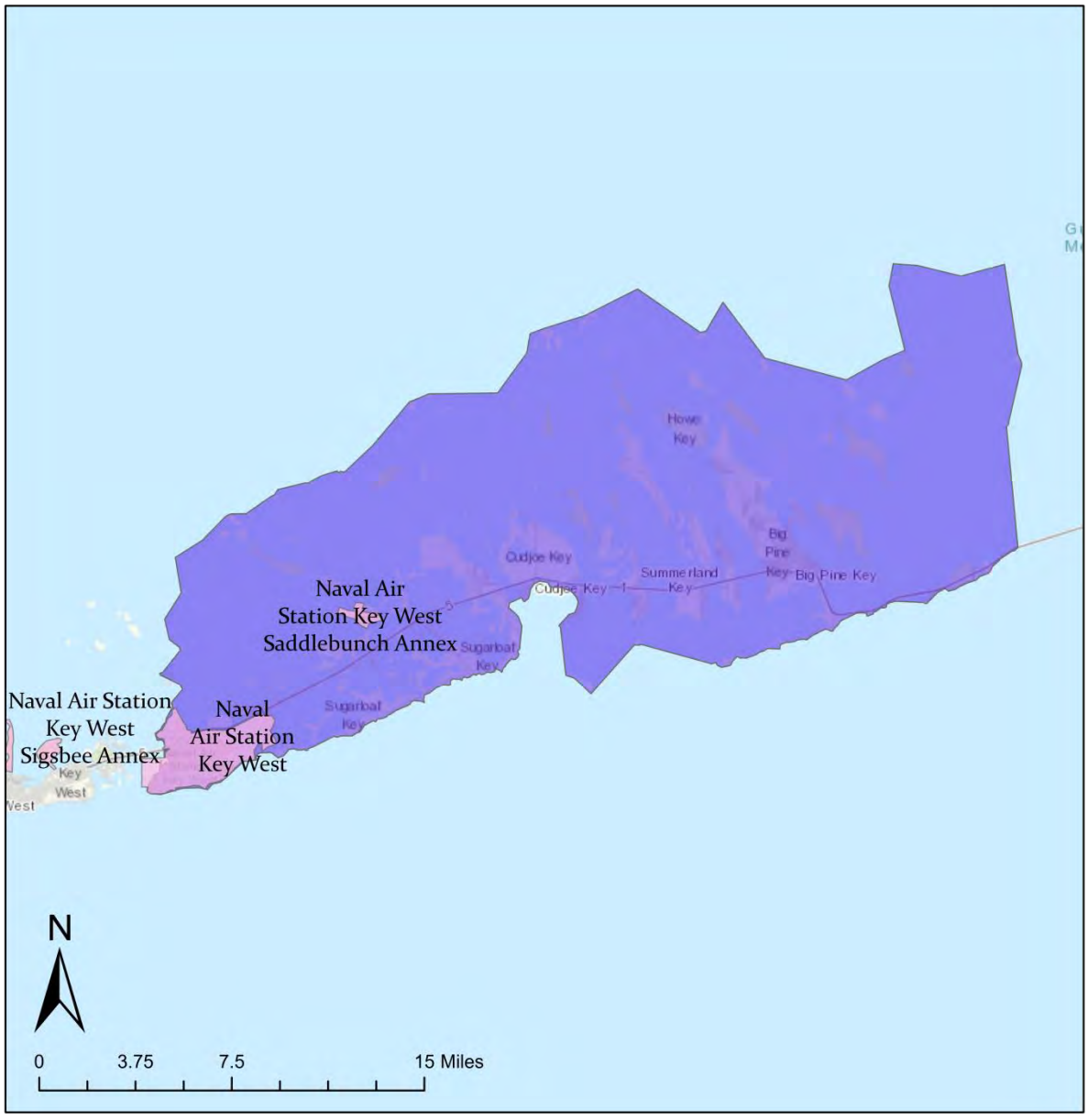
Opportunities:
- FWC
- FDEP
- USFWS
- DoD
- National Aeronautics and Space Administration
- NPS
- Municipal Parks

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:

- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
    - Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorist
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles

LOWER KEYS, FLORIDA



PARCA: Lower Keys

Overlapping DoD Installations:
Naval Air Station Key West
Naval Air Station Key West Saddlebunch Annex

General Description: The Lower Keys PARCA is characterized by pine rockland habitat with some hammocks and freshwater wetlands. This region provides habitat for the rimrock crowned snake, Florida Keys mole skink, endemic subspecies or distinctive populations of the Key ring-necked snake, peninsula ribbonsnake, and Florida brown snake. The last sighting in the Keys of the indigo snake occurred in this region. This PARCA falls within the Southern Coast and Islands ecoregion of Florida.

Habitat Description: The Southern Coast and Islands ecoregion is a highly diverse marine vegetated ecosystem consists of mangroves, seagrass beds, coral reefs, and marshes. Seagrass habitat has been cited as the largest in the northern hemisphere and is dominated by species such as turtlegrass (*Thalassia testudinum*), shoalweed (*Halodule wrightii*), and manatee grass (*Syringodium filiforme*). Mangroves that dominate intertidal wetlands in the region consist of four primary tree species: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood (*Conocarpus erectus*). The southwestern Florida coast is characterized by a subtropical climate, modulated by the Gulf Stream, cold fronts, and hurricanes.

Focal Species:
Information Needed

Threats:
Information Needed

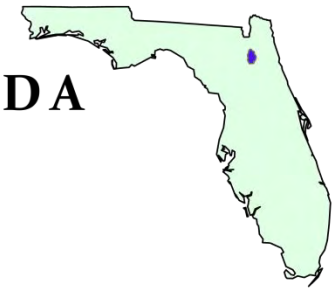
Opportunities:
- FWC
- FDEP
- DoD
- USFWS
- State Parks

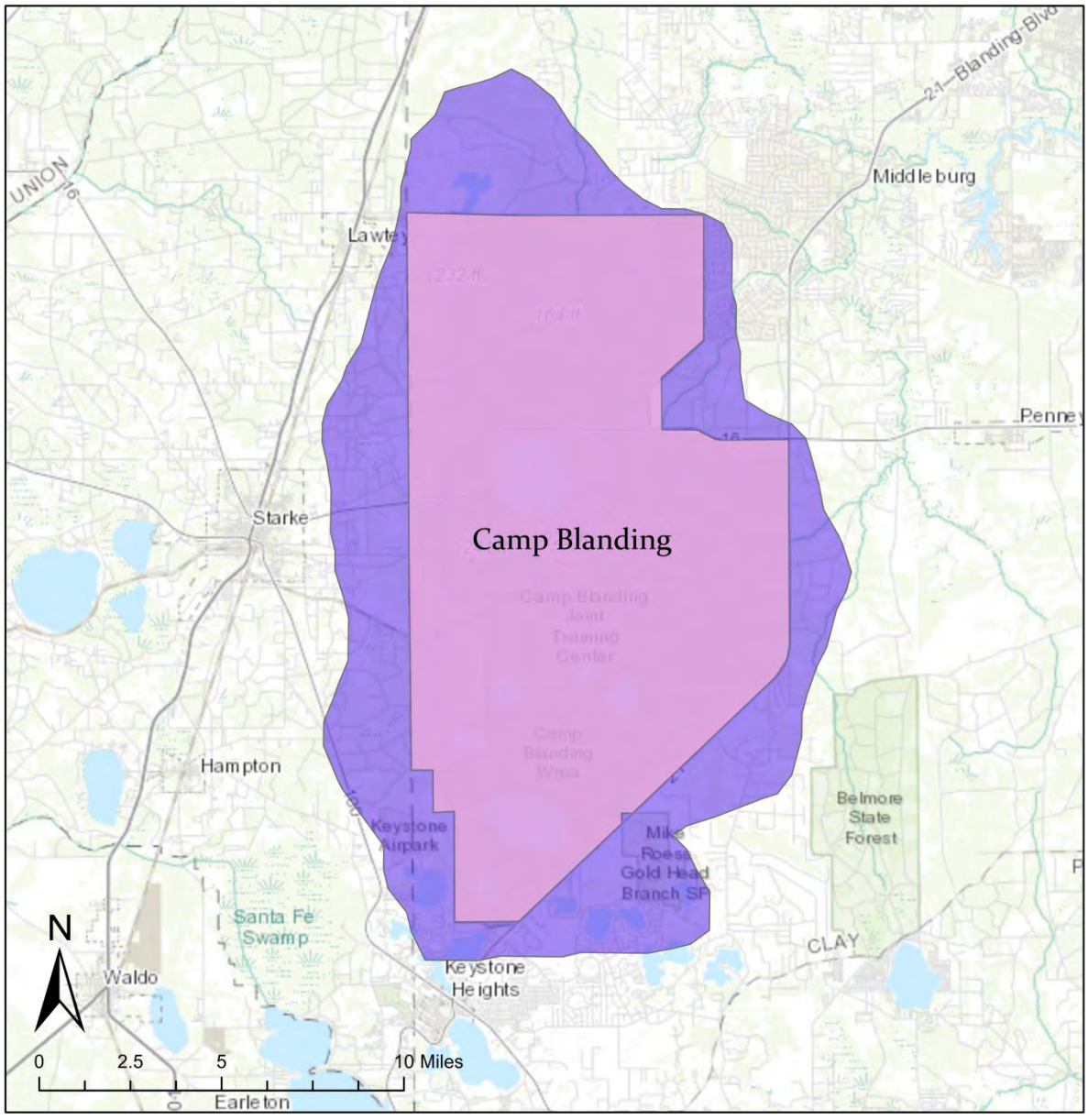
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:

- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate "beach re-nourishment" activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Maintain contiguous gradients between wetlands and adjacent complementary habitat types
    - Restore the natural composition and structure of adjacent complementary habitat types where these habitats have been degraded
- Avoid diverting surface water from existing roads or facilities into wetlands
- Permit prescribed fires to burn into wetlands and pond basins when water levels are naturally low
- Restore natural hydroperiod of seasonal wetlands
- Construct artificial wetlands or ponds where natural wetlands have been degraded or lost
- Install culverts or tunnels in conjunction with barriers to direct animals under or away from roads

CAMP BLANDING, FLORIDA





PARCA: Camp Blanding

Overlapping DoD Installation: Camp Blanding Joint Training Center

General Description: The Camp Blanding PARCA is within northeast Florida and encompasses the entirety of the Camp Blanding Joint Training Center, the primary military reservation and training base for the Florida National Guard. The region is characterized by extensive sandhill habitat with assorted wetlands. It provides habitat for the striped newt, gopher frog, gopher tortoise, Florida pine snake, and eastern indigo snake. In 2017, a Candidate Conservation Agreement with Assurances (CCAA) was implemented at Camp Blanding in order to maintain and/or increase certain covered species' population numbers and quality of habitat through Best Management Practices. The herpetofauna listed as covered species were the striped newt, gopher frog, eastern diamond-backed rattlesnake, Florida pine snake, gopher tortoise, southern hog-nosed snake, and spotted turtle.

Habitat Description: In the flatwoods of Camp Blanding, both fire and seasonal precipitation influence community structure and composition. The four dominant overstory species are longleaf pine, slash pine, loblolly pine, and pond pine. Live oak, water oak, sweetgum, red maple, and ash are also occasionally found among the overstory species, especially in north and central Florida. Mesic flatwoods are seldom inundated and typically have slash or longleaf pine in the overstory, a dense understory of saw palmetto, gallberry, rusty lyonia, and wax myrtle, and wiregrass in the groundcover. Wet flatwoods are inundated for 1-2 months per year and have slash pine, pond pine, and/or cabbage palm in the overstory, wax myrtle and gallberry in the understory, and grasses and forbs in the groundcover; the composition of these species varies, however, with fire frequency. Scrubby flatwoods sit at a slightly higher elevation than mesic flatwoods and are the ecotone between flatwoods and sandhills/scrub. The overstory in these flatwoods is variable with a high frequency of shrub oak species in the understory and a sparse herbaceous layering.

The Sandhills occur on upland sites with an open pine canopy (typically longleaf pine), a sparse mid-story of deciduous oaks such as turkey oak, and a moderate to dense groundcover of herbaceous species and low woody species. Soils in this habitat are deep, well-drained, and relatively infertile. Historically, low-intensity fires occurred every 1-3 years keeping litter accumulation low. These frequent, low-intensity fires, which often occurred during the growing season, maintained the open structure of the forest, reduced the prevalence of hardwoods, and increased the abundance of herbaceous species. The frequency, intensity, and season of fire are the most important factors in Sandhill ecology as they determine community structure and species' composition. Due to the absence of fire and the historical overharvest of longleaf pine, oaks now dominate many of the Sandhill areas on the Installation. Lengthy fire suppression also leads to xeric hammock, turkey oak barrens, or sand pine dominated Sandhill.

Wetland types include ephemeral wetlands, forested wetlands, and surface waters. In Florida, ephemeral wetlands are generally found in flatwoods, Sandhill, and scrub habitats. Given their presence in these habitats, fire is an important factor in the ecology of these wetlands. Ponds are often dry during the early spring and summer when fires once were historically ignited by lightning and would run through the basin, decreasing organic material and controlling invading upland species. Fire also is important to the herbaceous material growing at the edge of the ponds. There are two major categories of forested wetlands: river swamps and stillwater swamps. River swamps have a short hydroperiod and a visible flow for at least part of the year. Stillwater swamps, on the other hand, have longer hydroperiods and no noticeable flow. The most common wetland tree species is cypress, and in Florida, it dominates forested wetlands with variable water levels. Pond cypress and swamp black gum are common in stillwater swamps while bald cypress and water tupelo are common in river swamps. Pines, cedars, palms, and other hardwoods are also found in varying frequencies in forested wetlands. Both North Fork Black Creek, with its headwaters in Kingsley Lake, and Bull Creek are located in the northern part of Camp Blanding. Multiple lakes and several small ponds also occur.

Focal Species:
Information Needed

Threats:
Information Needed

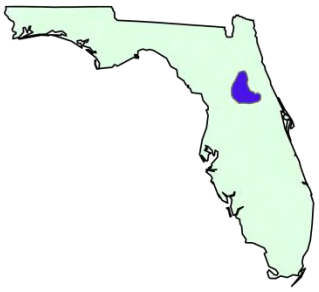
Opportunities:
- FWC
- FDEP
- DoD
- State Parks
- St. Johns River Water Management District
- Candidate Conservation Agreement with Assurances (CCAA)

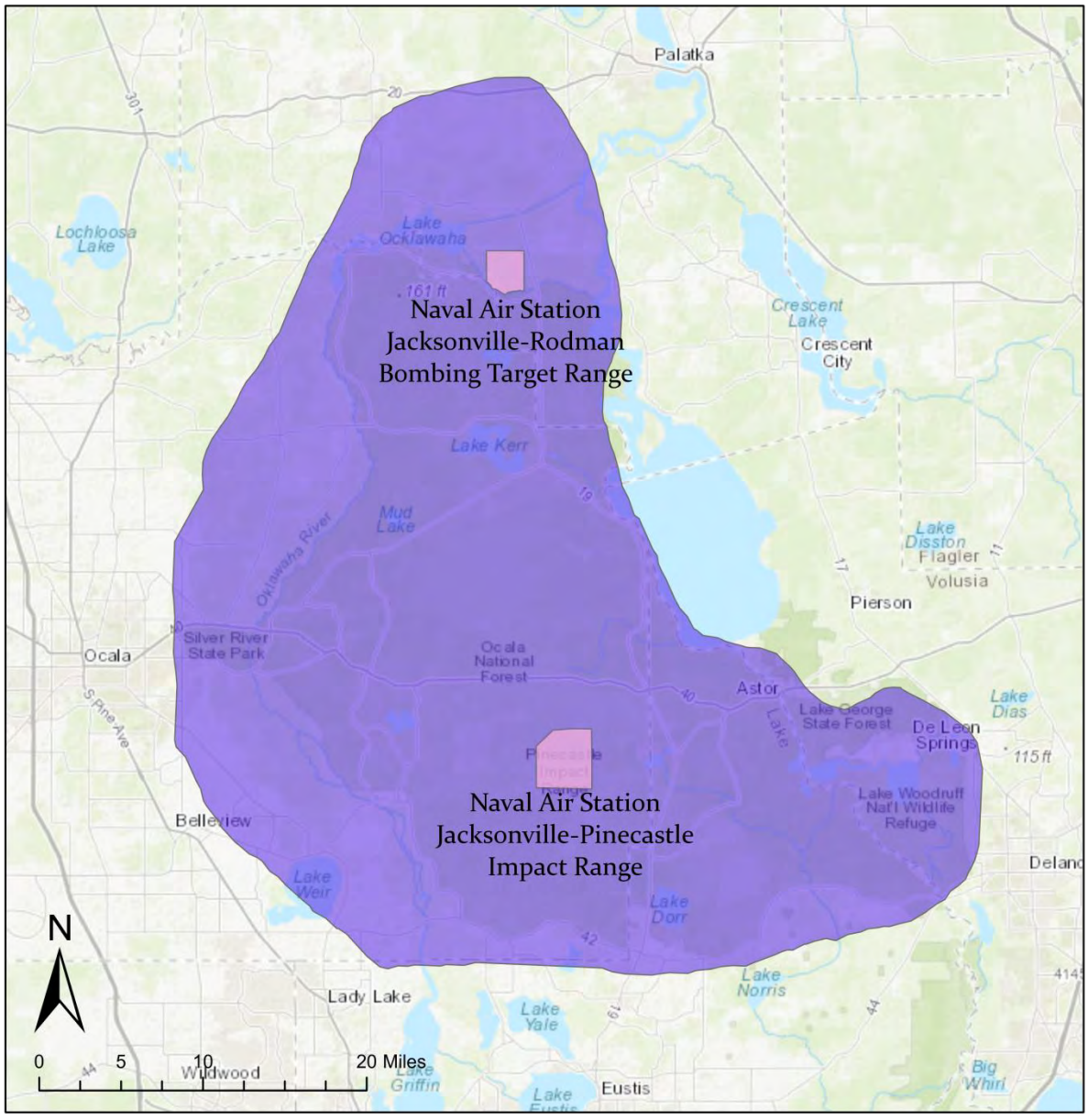
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Florida Fish and Wildlife Conservation Commission
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance

- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats
- Maintain contiguous gradients between wetlands and adjacent complementary habitat types
    - Restore the natural composition and structure of adjacent complementary habitat types where these habitats have been degraded
- Avoid diverting surface water from existing roads or facilities into wetlands
- Permit prescribed fires to burn into wetlands and pond basins when water levels are naturally low
- Restore natural hydroperiod of seasonal wetlands
- Construct artificial wetlands or ponds where natural wetlands have been degraded or lost
- Install culverts or tunnels in conjunction with barriers to direct animals under or away from roads
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands

OCALA, FLORIDA





PARCA: Ocala

Overlapping DoD Installations:
Naval Air Station Jacksonville- Pinecastle Impact Range
Naval Air Station Jacksonville- Rodman Bombing Range

General Description: The Ocala PARCA is within eastern Florida and encompasses the Ocala National Forest, Lake Woodruff National Wildlife Refuge, Pine Castle Missile Range, and multiple state parks. It is an extensive area of sand pine scrub with embedded sandhill islands and assorted wetlands. It hosts the largest population of striped newts (ca. 40 breeding ponds) and gopher frogs (>60 breeding ponds) anywhere, and provides habitat for gopher tortoises, Florida pine snakes, indigo snakes, short-tailed snakes, and the northern range extent of Florida scrub lizards and sand skinks.

Habitat Description: The Ocala National Forest, located north of Orlando, is the southernmost forest in the continental United States and protects the world's largest contiguous sand pine scrub forest. Growing on deep, prehistoric sand dunes, the scrub is a unique plant community that is home to the threatened Florida scrub-jay, sand skink, Florida bonamia plant and many other rare species. Within this sea of sand pine and scrub oaks, longleaf pine islands provide a different view with open park-like stands of trees over a diverse grassy groundcover. Wildlife species of interest include the bald eagle, Florida black bear, gopher tortoise, indigo snake, and red-cockaded woodpecker. The forest's porous sands and largely undeveloped character provide an important recharge for the Floridan aquifer. Freshwater springs produce several hundred million gallons of water each day. Crystal clear springs, pothole marshes, and sinkhole lakes provide year-round recreation opportunities and unique aquatic habitats.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- FWC
- FDEP
- USFS
- DoD
- State Parks
- St. Johns River Water Management District
- State of Florida Conservation Easements

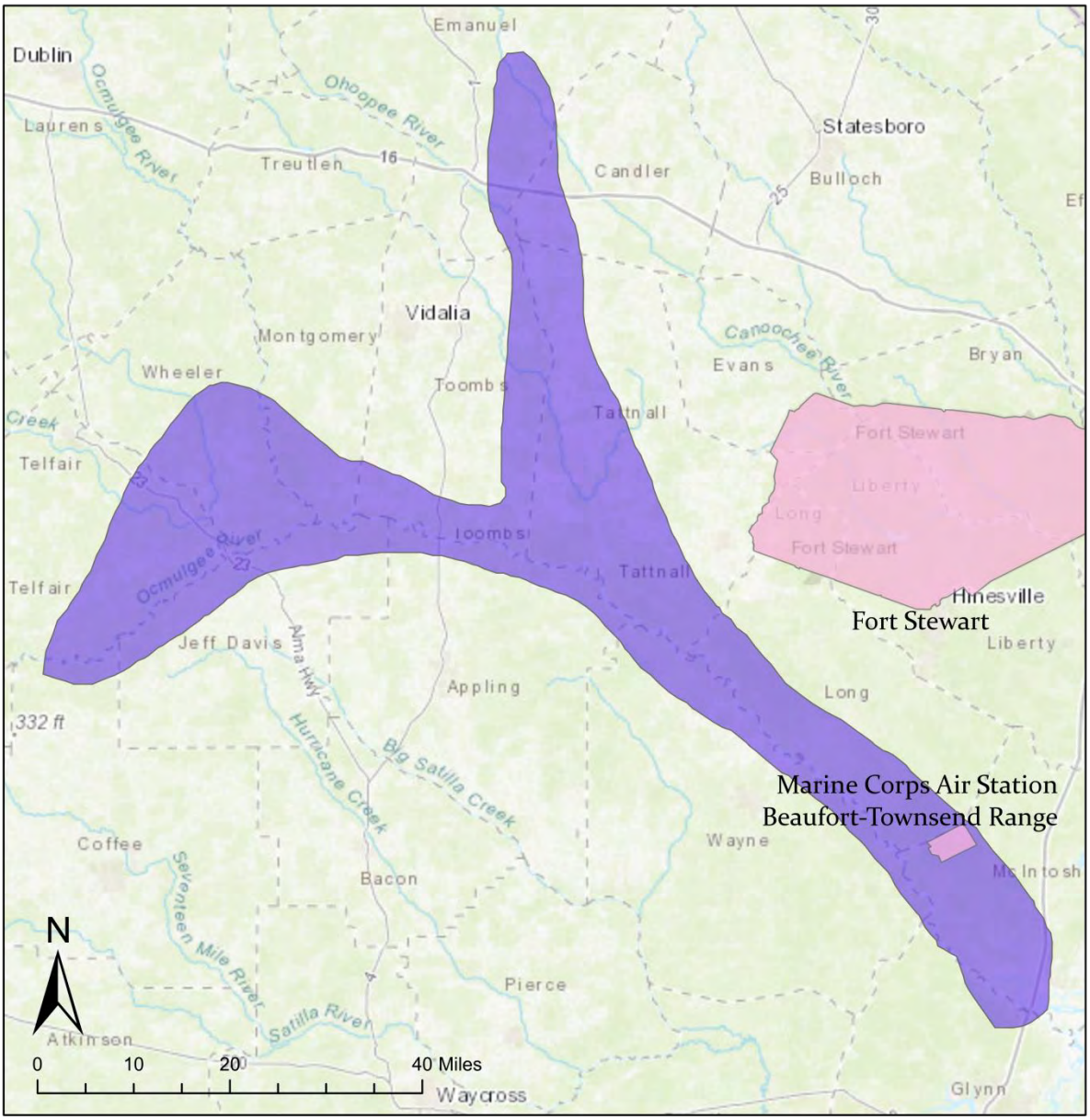
- USFWS

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in pine habitats
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- Meet or exceed forestry and agricultural BMPs including recommendations for Streamside Management Zones (SMZs)
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt

Georgia

ALTAMAHA OCMULGEE, GEORGIA



PARCA: Altamaha Ocmulgee

Overlapping DoD Installation: Marine Corps Air Station Beaufort- Townsend Range

General Description: The Altamaha Ocmulgee ecoregion is in southeast Georgia and follows the Altamaha River from south of Mount Vernon, the Ocmulgee River from Jacksonville, and the Ohoopee River from Oak Park to their convergence then to the coast. Aeolian sandhills are present on the north and east sides of these rivers and adjacent summer habitat retreats harbor the best remaining populations of Eastern Indigo Snakes in the state, if not in their entire range. Gopher Tortoises, Spotted Turtles, Pine Snakes, and Eastern Diamond-backed Rattlesnakes also thrive here.

The region falls mostly within the Southeastern Floodplains and Low Terraces, Southern Coastal Plain Floodplains and Low Terraces, and Atlantic Southern Loam Plains ecoregions. Both the Southeastern Floodplains and Low Terraces and the Southern Coastal Plain Floodplains and Low Terraces ecoregions occur directly surrounding the rivers, with the Southeastern Floodplains and Low Terraces in the west and the Southern Coastal Plain Floodplains and Low Terraces to the east. Both ecoregions are characterized by major river floodplains and associated low terraces, low gradient streams with sandy and silty substrates, oxbow lakes, ponds, and swamps. The Atlantic Southern Loam Plains, which are in the region of the PARCA further upland of the major rivers, is characterized by dissected irregular plains, some smooth plains, and broad interstream divides and mostly gentle side slopes dissected by numerous small, low to moderate gradient sandy bottomed streams.

Habitat Description: The land cover of the Southeastern Floodplains and Low Terraces ecoregion is mostly deciduous forest, forested wetlands, pine plantations on floodplains, and cropland and pine plantations on terraces. River swamp forests of bald cypress and water tupelo and oak dominated bottomland hardwood forests provide important wildlife corridors and habitat. The Southern Coastal Plain Floodplains and Low Terraces ecoregion is mostly forested wetland, deciduous forest, and wildlife habitat. The region includes large sluggish rivers and backwaters with ponds, swamps, and oxbow lakes. River swamp forests of bald cypress and water tupelo and oak-dominated bottomland hardwood forests provide important wildlife habitat.

The Atlantic Southern Loam Plains has land cover of cropland and pasture with corn, soybeans, onions, rye, wheat, tobacco, and hogs; pine plantations; and mixed forest. The region has an abundance of the agriculturally important Tifton soils, but the region also contains forested areas that are more sloping or are low, flat and poorly drained. Parallel to some of the major stream courses are some excessively-drained, dunal sand ridges with xeric vegetation such as longleaf

pine / turkey oak forests, and some distinctive evergreen shrubs, such as rosemary and woody mints.

Focal Species:
Information Needed

Threats:
Information Needed

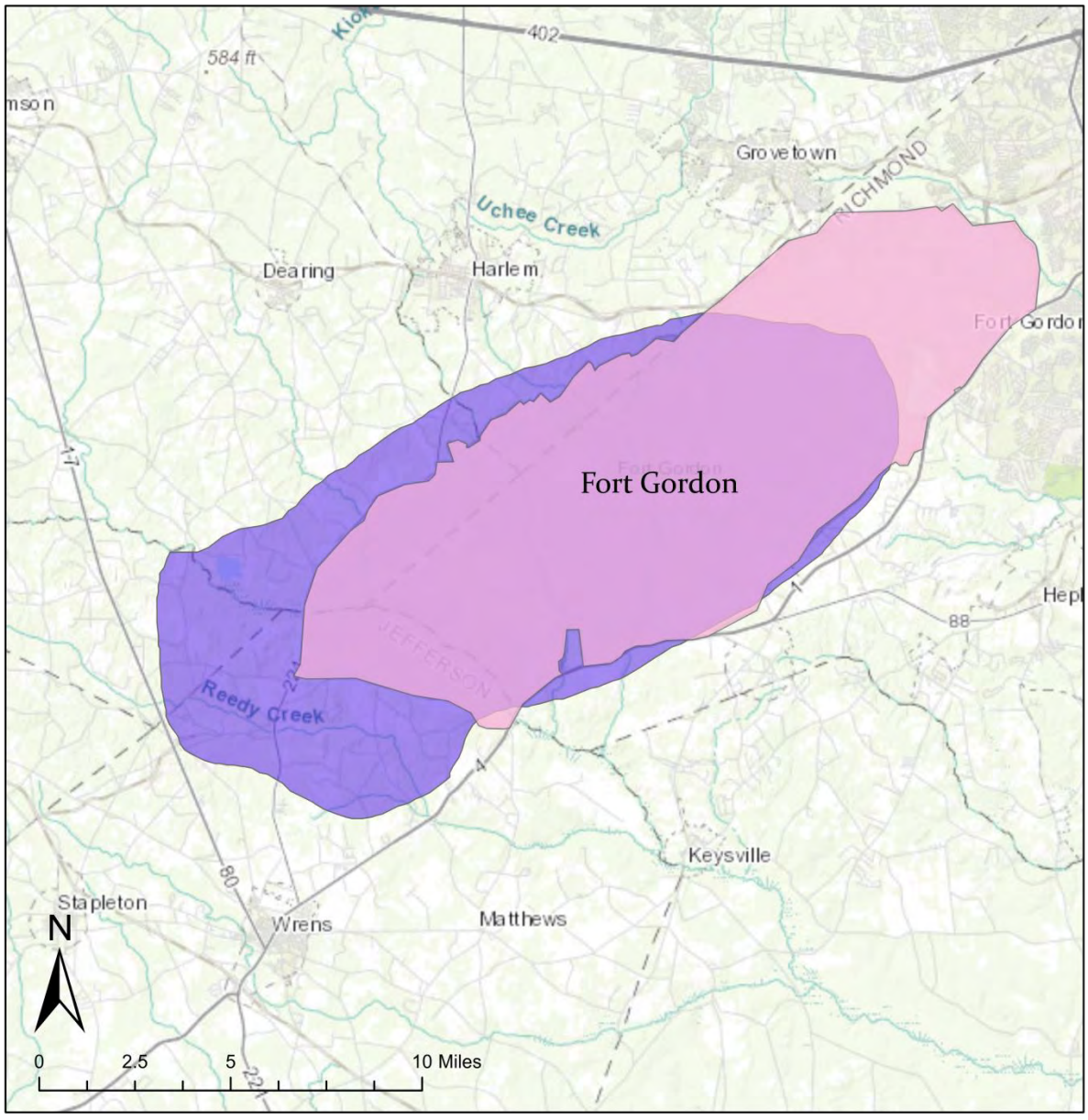
Opportunities:
- Georgia Department of Natural Resources (GADNR)
- DoD
- TNC
- Atlantic Coast Conservancy
- USFWS

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes
- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks

- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands

FORT GORDON, GEORGIA



PARCA: Fort Gordon

Overlapping DoD Installation: Fort Gordon

General Description: The Fort Gordon PARCA encompasses the majority of Fort Gordon. The uplands support Gopher Tortoises and Southern Hog-nosed Snakes, as well as the Georgia endemic Savannah Slimy Salamander. Streams contain excellent populations of Dwarf Waterdogs. This PARCA is within the Sand Hills ecoregion, which forms a narrow, rolling to hilly, highly dissected coastal plain belt stretching across the state from Augusta to Columbus. The region is composed primarily of Cretaceous and some Eocene-age marine sands and clays deposited over the crystalline and metamorphic rocks of the Piedmont. Many of the droughty, low-nutrient soils formed in thick beds of sand, although soils in some areas contain more loamy and clayey horizons.

Habitat Description: Within the Sand Hills ecoregion, on the drier sites, turkey oak and longleaf pine are dominant, while shortleaf-loblolly pine forests and other oak-pine forests are common throughout the region. The land cover of the Sand Hills ecoregion is mostly pine plantations, mixed forest, and some pasture and cropland.

Focal Species:
Information Needed

Threats:
Information Needed

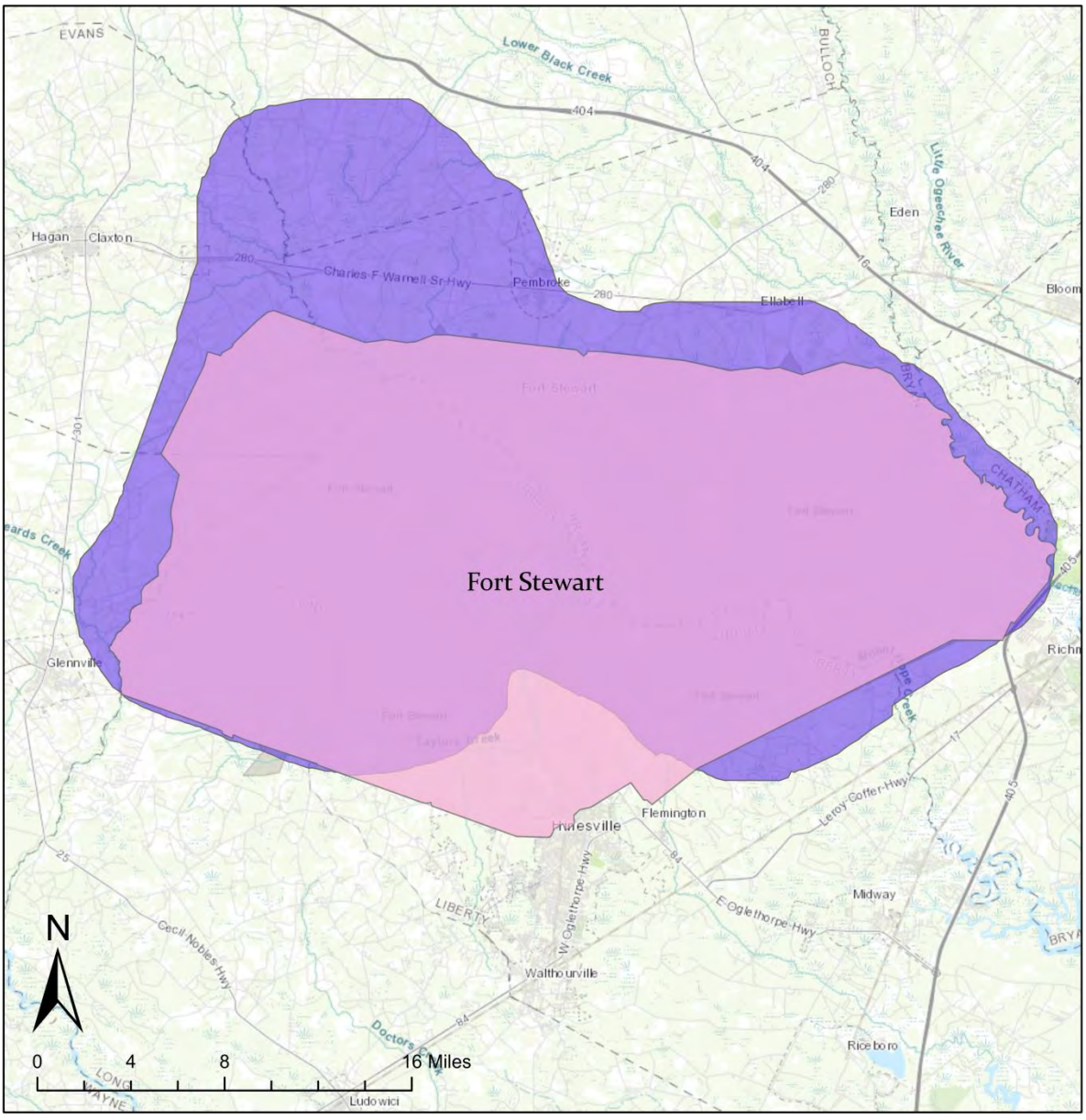
Opportunities:
- GADNR
- DoD
- Central Savannah River Land Trust

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur

- In sandhill and pine habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- Protect and manage remaining mature forest stands
    - Favor mature stands, but maintain a mixture of forest types and ages (including some openings)
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in forests
- Protect and buffer any remaining natural areas on agricultural land
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Follow pesticide/fertilizer directions very carefully; use precisely where needed and minimum amounts necessary to achieve objectives
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall

FORT STEWART, GEORGIA



PARCA: Fort Stewart

Overlapping DoD Installation: Fort Stewart

General Description: The Fort Stewart PARCA encompasses the majority of Fort Stewart and is the largest contiguous old-growth longleaf pine-dominated ecosystem in the state. The region harbors the only known extant population of Frosted Flatwoods Salamanders in the state. Many other rare or unique herpetofauna thrive here including Gopher Tortoises, Spotted Turtles, Eastern Diamond-backed Rattlesnakes, Pinesnakes, Southern Hog-nosed Snakes, Gopher Frogs, Carpenter Frogs, Tiger Salamanders, Many-lined Salamanders, and Striped Newts. The most recently documented Mimic Glass Lizard was found at Fort Stewart.

Habitat Description: This PARCA falls within the Sea Island Flatwoods ecoregion, which consists of poorly-drained flat plains. Pleistocene sea levels rose and fell several times creating different terraces and shoreline deposits. Spodosols and other wet soils are common, although small areas of better-drained soils add some ecological diversity. Trail Ridge is in this region. Loblolly and slash pine plantations cover much of the region. Water oak, willow oak, sweetgum, blackgum, and cypress occur in wet areas.

Focal Species:
Information Needed

Threats:
Information Needed

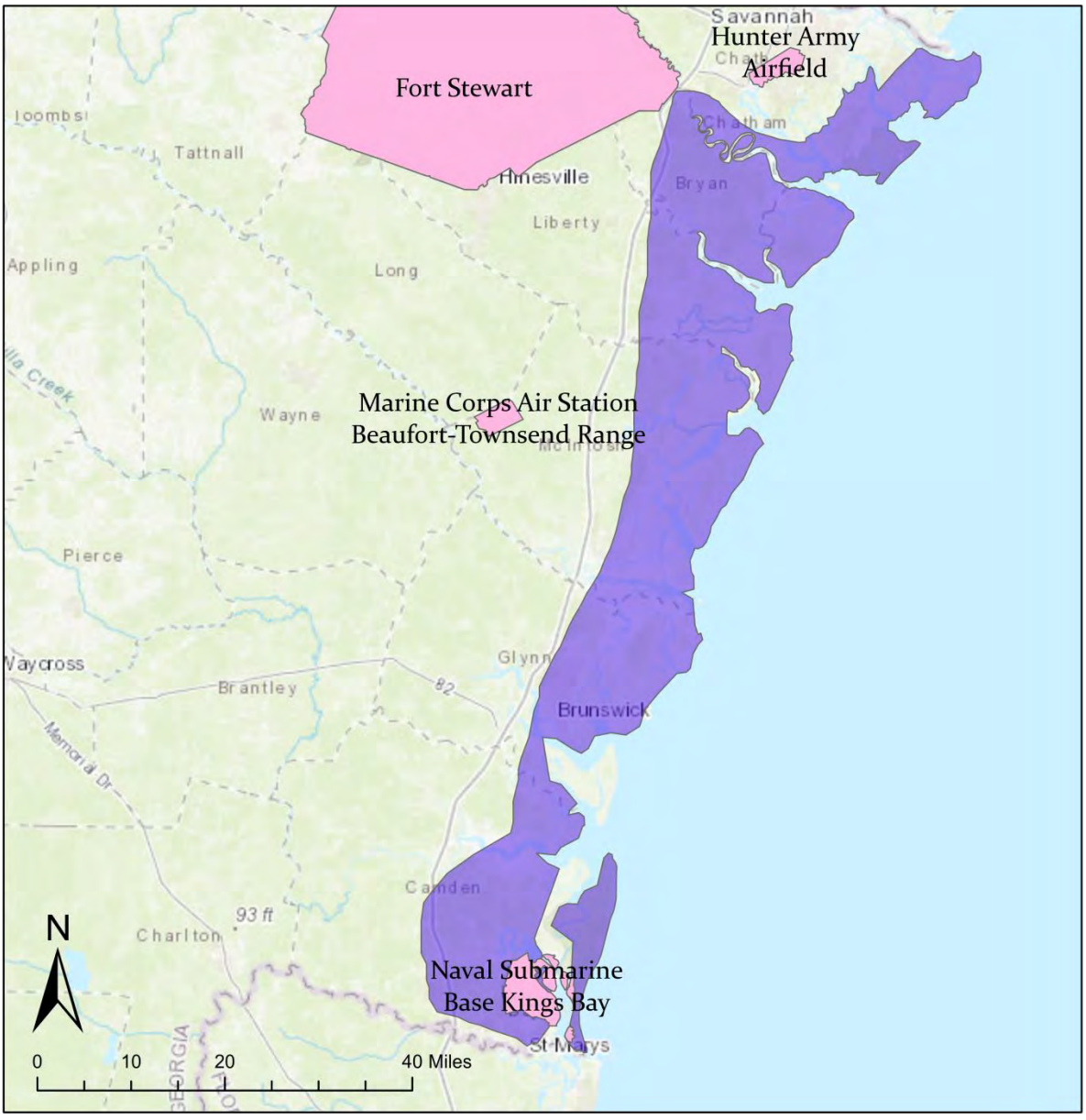
Opportunities:
- GADNR
- DoD
- St. Simons Land Trust

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in pine habitats

- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes
- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats

BARRIER ISLANDS AND MARSHES, GEORGIA



PARCA: Barrier Islands and Marshes

Overlapping DoD Installation: Naval Submarine Base Kings Bay

General Description: The Barrier Islands and Marshes PARCA is along the coast of Georgia, spanning north from Tybee Island, south to St. Mary's and includes Cumberland Island. This region contains multiple wildlife refuges, national wilderness areas, and Cumberland Island National Seashore. This area provides nesting (island beaches) and/or foraging habitat (estuaries and nearshore waters) for four marine turtles (Green, Loggerhead, Kemp's Ridley, and Leatherback). Estuaries and embedded marsh islands are habitat for Diamond-backed Terrapins. Other rare species found in upland areas in this region include Island Glass Lizards and dense populations of Eastern Diamond-backed Rattlesnakes.

Habitat Description: This PARCA is within the Sea Islands/Coastal Marsh ecoregion, which contains the lowest elevations in Georgia and is a highly dynamic environment affected by ocean wave, wind, and river action. Mostly sandy soils occur on the barrier islands, while organic and clayey soils occur in the freshwater, brackish, and salt marshes. Maritime forests of live oak, red cedar, slash pine, and cabbage palmetto grow on parts of the sea islands, and various species of cordgrass, saltgrass, and rushes are dominant in the marshes. The coastal marshes are important nursery areas for fish, crabs, shrimp, and other marine species.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- GADNR
- USFWS
- NPS
- DoD
- DOJ
- TNC
- Clemson University Board of Regents
- State Parks
- Devendorf Easements
- New York Zoological Society
- North American Land Trust
- St. Simons Land Trust

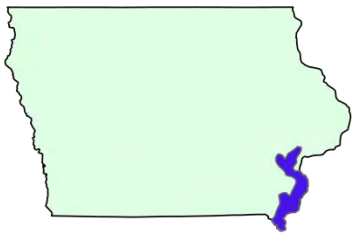
- Georgia Land Trust

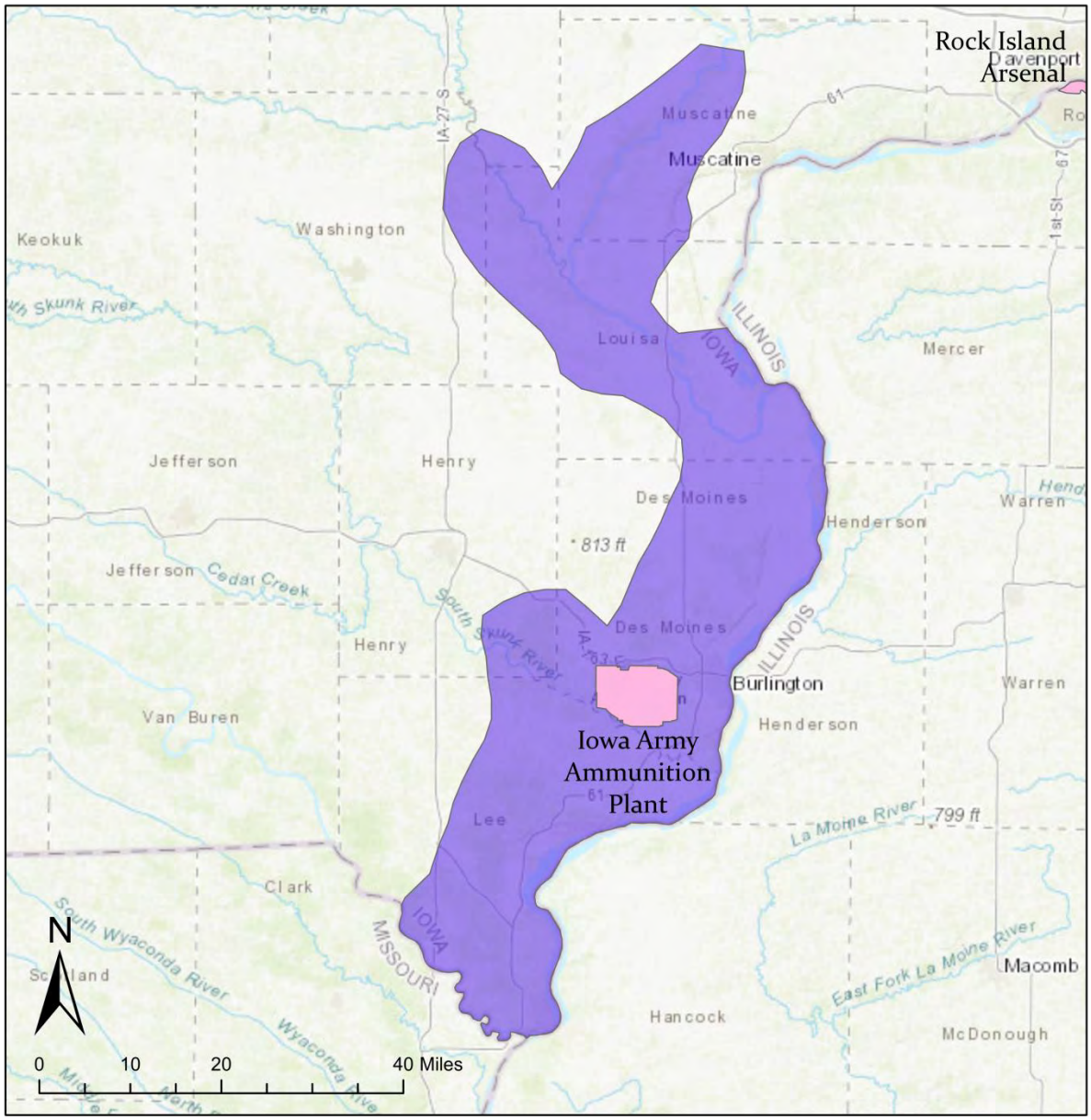
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate "beach re-nourishment" activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests

Iowa

LEOPOLD, IOWA





PARCA: Leopold

Overlapping DoD Installation: Iowa Army Ammunition Plant

General Description: This PARCA is situated in the Upper Mississippi River Alluvial Plain portion of the Interior River Valleys and Hills ecoregion. The Interior River Valleys and Hills is made up of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. A little less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands.

Habitat Description: The Upper Mississippi Alluvial Plain, an ecoregion within the Interior River Valleys and Hills ecoregion, contains smooth to irregular alluvial plains and channelized streams. Natural vegetation includes cottonwood-willow riparian forest, pin oak forest, and cordgrass wet prairie.

Focal Species:

- Reptiles
    - Blanding's Turtle (*Emydoidea blandingii*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Yellow Mud Turtle (*Kinosternon flavescens*)
    - Eastern Musk Turtle (*Sternotherus odoratus*)
    - Smooth Softshell (*Apalone mutica*)
    - Western Wormsnake (*Carphophis vermis*)
    - Plains Hog-nosed Snake (*Heterodon nasicus*)
    - Speckled Kingsnake (*Lampropeltis holbrooki*)
    - Plain-bellied Watersnake (*Nerodia erythrogaster*)
    - Diamond-backed Watersnake (*Nerodia rhombifer*)
    - Gophersnake (*Pituophis catenifer*)
    - Eastern Copperhead (*Agkistrodon contortrix*)
    - Eastern Massasauga (*Sistrurus catenatus*)
- Amphibians
    - Common Mudpuppy (*Necturus maculosus maculosus*)
    - Eastern Newt (*Notophthalmus viridescens)*

Threats:

- Upland
    - Loss of upland prairie
    - Urban encroachment on wood turtle sites
    - Woody species encroachment into grasslands and sand prairie

    - Farming and housing development on sand prairies
    - Pesticides and herbicides on land and in run-off
    - Peat mining
    - Deforestation
    - Pesticides
    - Confined animal feeding operations
    - Drastic changes in the water table
    - Lack of inland connection to Mississippi River due to levees
    - Extreme drought
    - Invasive species and aggressive natives
    - Confined animal feeding operations
- Aquatic
    - Water extraction
    - Loss and/or alteration of sandbar habitat for nesting turtles
    - Lock and dam system in Mississippi River
    - Recreational powerboating
    - Extreme flooding events
    - Siltation
    - Dams causing barriers to movement
    - Loss of isolated wetland habitats that are free, or nearly free of predatory fish species
    - Loss of turtle nesting sites
    - Yellow mud turtle is in serious decline and near extirpation

Opportunities:

- Working with private landowners
- Some organizations working to mitigate flooding
- Floodplain restoration
- Opportunities to partner with county conservation boards
- Several NGOs with similar missions
- Presence of National Wildlife Refuge

Research/ Conservation Needs:

- Effects of peat mining
- Impacts of flooding

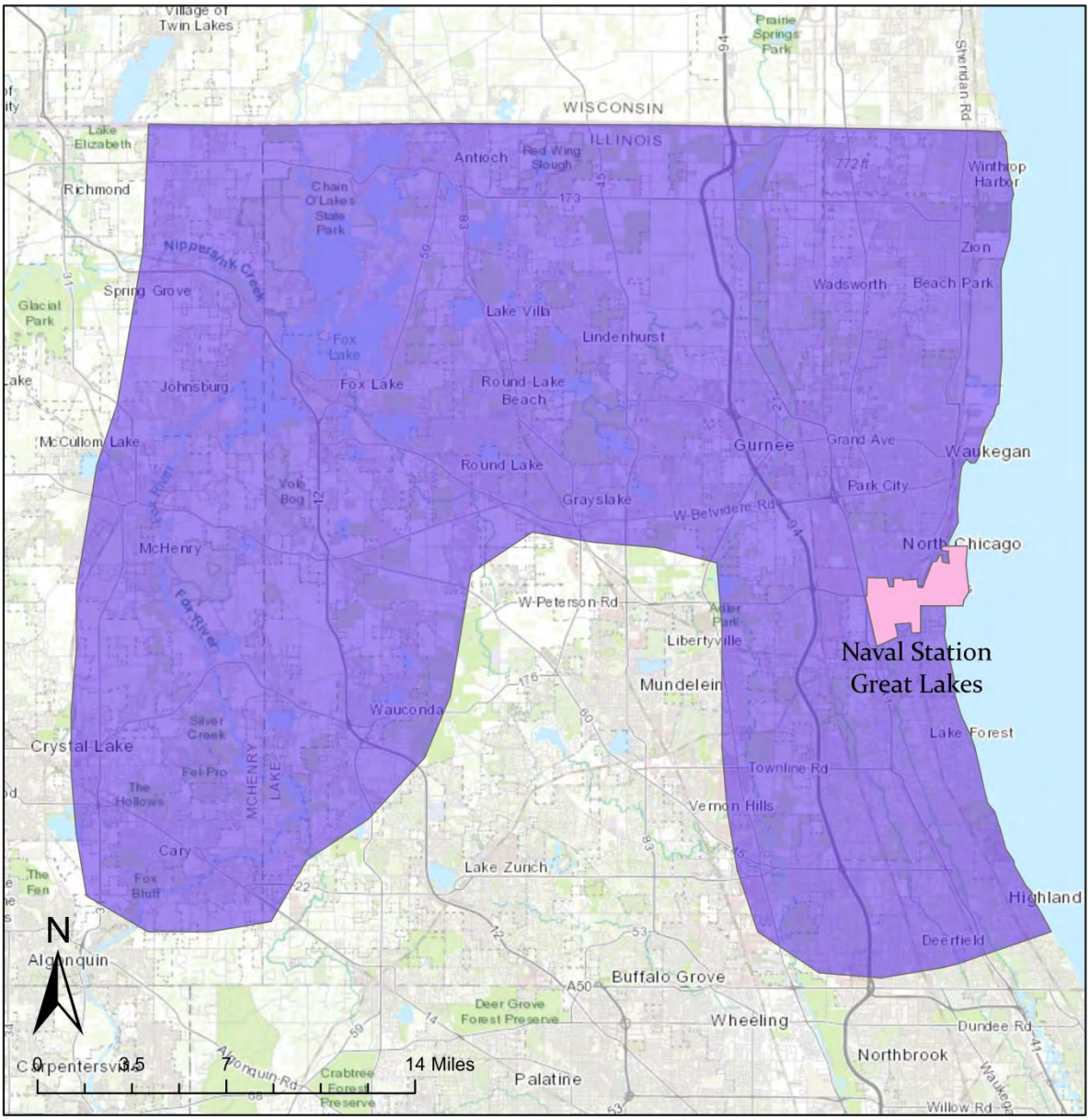
Habitat Management Recommendations:

- Maintenance of sand prairies, prairies, and wetlands with shrub removal
- Control of mesopredators

- Identify remaining wetlands, riparian zones, and sand prairies necessary for management/public ownership
- Mitigate drawdowns of wetlands and river backwaters
- Partner with private landowners to implement agricultural conservation practices to buffer wetlands and waterways
- Connect habitat fragments with vegetative corridors
- Stabilize impaired riverbanks to allow wildlife access between river and adjacent uplands, (limiting or avoiding use of rip-rap)
- Within rivers, allow the natural movement of sand and gravel and the natural buildup of coarse woody materials- sandbars provide basking and nesting sites for turtles; snags and rocks are used as basking sites for snakes and turtles

Illinois

UPPER DES PLAINES, ILLINOIS



PARCA: Upper Des Plaines

Overlapping DoD Installation: Naval Station Great Lakes

General Description: The Upper Des Plaines PARCA occurs on the northeastern morainal division of Illinois along the Lake Michigan plain and along the IL/WI stateline. The region has high levels of urbanization interspersed with pockets of farmland, county forest preserves, and state parks with remnant and restored high- quality habitats supporting herpetofauna. Lake Michigan forms the eastern boundary of the region encompassing Chiwaukee Prairie/Illinois Beach State Park. The PARCA extends along the Des Plaines River watershed within Lake County, IL and includes part of the Fox River watershed in the northwestern portion of the county, encompassing Chain O'Lakes State Park and Volo Bog State Park.

Habitat Description: Remnant and restored wetland/sedge meadows, open palustrine wetlands, forested flatwoods, lake plains, forested ravines, tallgrass prairies, wet meadows, oak savannas, oak-hickory forest, maple-dominated floodplain forests, and oak woodlands are characteristic of the Upper Des Plaines region.

Focal Species:

- Reptiles
    - Blanding's Turtle (*Emydoidea blandingii*)
    - Smooth Greensnake (*Opheodrys vernalis*)
    - Graham's Crayfish Snake (*Regina grahamii*)
- Amphibians
    - Blue-spotted Salamander (*Ambystoma laterale*)
    - Mudpuppy (*Necturus maculosus*), potential along lakeshore

Threats:

- Road mortality
- Urban sprawl
- Invasive vegetation
- Abundant mesopredators
- Collection
- Surrounded by a city
- Disease
- Fragmentation
- Altered hydrology
- Industrial pollution
- Road salt
- Recreational herping habitat disturbance

- Shoreline erosion

Opportunities:

- Lake and McHenry County Forest Preserve District
- Chicago Wilderness
- Lake County Preservation Foundation
- USFWS
- Local support for conservation
- Audubon
- Strong volunteer network
- Openlands
- Conserve Lake County
- Great Lakes Restoration Initiative
- Stormwater District
- Illinois Nature Preserves Commission (INPC)

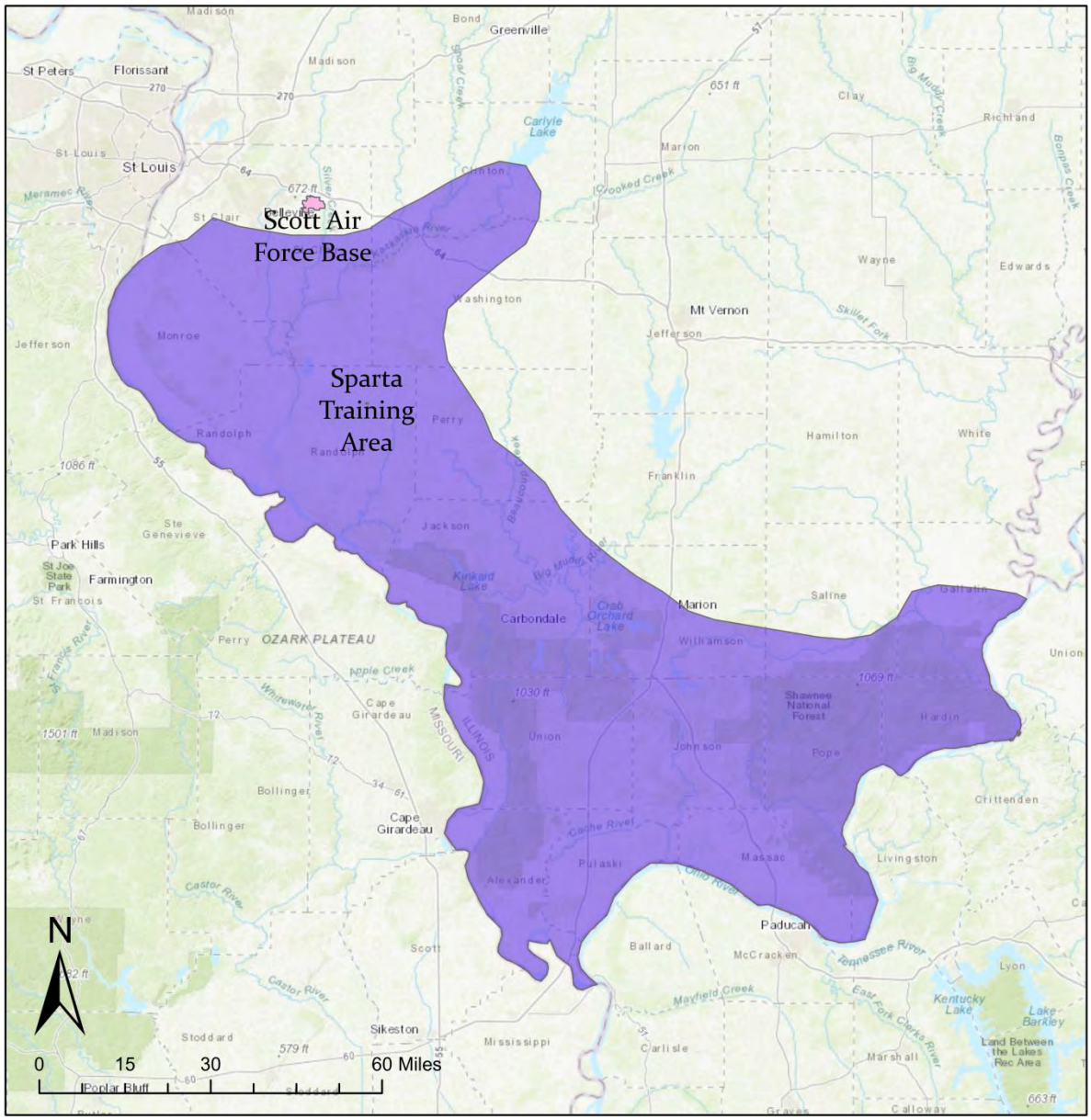
Research/ Conservation Needs:

- Burn frequency and timing research
- Smooth greensnake demography
- Reintroduction
- Mesopredator control
- Continued BD monitoring
- Disease surveillance

Habitat Management Recommendations:

- Manage invasive vegetation
- Remove drain tiles
- Mesopredator control
- Traffic control in specific spots (wildlife passages)
- Reestablish native vegetation

SHAWNEE, ILLINOIS



PARCA: Shawnee

Overlapping DoD Installation: Sparta Training Area

General Description: This largest Illinois PARCA contains six Illinois Natural Divisions: Southern Till Plain, Wabash Border, Ozark, Lower Mississippi River Bottomlands, Shawnee Hills, and Coastal Plain. It also contains five of Smith's (1961) Herpetofaunal Divisions that closely correlate to the Natural Divisions. The Southern Till Plain is characterized by forested streams and open upland prairie with largely claypan soils, and extensive areas of river floodplain and glacial lake beds. The Wabash Border is characterized by lowland forested bottomlands and loess-covered uplands with scattered grasslands & sandstone cliff exposures in the ravines. The Ozark is characterized by both glaciated and unglaciated hill country that is forested with loess hill prairies interspersed, along with steep limestone cliff outcrops along the river edges and numerous karst topography features. The Lower Mississippi River Bottomlands is characterized by glaciated floodplain bottomlands that used to be mostly forested with numerous marshes, wet prairies, oxbow sloughs, and spring-fed swamps. The Shawnee Hills are characterized by unglaciated hills with open ridged uplands and many cliffs and valleys, containing some sinkholes and karst topography. The Coastal Plain is characterized by swampy forested bottomlands and steep to rolling clay/gravel hills.

Habitat Description: The Southern Till Plain is comprised of southern flatwoods, dry barrens, dry-mesic prairie, dry-mesic forest, dry-mesic savanna, low gradient creeks, big river, and sandstone overhang. The Wabash Border contains streams and rivers, large river backwaters and mesic floodplain forests dominated by beech-maple-yellow poplar, ephemeral woodland ponds, and sandstone cliffs. The Ozark is characterized by dry upland forest, mesic upland forest, floodplain forest, loess hill prairie, sinkhole ponds, terrestrial and subterranean caves, bluffs, cliffs, limestone glades, and sandstone glades. The Lower Mississippi River Bottomlands is comprised of floodplain forest, wet and mesic prairie, cypress-tupelo swamps, and geological areas. The Shawnee Hills contains xeric upland forest, upland oak-hickory forest, shale glades, limestone glades, sandstone glades, cliffs, shelter bluffs, barrens, caves, sinkholes, and rocky bottom clear streams. The Coastal Plain is characterized by dry-mesic acid oak upland forest, interior highlands oak barrens, backwater/slough floodplain forests, wet flatwoods, forested acid seeps, open ponds and emergent marshes, thin soil oak savannas/barrens, shaded rock outcrops, canebrakes, mesophytic slope forest, and cypress-tupelo swamps.

Focal Species:

- Reptiles
    - Midland Smooth Softshell (*Apalone mutica mutica*)
    - Alligator Snapping Turtle (*Macrochelys temminckii*)
    - River Cooter (*Pseudemys concinna*)

    - Eastern Box Turtle (*Terrapene carolina*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Timber Rattlesnake (*Crotalus horridus*)
    - Great Plains Ratsnake (*Pantherophis emoryi*)
    - Red-bellied Mudsnake (*Farancia abacura*)
    - Eastern Coachwhip (*Coluber flagellum flagellum*)
    - Mississippi Green Watersnake (*Nerodia cyclopion*)
    - Southern Watersnake (*Nerodia fasciata*)
    - Graham's Crayfish Snake (*Regina grahamii*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Flat-headed Snake (*Tantilla gracilis*)
    - Eastern Ribbonsnake (*Thamnophis saurita*)
- Amphibians
    - Eastern Hellbender (*Cryptobranchus alleganiensis*)
    - Spotted Dusky Salamander (*Desmognathus conanti*)
    - Common Mudpuppy (*Necturus maculosus*)
    - Lesser Siren (*Siren intermedia*)
    - Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis*)
    - Western Bird-voiced Treefrog (*Hyla avivoca*)
    - Illinois Chorus Frog (*Pseudacris illinoensis*)
    - Northern Crawfish Frog (*Lithobates areolatus circulosus*)

Threats:

- Collection
- Vehicular mortality
- Disease
- Urban sprawl in the northwestern section
- Habitat disturbance from recreational herping
- Altered hydrology
- Agriculture
    - Loss of upland and wetland habitat to crop conversion
    - Disking of farm fields
    - Mortality and/or soil compaction from heavy equipment
    - Herbicides and pesticides
    - Dredging water filled farm ditches
- Changes in hydrology
    - Tiling
    - Water control structures
    - Woody encroachment
    - Lowering of the water table by irrigation

- Increased mesopredators
    - High mortality of adults
    - Nest predation
    - Hatchling mortality
- Clay mining
- Loss of non-vegetated areas
- Den destruction
- Loss of wetlands

Opportunities:

- USFS partnerships
- USFWS partnerships
- Heartlands Conservancy
- TNC
- Illinois Audubon
- Clifftop Land Trust
- Ducks Unlimited
- NRCS
- Friends of Shawnee National Forest
- INPC

Research/ Conservation Needs:

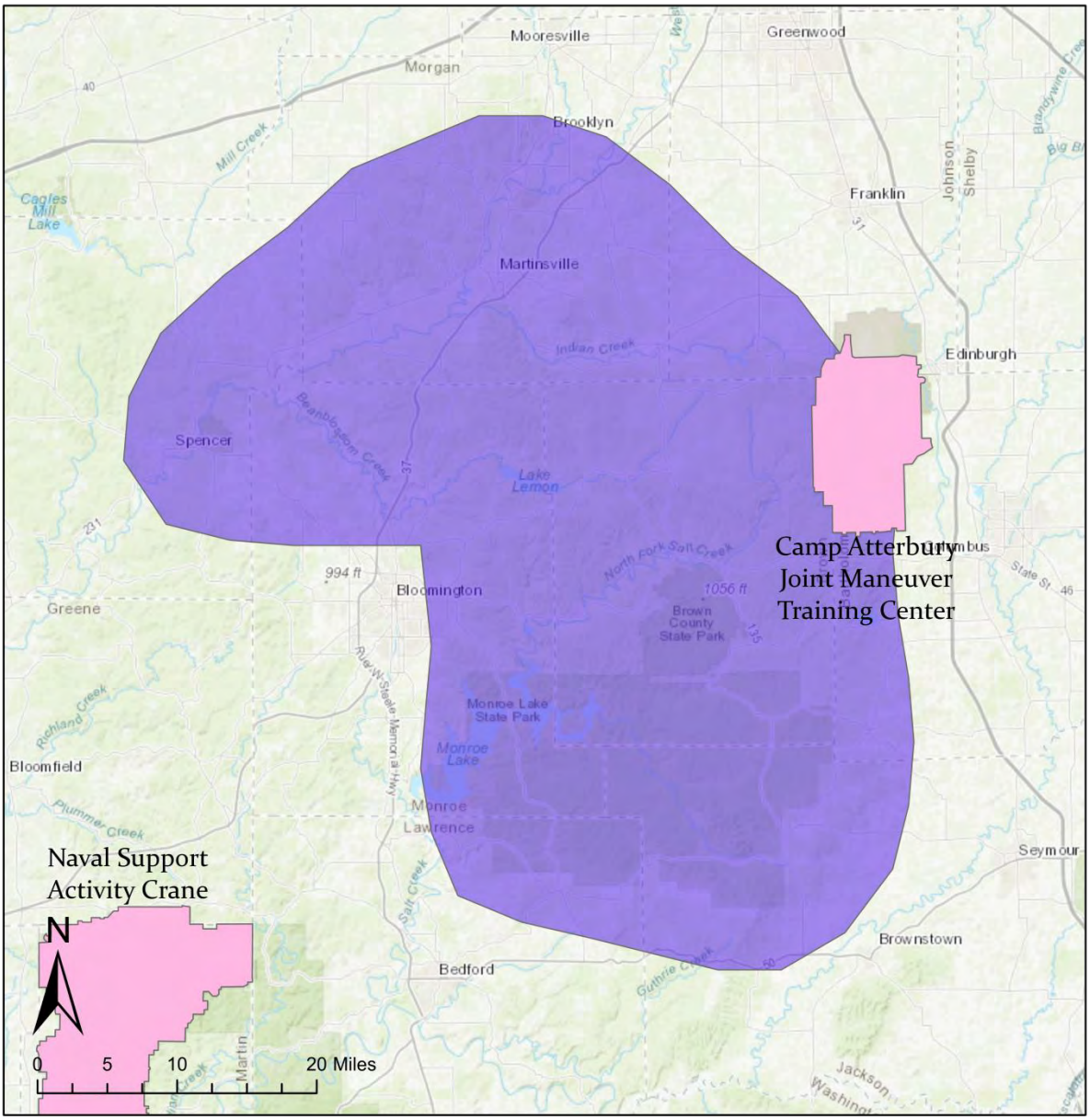
- Surveys for southern watersnakes, coachwhips, great plains ratsnake, flathead snakes, river cooters, narrow-mouthed toads
- Demography info and surveys (distribution data) for bird voiced tree frogs
- TR den site surveys
- Long term monitoring for TRs
- Den egress surveys
- Investigate growing season burns
- Disease prevalence monitoring

Habitat Management Recommendations:

- Stabilize stream banks
- Sinkhole management and protection from pollution

Indiana

BROWN COUNTY HILLS, INDIANA



PARCA: Brown County Hills

Overlapping DoD Installation: Camp Atterbury Joint Maneuver Training Center

General Description: Most of this region was not reached by the most recent, Wisconsin, glaciation. The "hills and hollers" topography is the result of streams downcutting for over 100,000 years. Native habitats are less fragmented than in many parts of Indiana, and the proportion of public land is higher. Forest persists on both public and private lands.

Habitat Description: Forested lands dominate most of this region. Except in the northernmost reaches, flat lands (and, thus, agriculture) are limited to valley bottoms and the tops of major ridges; ponds and lakes are largely man-made, although smaller ephemeral pools occur naturally. Due to early attempts at agriculture in the region, topsoil losses to erosion in the early part of the 20th century were significant, steepening hillsides and slowing the rebuilding of topsoil when farming and grazing eventually ceased. Because agriculture occurred throughout the landscape, existing forest is mostly 40-80 years old at this time. Some slopes offer rocky outcrops, and the local rock is largely sedimentary, often siltstone and mudstone, but limestone in some areas.

The ridge-and-valley topography produces abundant intermittent and permanent streams, but well-developed riparian habitat is limited to wider valley bottoms. Ephemeral pools are relatively rare, often eliminated by earlier agricultural efforts; stock ponds, which are not uncommon, are sometimes stocked with fish. Dammed lakes occur throughout the region and are also usually stocked with fish.

Focal Species:

- Reptiles
    - Timber Rattlesnake (*Crotalus horridus*)
    - Kirtland's Snake (*Clonophis kirtlandii*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Rough Greensnake (*Opheodrys aestivus*)
- Amphibians
    - Four-toed Salamander (*Hemidactylium scutatum*)

Threats:

- Habitat loss and fragmentation
- Vegetation management
- Cultural resistance to vegetation structure and management
- Poaching and overcollecting
- Persecution

- Invasive species and native encroachment
- Recreation and management conflicts
- Poor timber harvest practices

Opportunities:

- Land acquisition and easements including incentive programs (Wetlands Reserve Program (WRP), Environmental Quality Incentives Program (EQIP), etc.)
- Outreach to private landowners by agency private-lands biologists
- Protect existing connectivity and add to it
- Hardwood Ecosystem Experiment (Purdue: HEE)
- Indiana University Research and Teaching Preserve
- TNC, including their forest bank program, Sycamore Land Trust

Research/ Conservation Needs:

- Population/landscape genetics on focal species
- Species status and distribution surveys
- Research on the intersection of habitat management and population responses
- Work with public to diminish persecution and recreational conflicts
- Continue work to improve timber harvest standards in the region

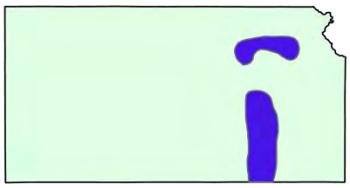
Habitat Management Recommendations:

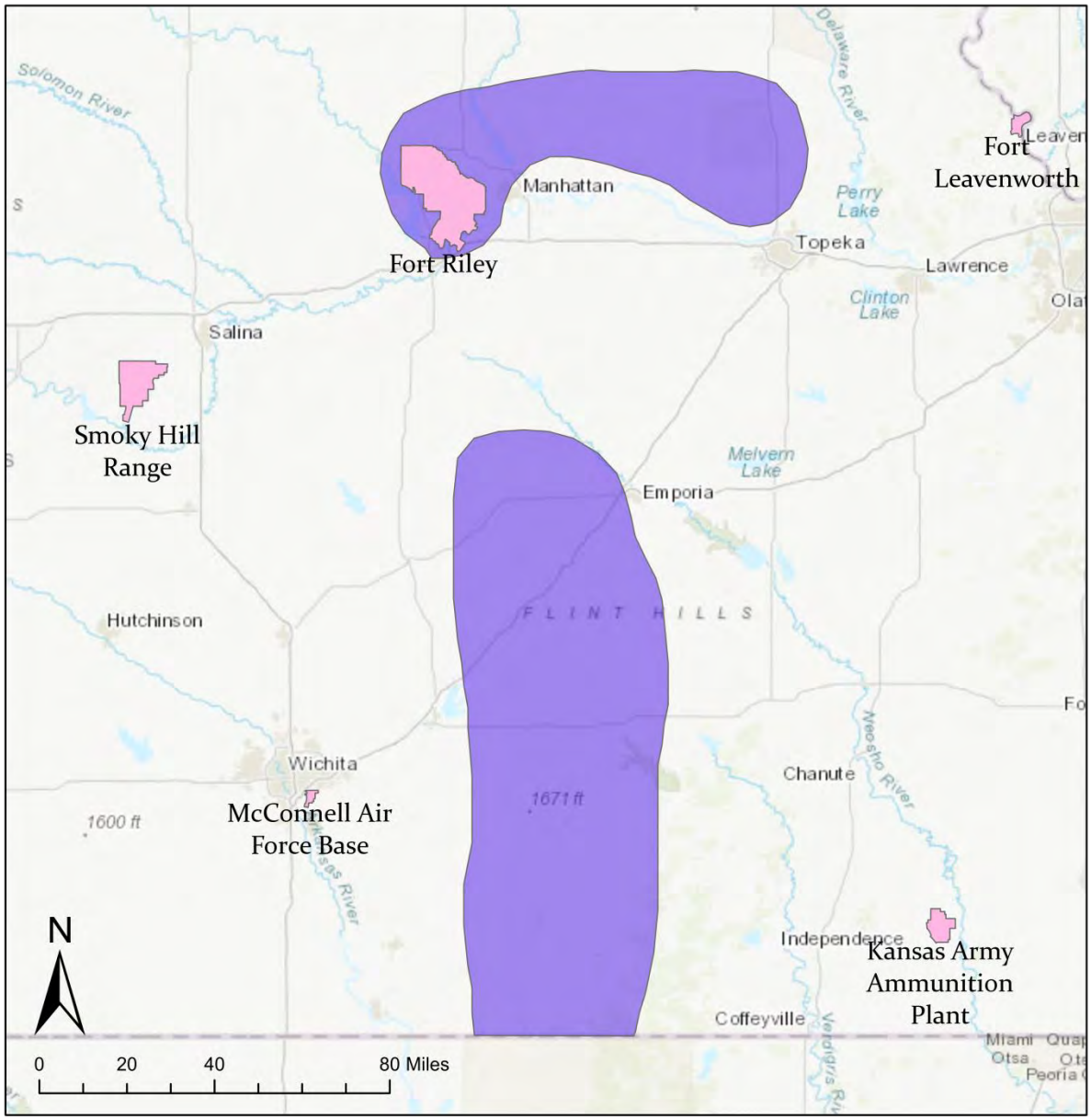
- Protection of forest
    - Fill inholdings
    - Increase size of existing protected blocks
    - Connect existing blocks
- Protection and restoration of wetland habitats, especially fish-free habitats
- Removal of relevant invasives

Other Comments: This is one of the most popular areas for outdoor recreation in the state. Several managed properties occur in this region, including: Yellowwood State Forest, Morgan-Monroe State Forest, Hoosier National Forest, Brown County State Park, McCormick's Creek State Park, and Monroe Reservoir.

Kansas

FLINT HILL, KANSAS





PARCA: Flint Hills

Overlapping DoD Installation: Fort Riley

General Description: The Flint Hills PARCA lies at the western edge of the tallgrass prairie and contains the largest contiguous area of tallgrass prairie in the country. Flint-bearing limestone, which is resistant to erosion, defines the geography in the region. Flat-topped hills which drop off steeply into valleys with rocky, clear-flowing streams occur in the region. The soil is fertile but shallow and gravelly, discouraging the conversion of prairie to cropland. Woody vegetation is scarce. Forests occur along stream and river bottoms, and areas protected from fire. The tallgrass habitat present in this PARCA persists in part because the soils are too shallow to plow.

Habitat Description: This tallgrass prairie habitat is characterized by bands of rolling hills with abundant residual flint eroded from the bedrock that lies near the surface. The rocky uplands of this prairie are not conducive to cultivation, leaving this area still largely intact as native prairie well-suited for livestock production. The region is ecologically important because it is the largest remaining expanse of tallgrass prairie in the country. Disturbance from grazing and fire play important roles in preserving the dominance of herbaceous species and floristic diversity of the prairie. This habitat is dominated by warm-season grasses such as big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), and Indian grass (*Sorghastrum nutans*). Wildflowers such as violets (*Viola* spp.), *Echinacea* spp., *Oenothera* spp., *Lobelia* spp., beardtongues (*Penstemon* spp.), and sunflowers (Heliantheae tribe) can be found throughout the Tallgrass Prairie habitat.

Wetland habitat in the Flint Hills PARCA includes low or wet prairie, freshwater marsh, cattail marsh, and weedy marsh. These habitats are located in the floodplains along rivers and streams, in swales associated with rivers, or as margins of lakes and impoundments. These are mostly seasonal and permanent wetlands.

Lotic habitat includes the small rivers, streams and their tributaries in the Neosho, Missouri, Verdigris, and eastern Arkansas River basins in eastern Kansas. Floodplain habitats are temporarily flooded habitats. In areas that often experience flooding from torrential rains that scour the ground, eastern cottonwoods (*Populus deltoids*) and willows (*Salix* spp.) are able to establish themselves quickly and thrive. Other dominant species are pecan (*Carya illinoinensis*), bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), sugar maple (*Acer saccharum*), river birch (*Betula nigra*), and hackberry (*Celtis occidentalis*). The understory varies depending on how well the woodlands drain after rainfall. Sedges, scouring rush, and weedy nettles can be found with common shrubs and forbs.

Focal Species:

- Reptiles
    - Common Lesser Earless Lizard (*Holbrookia maculata*)
    - Eastern Hog-nosed Snake (*Heterodon platirhinos*)
    - Smooth Softshell (*Apalone mutica*)
    - Prairie Skink (*Plestiodon septentrionalis*)
    - Timber Rattlesnake (*Crotalus horridus*)
- Amphibians
    - Crawfish Frog (*Lithobates areolatus*)
    - Mudpuppy (*Necturus maculosus*)

Threats:

- Water quality
    - Sedimentation
    - Pesticide/herbicide runoff
- Impoundments
- Habitat alteration
- Invasive species
- Grazing and burning regimes
- Woody encroachment
- Gravel mining

Opportunities:

- Kansas Department of Wildlife, Parks and Tourism (KDWPT)
- Fort Riley
- Prairie Band Potawatomi
- Kennesaw State University (KSU)
- Kansas Land Trust
- USFWS
- USDA
- NPS
- TNC
- Pheasants/Quail Forever
- KAZOO
- Local municipalities (aquatic organism passages)
- Westar Energy
- Kansas Grazing Lands Coalition (KGLC)
- Kansas Herpetological Society
- Pittsburg State University
- Emporia State University

- Fort Hays State University
- Large landowners that are interested in conservation
- Wichita State University

Research/Conservation Needs:

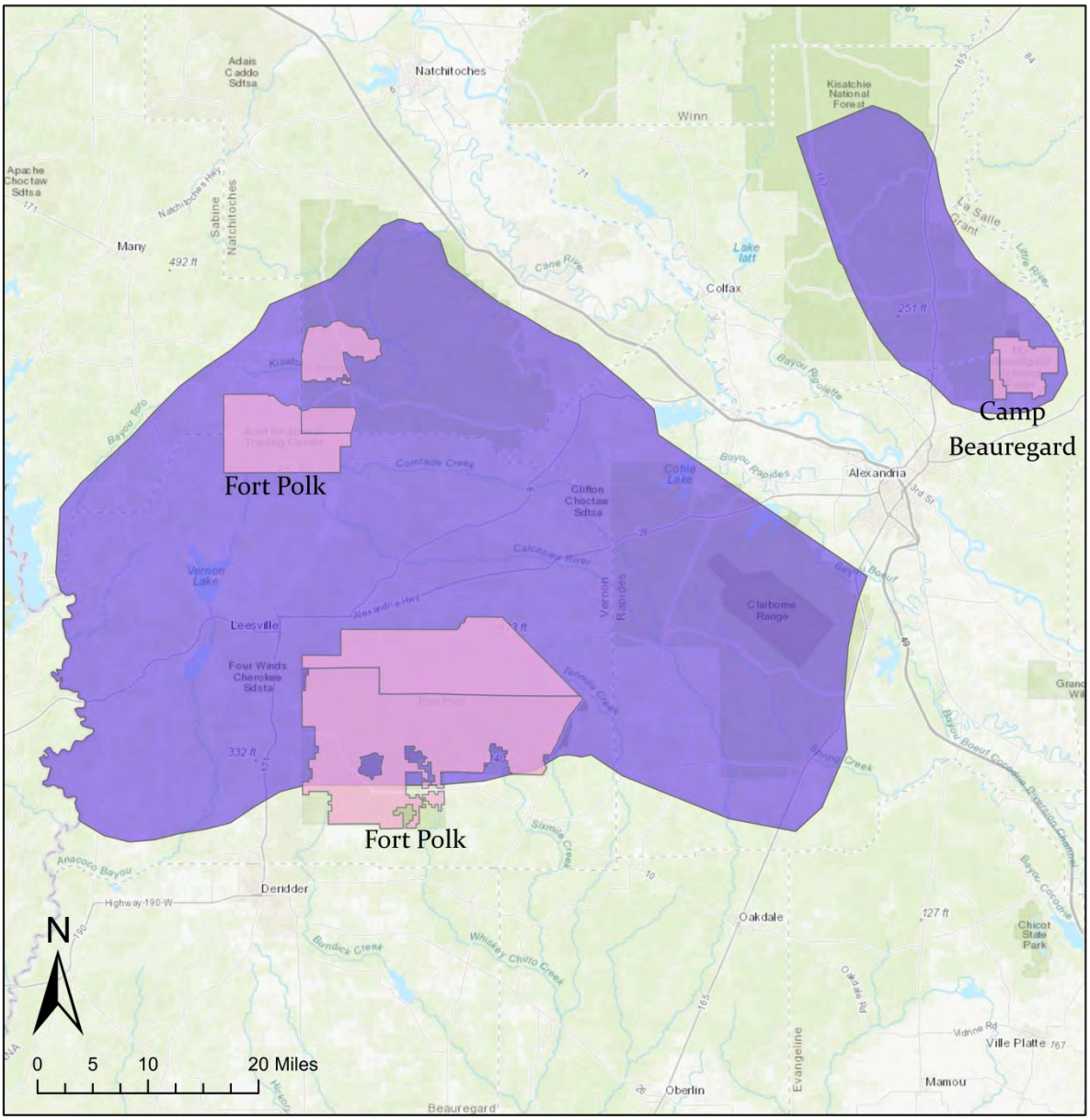
- Inventory and monitoring- crawfish frog (population trends and occurrences)
- Effects of different burning and grazing regimes
- Aquatic organism passages

Habitat Management Recommendations:

- Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools
- Promote the use of USDA's Agriculture Conservation Easement Program, USFWS' Flint Hills Legacy Easement Program, or other conservation easements to maintain the integrity of tallgrass prairie wildlife habitat, stream water quality, and rich agricultural heritage of the Flint Hills
- Provide landowners incentives to maintain wetlands
- Promote rangeland management tools, such as techniques for controlling invasive species, patch-burn-grazing, and drought management planning
- Develop an invasive species task force to create a state invasive plant and animal management plans
- Conduct wildlife surveys for data lacking species- surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
- Continue disease monitoring (e.g. chytrid fungus, Ranavirus, white nose syndrome, etc.)
- Research and investigate best management practices to control invasive species (*e.g. Sericea lespedeza*, old world bluestems, etc.)
- Implement surveys to quantify current wetlands, and identify priority areas
- Develop partnerships to help private landowners conduct prescribed burns
    - Provide education, equipment, expert advice and assistance

Louisiana

NO MAN'S LAND, LOUISIANA



PARCA: No Man's Land

Overlapping DoD Installations:
Camp Beauregard
Fort Polk

General Description: No Man's Land PARCA is found within the West and Upper West Gulf Coastal Plain Ecoregions and is separated into 2 tracts. These two tracts encompass Cotile, Vernon, Anacoco, Oden, and Hardwater Lakes, Kincaid and Indian Creek Reservoirs, and the Calcasieu River. This area contains unique geologic formations occurring in northeast to southwest bands across the area. The Jackson, Catahoula, Cook Mountain, and Fleming formations present distinctive soil types and conditions which influenced the development of natural community types along these formation bands. Federal lands include the Calcasieu, Catahoula, and Kisatchie Ranger Districts of the Kisatchie National Forest, and Fort Polk, Peason Ridge, and Camp Beauregard military grounds. Peason Ridge and Fort Polk are also designated Wildlife Management Areas. State lands include Clear Creek and Walnut Hills Wildlife Management Areas, South Toledo Bend and Hodges Gardens State Parks, and Alexander State Forest.

Habitat Description: Due to the formation types found within this PARCA, calcareous clays, sandstones, saline deposits, siltstones, and ironstones have shaped the development of natural communities such as the Calcareous Forests, Calcareous Prairies, Saline Prairies, and Small Stream Forests of this area. The Calcareous Forest and Calcareous Prairie communities occur on calcareous soils in the uplands of central, western and northwest Louisiana. Most known examples of Calcareous Forest occur on hills and slopes on either side of small creeks, downslope from Calcareous Prairies. Calcareous Prairies are typically small, naturally treeless areas with very diverse herbaceous flora dominated by grasses, composites, and legumes. Saline Prairies are small-scale grasslands, often occurring in complexes of small openings and ranging in size from less than one acre to about 30 acres. The south and southwestern portions of this PARCA are known for Western Longleaf Pine Flatwoods Savannas and associated Flatwoods Ponds and this area serves as the transition zone between Louisiana's Coastal Prairies and Upland Longleaf Pine Woodlands.

Focal Species:

- Reptiles
    - Louisiana Pinesnake (*Pituophis ruthveni*)
    - Alligator Snapping Turtle (*Macrochelys temminckii*)
    - Pygmy Rattlesnake (*Sistrurus miliarius*)
    - Timber Rattlesnake (*Crotalus horridus*)
    - Eastern Hog-nosed Snake (*Heterodon platirhinos*)

    - Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*)
    - Coal Skink (*Plestiodon anthracinus*)
    - Chicken Turtle (*Deirochelys reticularia*)
    - Six-lined Racerunner (*Aspidoscelis sexlineata*)
    - Coachwhip (*Masticophis flagellum*)
    - Flat-headed Snake (*Tantilla gracilis*)
    - Scarletsnake (*Cemophora coccinea*)
    - Razor-backed Musk Turtle (*Sternotherus carinatus*)
- Amphibians
    - Tiger Salamander (*Ambystoma tigrinum*)
    - Southern Red-backed Salamander (*Plethodon serratus*)
    - Red River Mudpuppy (*Necturus maculosus louisianensis*)
    - Southern Crawfish Frog (*Lithobates areolatus areolatus*)
    - Hurter's Spadefoot (*Scaphiopus hurterii*)
    - Louisiana Slimy Salamander (*Plethodon kisatchie*)
    - Small-mouthed Salamander (*Ambystoma texanum*)
    - Spotted Dusky Salamander (*Desmognathus conanti*)
    - Gray Treefrog (*Hyla versicolor*)

Threats:

- Fire suppression
- Invasive species
    - Wild hogs
    - Tallow tree and other invasive plants
- Unsustainable forestry practices
- Siltation
- Erosion
- Canopy closure
- Habitat degradation
- Hydrology changes to ephemeral ponds
- Shrub encroachment on wetlands

Opportunities:

- USFS
- DoD
    - Ft. Polk
- Louisiana Ecological and Forestry Center
- Clear Creek Wildlife Management Area
- Corporate timber companies
- Louisiana Forestry Association

- USFWS
- USGS
- South Toledo Bend State Park
- Sabine River Authority
- Louisiana Department of Wildlife and Fisheries (LDWF)
    - Scenic Rivers
- Louisiana Department of Environmental Quality (LDEQ)
- DOT
- NRCS
- TNC
- Louisiana State University
- University of Illinois
- Colorado State University
- McNeese State University
- University of Texas Tyler
- National Fish and Wildlife Foundation
- Quail Forever
- National Wild Turkey Federation
- West-central Louisiana Ecosystem Partnership
- Longleaf Alliance
- US Army Corps of Engineers - Construction Engineering Research Laboratory
- Memphis Zoo

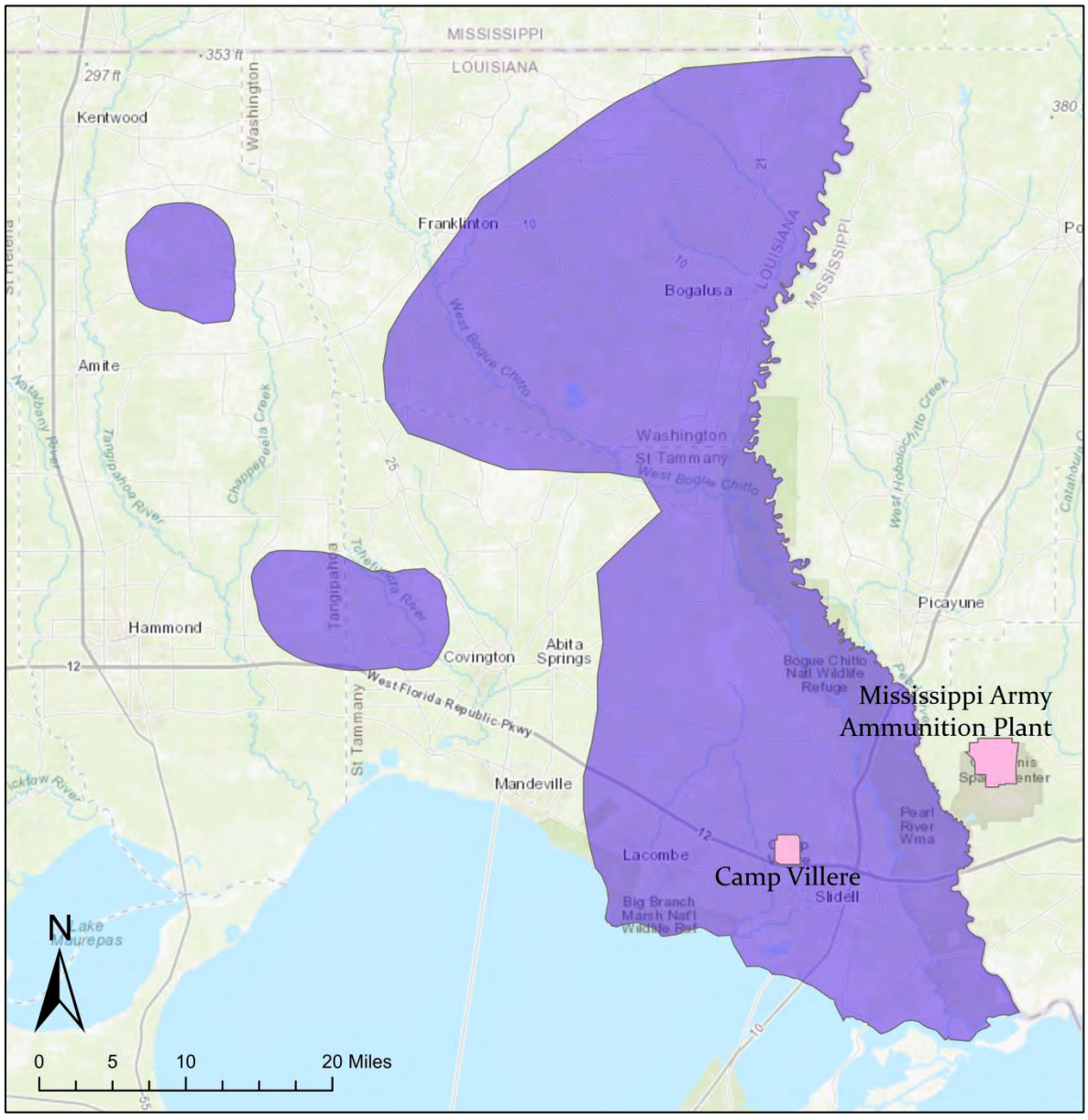
Research/ Conservation Needs:

- Conservation practices on working forests
- Inventory and monitoring
- Long term monitoring projects
- Identify suitable habitat for focal species
- Identify breeding sites for focal species
- Investigate the use of eDNA techniques to detect new populations
- Monitor for causes of possible declines
- Disease sampling
- Increased knowledge of ephemeral ponds and associated hydrology
- Identify why chuck can't find chicken turtles
- Identify optimal and minimal pocket gopher canopy densities and habitat features
- Effects of fire intensity and magnitude on herpetofauna communities
- Increase public outreach to limit mortality and promote species conservation

Habitat Management Recommendations:

- Maintain natural burn regimes
- Establish natural canopy densities
- Maintain Best Management Practices and Streamside Management Zones
- Promote sustainable forestry practices
- Restore native habitat types
- Restore and create ephemeral ponds
- Open Pine
    - Return fire to natural burn regimes
    - Maximize open canopy conditions
    - Minimize midstory and shrub encroachment
    - Allow wetlands to burn
- Control invasive species
- Manually remove trees and shrubs from ephemeral wetlands
- Collaborate with partnerships and landowners to establish healthy ecosystems

PEARL RIVER BASIN, LOUISIANA



PARCA: Pearl River Basin

Overlapping DoD Installation: Camp Villere

General Description: The Pearl River Basin PARCA is found within the East Gulf Coastal Plain Ecoregion and hosts the highest herpetofaunal diversity in Louisiana. This area consists primarily of upland forest dominated by evergreen/mixed hardwoods, pine flatwoods, and forested wetlands. Flatwoods Ponds are embedded in pine flatwoods and are believed to occupy swales and depressions remaining from ancient Pleistocene stream channels. Major waterways include the Tchefuncte, Bogue Chitto, and Pearl Rivers, and Lake Ramsey. Federal lands include Camp Villere National Guard Base, and Bogue Chitto and Big Branch Marsh National Wildlife Refuge. State lands include Sandy Hollow, Lake Ramsey, Pearl River, and Tangipahoa Parish School Board Wildlife Management Areas, St. Tammany Refuge, and Fairview-Riverside and Fontainebleau State Parks.

Habitat Description: The Pearl River Basin PARCA primarily consists of Eastern Upland Longleaf Pine Woodlands, Longleaf Pine Flatwoods, Slash Pine-Pondcypress-Hardwood Woodlands, Eastern Hillside Seepage Bogs, Cypress-Tupelo-Blackgum Swamps, Bayhead Swamps, and Small Stream Forests. Much of the historical longleaf pine component within the woodlands and flatwoods has been converted to loblolly pine. Ongoing efforts continue to restore longleaf and improve habitat conditions to these vital communities. Flatwoods Ponds are generally treeless and are vegetated by a variety of obligate and facultative wetland herbaceous species, mainly tall sedges and grasses. The hydrologic regime of these ponds are characterized by a seasonally fluctuating water level in which they remain mostly dry in summer and fall and flooded to various depths in winter and early spring. Flatwoods Ponds were historically maintained by frequent lightning generated fires that swept the Longleaf Pine Flatwoods Savannas every few years.

Focal Species:

- Reptiles
    - Pearl River Map Turtle (*Graptemys pearlensis*)
    - Ringed Map Turtle (*Graptemys oculifera*)
    - Gopher Tortoise (*Gopherus polyphemus*)
    - Eastern Glass Lizard (*Ophisaurus ventralis*)
    - Eastern Diamond-backed Rattlesnake (*Crotalus adamanteus*)
    - Striped-necked Musk Turtle (*Sternotherus minor peltifer*)
    - Southeastern Crowned Snake (*Tantilla coronata*)
    - Black Pinesnake (*Pituophis melanoleucus lodingi*)
    - Smooth Softshell (*Apalone mutica*)
    - Alligator Snapping Turtle (*Macrochelys temminckii*)

    - Pine Woods Littersnake (*Rhadinaea flavilata*)
    - Rainbow Snake (*Farancia erytrogramma*)
    - Northern Mole Kingsnake (*Lampropeltis rhombomaculata*)
    - Harlequin Coralsnake (*Micrurus fulvius*)
    - Pygmy Rattlesnake (*Sistrurus miliarius*)
    - Eastern Hog-nosed Snake (*Heterodon platirhinos*)
    - Coal Skink (*Plestiodon anthracinus*)
    - Saltmarsh Snake (*Nerodia clarkii*)
    - Diamond-backed Terrapin (*Malaclemys terrapin*)
    - Timber Rattlesnake (*Crotalus horridus*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Six-lined Racerunner (*Aspidoscelis sexlineata*)
    - Eastern Wormsnake (*Carphophis amoenus amoenus*)
    - Common Watersnake (*Nerodia sipedon*)
    - Eastern Ribbonsnake (*Thamnophis saura*)
    - Coachwhip (*Masticophis flagellum*)
    - Scarletsnake (*Cemophora coccinea*)
    - Scarlet Kingsnake (*Lampropeltis elapsoides*)
    - Razor-backed Musk Turtle (*Sternotherus carinatus*)
- Amphibians
    - Gulf Coast Mud Salamander (*Pseudotriton montanus flavissimus*)
    - Southern Red Salamander (*Pseudotriton ruber vioscai*)
    - Dusky Gopher Frog (*Lithobates sevosus*)
    - Four-toed Salamander (*Hemidactylium scutatum*)
    - Holbrook's Southern Dusky Salamander (*Desmognathus auriculatus*)
    - Eastern Spadefoot (*Scaphiopus holbrookii*)
    - Small-mouthed Salamander (*Ambystoma texanum*)
    - Spotted Dusky Salamander (*Desmognathus conanti*)
    - Southern Two-lined Salamander (*Eurycea cirrigera*)
    - Three-lined Salamander (*Eurycea guttolineata*)
    - Southern Toad (*Anaxyrus terrestris*)

Threats:

- Fire suppression
- Urbanization
    - Fragmentation of habitat
    - Siltation
    - Rapid population growth
- Water pollution
    - Oil spills

- Unsustainable timber practices
- Cogon grass
- Wild hogs
- Mesopredator abundance
- Hurricanes
    - Salt water intrusion
    - Changes in vegetation structure
- Hydrologic changes
    - Ditching

Opportunities:

- Corporate landowners
    - Weyerhaeuser
- LDWF
    - Pearl River Wildlife Management Area
    - Lake Ramsey Wildlife Management Area
    - Sandy Hollow Wildlife Management Area
- TNC
    - Lake Ramsay
    - Abita Creek Flatwoods
    - Talisheek
    - Charter Oaks
- USFWS
    - National Wildlife Refuge- Bogue Chitto and Big Branch Marsh
- DoD
    - Camp Villere
- Louisiana State Parks
    - Bogue Chitto State Park
    - Fontainebleau
- Non-industrial private landowners
- Mitigation banks
- USGS
- Utility companies
    - Entergy
    - Cleco
    - Florida Gas
    - Southern Natural Gas
- Forest Stewardship Council controlled wood mitigation

Research/ Conservation Needs:

- Conservation practices on working forests
- Inventory and monitoring
- Identifying potential dusky gopher frog breeding habitat and reintroduction sites
- Threat mapping
    - Urbanization
    - Habitat conversion
    - Impacts of transportation and energy infrastructure
- Develop measures to lessen the impacts of roads
- Work with managers to limit cogon grass movement
- Long term monitoring programs
- Develop gopher tortoise recovery criteria
- Document important breeding habitat for focal taxa
- Disease monitoring
- Increase public outreach to improve acceptance of prescribed fire
- Increase public outreach to limit mortality and promote species conservation
- Mud turtle phylogenetics
- Use genetic data to determine geographical boundaries between the dusky salamanders
- Investigate the use of eDNA techniques to detect new populations
- Identify the critical stocking densities for species conservation

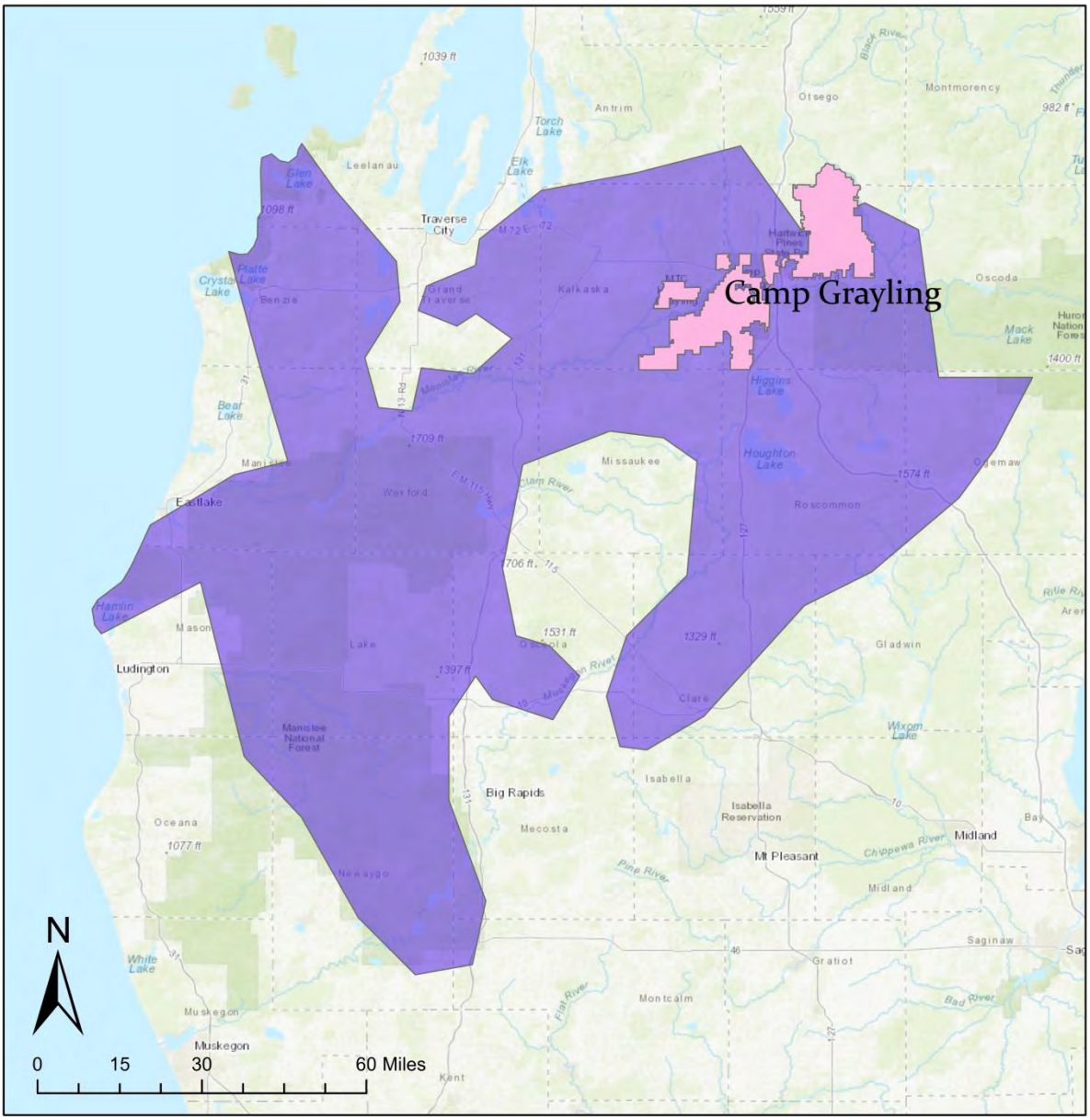
Habitat Management Recommendations:

- Open pine
    - Return fire to natural burn regimes
    - Maximize open canopy conditions
    - Minimize midstory and shrub encroachment
    - Allow wetlands to burn
- Protect and restore sand bars and nesting beaches
- Retain snags and downed woody debris
- Maintain and create shallow water ponds
- Bottomlands
- Work with partners to promote the use of Best Management Practices and Streamside Management Zones
- Control invasive species
    - Feral hogs
    - Cogon grass
    - Tallow
    - Fire ants
    - Privet
    - Coral ardisia

    - Air potato
    - Salvenia
- Restore native hardwood habitats

Michigan

NW MICHIGAN, MICHIGAN



PARCA: NW Michigan

Overlapping DoD Installation: Camp Grayling Joint Maneuver Center

General Description: The NW Michigan PARCA extends north to Glen Lake, south to the southwest extent of the Manistee National Forest, west to Hamlin Lake in the south and to Glenn and Platte lakes in the north, east to include the western part of the Huron National Forest, and north to Hartwick Pines State Park. Major features within this region include the Manistee National Forest, Camp Grayling, Hartwick Pines State Park, the western part of the Huron National Forest, and Higgins, Houghton, and Glen Lakes.

Habitat Description: The major habitat types of the NW Michigan PARCA include deciduous and coniferous forests, hardwood swamps, and oak/pine barrens.

Focal Species:

- Reptiles
    - Spotted Turtle (*Clemmys guttata*)
    - Blue Racer (*Coluber constrictor foxii*)
    - Northern Ring-necked Snake (*Diadophis punctatus edwardsii*)
    - Blanding's Turtle (*Emydoidea blandingii*)
    - Wood Turtle (*Glyptemys insculpta*)
    - Eastern Hog-nosed Snake (*Heterodon platirhinos*)
    - Smooth Greensnake (*Opheodrys vernalis*)
    - Queensnake (*Regina septemvittata*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Eastern Musk Turtle (*Sternotherus odoratus*)
    - Woodland Box Turtle (*Terrapene carolina carolina*)
    - Northern Ribbonsnake (*Thamnophis saurita septentrionalis*)
- Amphibians
    - Blanchard's Cricket Frog (*Acris blanchardi*)
    - Blue-spotted Salamander (*Ambystoma laterale*)
    - *Ambystoma laterale* complex
    - Spotted Salamander (*Ambystoma maculatum*)
    - Eastern Tiger Salamander (*Ambystoma tigrinum*)
    - Fowler's Toad (*Anaxyrus fowleri*)
    - Four-toed Salamander (*Hemidactylium scutatum*)
    - Common Mudpuppy (*Necturus maculosus maculosus*)
    - Western Chorus Frog (*Pseudacris triseriata*)
    - Pickerel Frog (*Lithobates palustris*)
    - Northern Leopard Frog (*Lithobates pipiens*)

Threats:

- Habitat loss and fragmentation
- Vehicular mortality
- Poaching and overcollection
- Incompatible land management
- Altered hydrology
    - Impounding and poorly times drawdowns
    - Water control structures
    - Lowering of the water table by irrigation
    - Contamination
- Persecution
- Disease
- Invasive species
- Pollution
- Vegetating nesting beaches along rivers and stabilizing toe to prevent erosion
- Subsidized mesopredators (particularly raccoons)
    - High mortality of adults
    - Nest predation
    - Hatchling mortality
- Agriculture
    - Loss of upland and wetland habitat to crop conversion
    - Increase in drain tiling and wetland loss
    - Mortality and/or soil compaction from heavy equipment
    - Herbicides and pesticides
    - Loss of hedges and vegetated buffers
- Loss of critical wetland habitat especially vernal pools

Opportunities:

- Michigan Department of Natural Resources (MIDNR)
- NRCS
    - Wetlands Reserve Program
- Michigan Department of Environmental Quality (MDEQ)
- USFWS
    - Farm Service Agency Interest of Michigan
- Land Conservancy of West Michigan
- Cadillac Area Land Conservancy
- Headwaters Land Conservancy
- Little Forks Conservancy
- Chippewa Watershed Conservancy
- Manistee National Forest

- Huron National Forest
- Hartwick Pines State Park
- Camp Grayling

Research/ Conservation Needs:

- Better documentation of species richness and distribution
- Location, quantity, and condition of vernal pool habitat for herpetofauna
- Evaluate threats and mitigate including management of raccoons
- Increase nesting opportunities and success of turtles
- Assess localized potential future impacts of climate change on target species in the area
- Long-term monitoring of both abundant and rare species
- Determine community composition across the region
- Determine which areas within the region have the highest rates of amphibian and reptile road mortality
- Outreach with recreationists (e.g., fishermen) and the public to reduce human persecution of certain species (e.g., mudpuppies)

Habitat Management Recommendations:

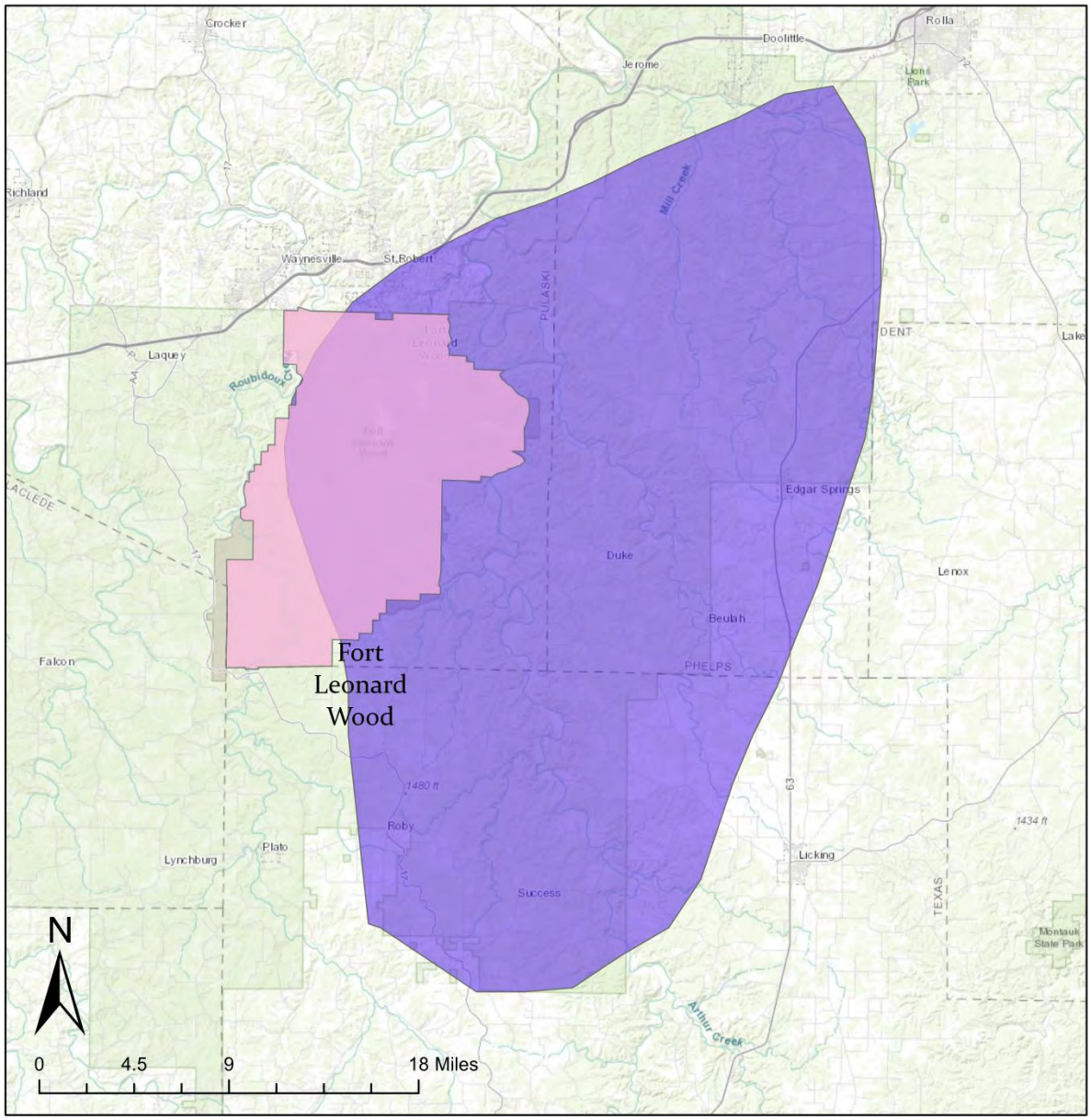
- Invasive species management
- Develop or protect existing naturally vegetated corridors between habitat fragments
- Protect and buffer natural areas in agricultural landscape
    - Establish forest buffers around permanent wetlands
- Restore and protect existing wetlands and wetland complexes
- Restore natural surface water and groundwater hydrology
- Maintain or restore native forest cover and forest floor structure
    - Protect stands of older trees
- When possible, mimic natural disturbance patterns such as wind-throws and fires in woodlands
    - Consider prescribed burns in oak/ pine barrens
- Identify road crossing areas for herpetofauna and install signs to alert drivers
    - Reduce speed limits and consider road closings (if possible) during nesting seasons
- Prioritize maintaining and restoring natural ecological processes and habitat in streams (especially rocky and/or coldwater streams), grassy savannas, and fens within this region
    - Fens harbor 2/8 target reptile species present in the region
    - Open grassy areas harbor 2/8 target species present in the region. Pesticide use should be limited in these areas as much as possible to avoid impacts to remaining robust populations of smooth green snakes.
    - Rocky and/or coldwater streams harbor 2/8 target reptile species and 2/4 target amphibian species in the region

- Limit the use of lampricides in lacustrine habitats capable of supporting mudpuppies
- Avoid using erosion netting that could injure or kill snakes and other herpetofauna along roadways
- Create wildlife underpasses in areas with high turtle and snake road mortality
- Consider thinning forests adjacent to open areas capable of supporting box turtles to expand their habitat and facilitate dispersal
    - Leaving limbs from harvested trees on the forest floor will also provide additional cover for target reptile species

Other Comments: Funding for nongame species is critical in helping conserve and best manage species and populations. The northwest region of Michigan is arguably the most intact. However, much of the landscape consists of thick red pine forests that support relatively few target species. Therefore, targeted management in areas with high quality habitat is critical. Additionally, although the forests of this region remain relatively intact in many places, roads cutting through these forests may still lead to high rates of road mortality for vagile species (e.g., snakes, turtles, and pond-breeding amphibians), and may act as barriers to dispersal for smaller, less-vagile species (e.g., red-backed salamanders).

Missouri

BIG PINEY, MISSOURI



PARCA: Big Piney

Overlapping DoD Installation: Fort Leonard Wood

General Description: The Big Piney region falls in the Osage/Gasconade Hills subsection in south-central Missouri. The landscape consists of moderately dissected hills, steep slopes, and narrow valleys with karst features and dendritic spring-fed perennial streams present. Steep slopes and narrow ridges of carbonate and sandstone underlie soils which are rocky and thin. Outcrops of Gasconade dolomite with some sandstone are found throughout the region along with areas of Roubidoux sandstone, Jefferson City-Cotter dolomites and scattered Mississippian limestone outliers in the western portion. Streams flow generally northward and drain into the Missouri River.

Habitat Description: Numerous caves, springs, calcareous wet meadows, losing streams, and streams with entrenched valley meanders are common. The natural vegetation is predominantly white-black oak forest, white oak forest, and an increase in shortleaf pine-oak forest. Vegetation also includes some small limestone and sandstone glades.

Focal Species:

- Reptiles
    - Scarletsnake (*Cemophora coccinea*)
- Amphibians
    - Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*)
    - Ringed Salamander (*Ambystoma annulatum*)
    - Grotto Salamander (*Eurycea spelaea*)
    - Southern Red-backed Salamander (*Plethodon serratus*)
    - Dark-sided Salamander (*Eurycea longicauda melanopleura*)

Threats:

- Sedimentation
- Recreation
- Disease
- Collection
- Poor timber harvest practices
- Overgrazing in riparian areas
- Feral hogs
- Disease

Opportunities:

- Landscape level restoration
- Public land partnerships
- Mill Creek watershed restoration coalition
- Landowner cooperatives
- Stream teams
- Technical and financial assistant programs
- DoD PARC involvement
- Ozark regional Land trust
- Big Piney River Stream Team Watershed Association

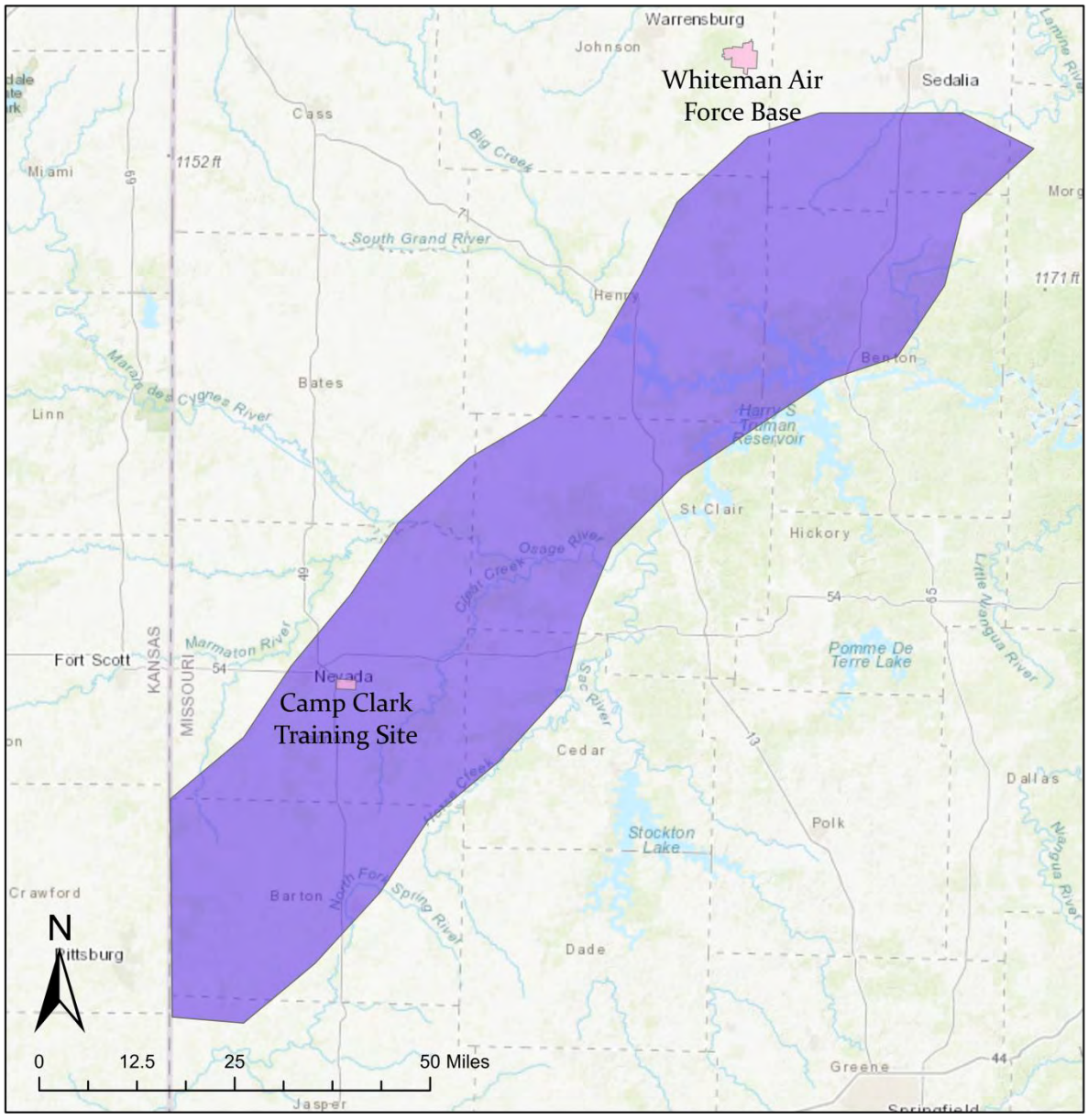
Research/ Conservation Needs:

- Species surveys
- Watershed threat analysis
- Add ephemeral vernal pools

Habitat Management Recommendations:

- Follow timber harvest BMPs
- At least 65% of the watershed should have 50 meter buffers
- Follow forest plan standards and guidelines
- Establish riparian connectivity

OSAGE PLAINS, MISSOURI



PARCA: Osage Plains

Overlapping DoD Installation: Camp Clark Training Site

General Description: The unglaciated Osage Plains are characterized by flat to gently rolling topography with intermittent and perennial streams. The soils are mostly composed of sandstone, shale, and limestone. Within the Cherokee Plains subsection, claypan soils distinguish this region from surrounding regions. Land use includes a mix of cropland and grassland, limited woodland, and areas of coal strip mining extending into southeastern Kansas.

Habitat Description: Historically, this region was dominated by tallgrass prairie with savannas and wetlands. While some of these prairies remain, most of the landscape has been converted to agriculture. The unglaciated landscape includes smooth to irregular plains with intermittent and perennial streams.

Potential natural vegetation consists of tallgrass prairie, oak-hickory woodland, and claypan prairie where soils are less permeable. Sites can be seasonally wet but usually become extremely dry during the summers. Plant communities may be similarly dominated by tallgrass species, but shorter grasses such as little bluestem (*Schizachyrium scoparium*), prairie dropseed (*Sporobolus heterolepis*), and sideoats grama (*Bouteloua curtipendula*), may be more prevalent. Forb species include blue false indigo (*Baptisia australis*), orange puccoon (*Lithospermum canescens*), and pale purple coneflower (*Echinacea pallida*).

Focal Species:

- Amphibians
    - Crawfish Frog (*Lithobates areolatus*)
    - Eastern Tiger Salamander (*Ambystoma tigrinum*)

Threats:

- Cattle overgrazing
- Soil compaction
- Wetland loss
- Loss of continuous prairie
- Invasive plants and woody encroachment
- Poor burning practices
- Many ponds are permanent and stocked
- Disease

Opportunities:

- Working with private landowners
- TNC partnerships
- Native Plant Society
- Missouri Prairie Foundation
- Landowner cooperatives
- Financial assistance programs (federal, state, & NGO)
- Technical assistance
- Easements
- Monarch and grassland working groups
- American burying beetle efforts
- Prairie chicken efforts

Research/ Conservation Needs:

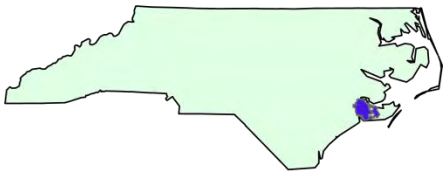
- Continue to purchase or provide easements for native prairies and grasslands
- Construction of ephemeral wetlands
- Renovation of existing permanent ponds to better create fishless conditions and vegetative growth
- Removal of fish from wetlands
- Working with land managers to reduce soil compaction
- Working with land managers to promote best practices for burning regimes
- Research on the impacts of grazing on crawfish burrows

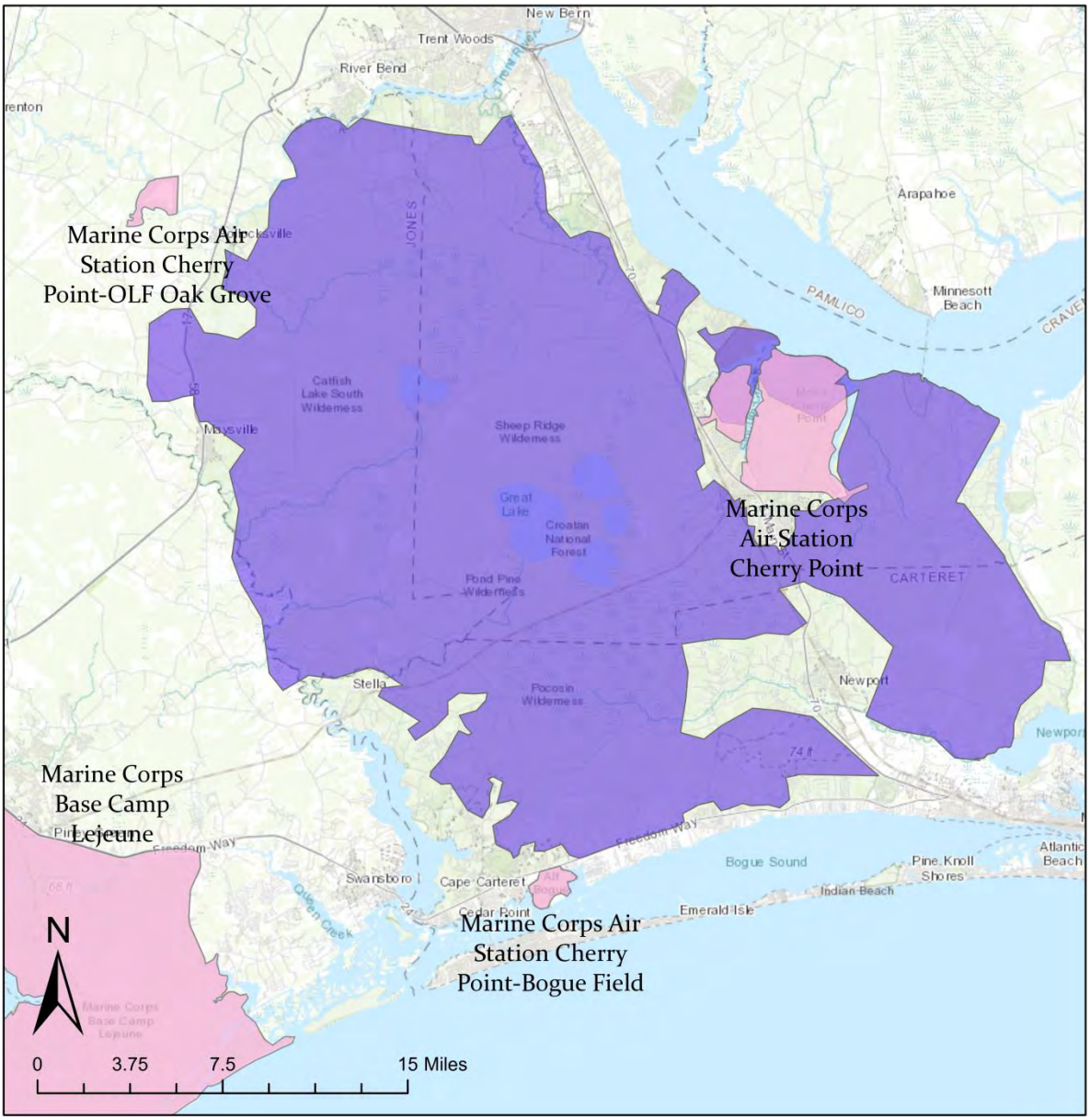
Habitat Management Recommendations:

- Manage woody encroachment
- Feral hog eradication
- Follow burning BMPs for the habitat type
- Maintain fishless ponds
- Avoid soil compaction
- Exclude cattle from vernal pools/ponds
- Promote native grassland communities

North Carolina

CROATAN, NORTH CAROLINA





PARCA: Croatan

Overlapping DoD Installation: Marine Corps Air Station Cherry Point

General Description: Dominated by the Croatan National Forest, the Croatan PARCA also includes many pieces of adjacent unprotected land. Considering this area is a hotspot of diversity for reptiles and amphibians, conservation measures taken on some of these additional lands would prove highly beneficial. Species of note in the Croatan PARCA include gopher frog, ornate chorus frog, southern chorus frog, oak toad, Mabee's salamander, mimic glass lizard, eastern chicken turtle, and pygmy rattlesnake.

Habitat Description: The Carolinian Barrier Islands and Coastal Marshes ecoregion covers most of the North Carolina coast, extending from Bodie Island in the north to North Myrtle Beach, South Carolina in the south. The maritime forests include live oak, laurel oak, loblolly pine, red cedar, yaupon holly, wax myrtle, and dwarf palmetto. Pamlico Sound is a shallow estuary supporting an important nursery for 90 percent of all the commercial seafood species caught in North Carolina, as well as vast recreational fisheries. Further inland is the Chesapeake-Pamlico Lowlands and Tidal Marshes ecoregion, which occur on the lowest marine terraces with elevations ranging from sea level to about 25 feet. The region is characterized by nearly level plains with some broad shallow valleys, seasonally wet soils (Aquults), brackish and fresh streams, and broad estuaries affected by wind tides. Some major areas of cropland are found in the region, growing corn, wheat, soybeans, and potatoes.

This PARCA also contains some areas of the Nonriverine Swamps and Peatlands ecoregion, characterized by poorly drained areas containing organic soils of peat and muck. The dark reddish-brown to black soils, acidic and nutrient-poor, often contain logs, stumps, and other woody matter from bald cypress and Atlantic white cedar trees. Pocosin lakes occur in some areas. The vegetation of the high and low pocosins contains a dense shrub layer, along with stunted pond pine, swamp red bay, and sweet bay. Swamp forests are dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Fire during drought periods, logging, and construction of drainage ditches has affected natural vegetation patterns. Several areas of mineral and shallow organic soils have been drained and cultivated for crops of corn, soybeans, and wheat.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:

- North Carolina Wildlife Resources Commission (NCWRC)
- USFS
- DoD
- North Carolina Coastal Land Trust

Research/ Conservation Needs:

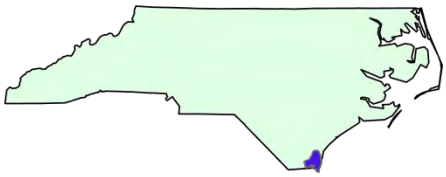
Information Needed

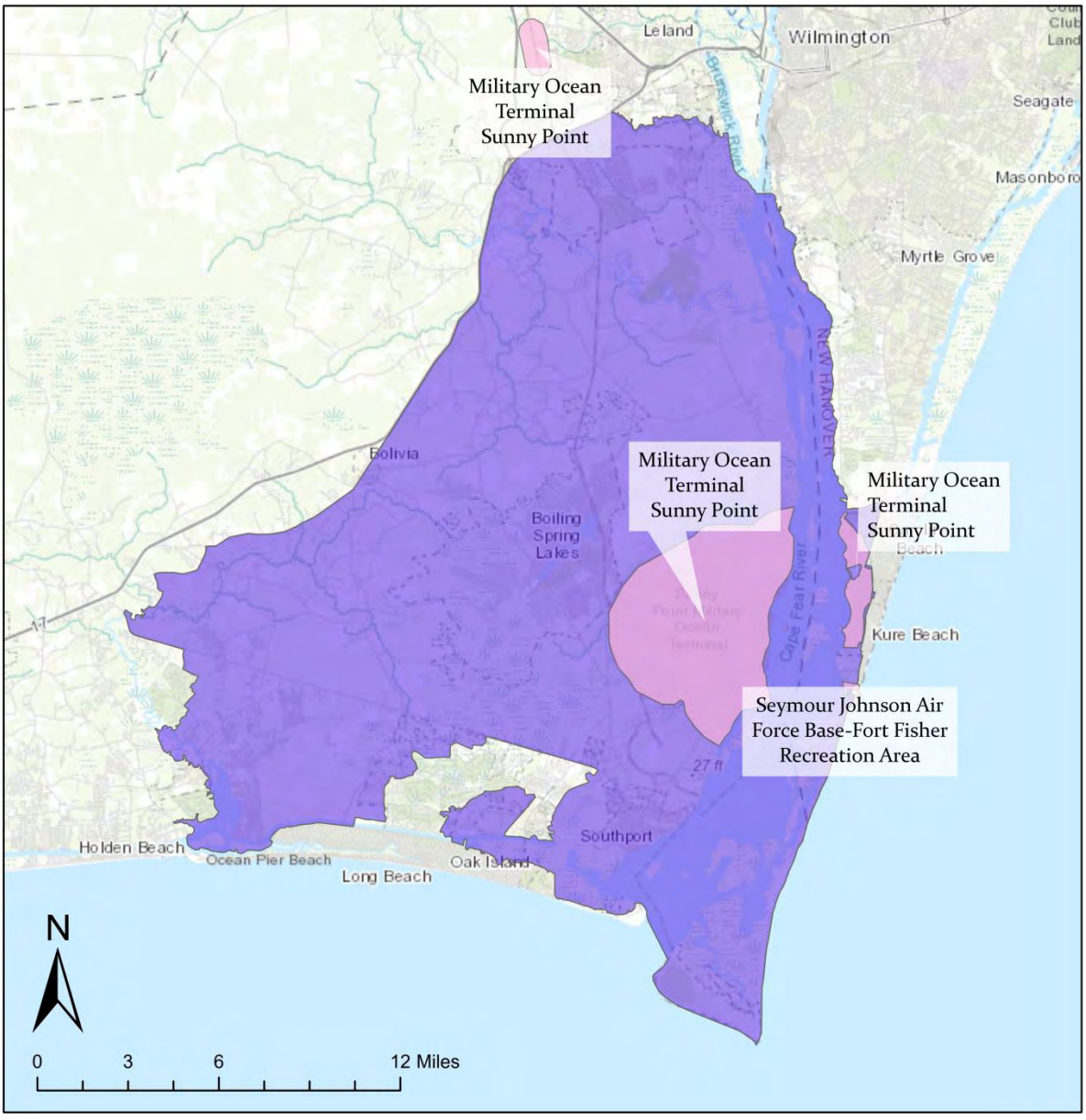
Habitat Management Recommendations:

- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions

- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in pine habitats
- Restore natural surface water and groundwater hydrology to bogs using ditch plugs or temporary dams if necessary
- Restore herbaceous vegetation in bogs using tools such as prescribed burning, low-impact mechanical removal of woody vegetation, or low-impact controlled grazing
- Restore native vegetation in between wet habitats and drier uplands

SOUTH BRUNSWICK, NORTH CAROLINA





PARCA: South Brunswick

Overlapping DoD Installations:
Military Ocean Terminal Sunny Point
Seymour Johnson Air Force Base- Fort Fisher Recreation Area

General Description: The South Brunswick PARCA encompasses an area known to support an exceptionally diverse array of habitats and associated species including the northern pinesnake, eastern chicken turtle, and gopher frog. While most of the remaining habitat in this PARCA is currently found on private property, a few small areas of high quality lands are managed with public resources. Significant potential for conservation exists in the South Brunswick PARCA.

Habitat Description: The nearly level coastal plain of the Carolina Flatwoods ecoregion was covered by shallow coastal waters during the Pleistocene, and the resultant terraces and shoreline-related landforms are covered typically by fine-loamy and coarse-loamy soils, with periodically high water tables. Other areas have clayey, sandy, or organic soils, contributing to the region's plant diversity. Carolina bays and pocosins are abundant in some areas. The region is a significant center of endemic biota, with high biological diversity and rare species. Pine flatwoods, pine savannas, freshwater marshes, pond pine woodlands, pocosins, and some sandhill communities were once common. Loblolly pine plantations are now widespread with an active forest industry. Artificial drainage for forestry and agriculture is common. North Carolina's blueberry industry is concentrated on some of the sandy, acidic soils of the region. The Carolinian Barrier Islands and Coastal Marshes ecoregion contains marshes, dunes, beaches, and barrier islands, but it tends to be slightly warmer and wetter. The maritime forests include live oak, laurel oak, loblolly pine, red cedar, yaupon holly, wax myrtle, dwarf palmetto, with cabbage palm (Sabal palmetto) in the south.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- NCWRC
- State Parks
- North Carolina Coastal Land Trust
- TNC
- DoD
- State of North Carolina

    - Clarendon Plantation
    - Davis Farm

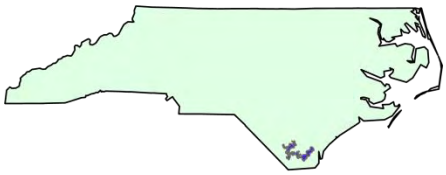
Research/ Conservation Needs:
Information Needed

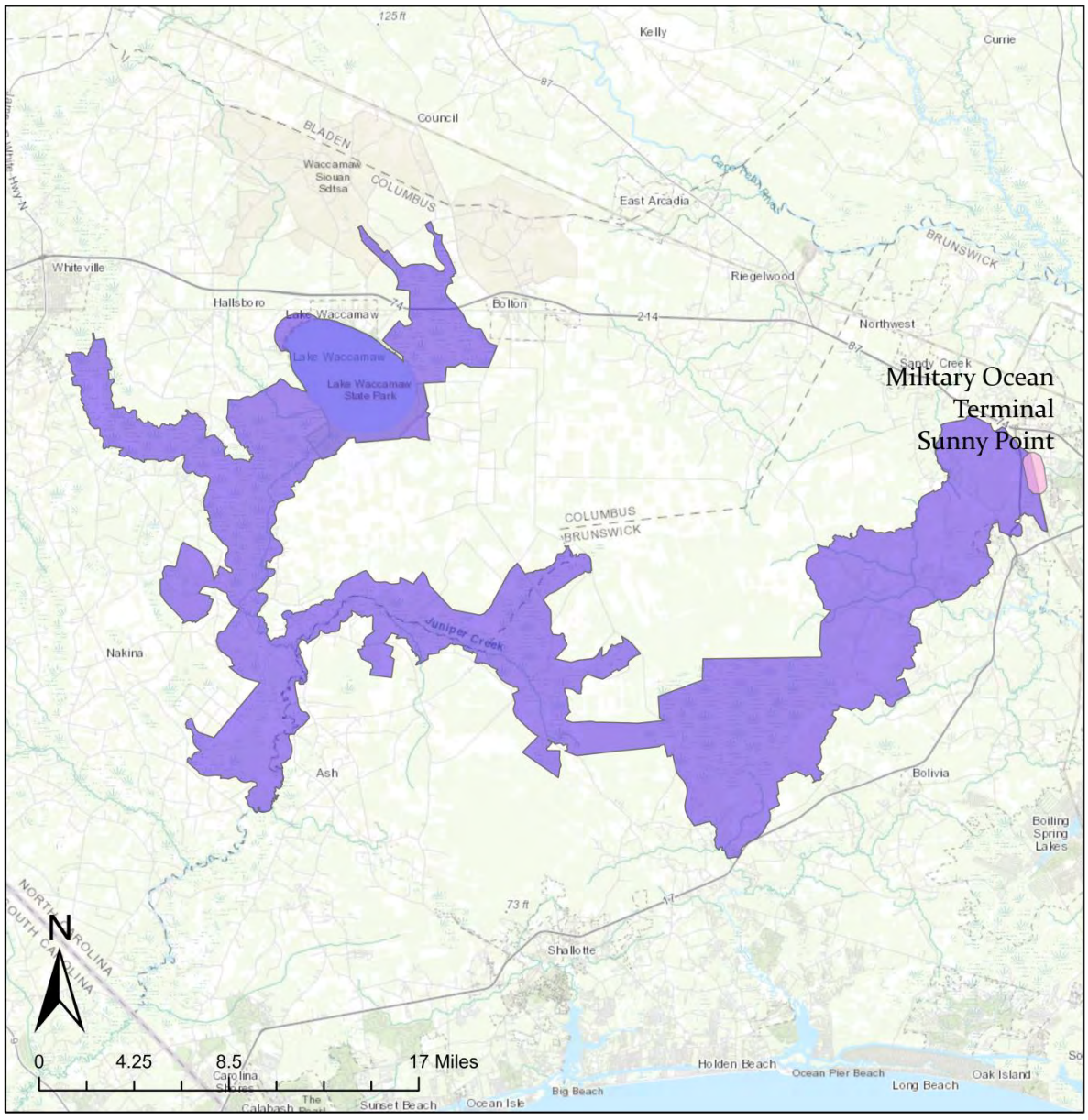
Habitat Management Recommendations:

- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists

- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate "beach re-nourishment" activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Protect and buffer any remaining natural areas on agricultural land
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Follow pesticide/fertilizer directions very carefully; use precisely where needed and minimum amounts necessary to achieve objectives
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall
- Include existing natural areas in the design of new neighborhoods
    - Identify and protect existing special habitat features such as streams, wetlands, and rock outcroppings
- Protect and maintain riparian and wetland areas in residential areas, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) in streams and wetlands
- Encourage landscaping with native species

GREEN SWAMP, NORTH CAROLINA





PARCA: Green Swamp

Overlapping DoD Installation: Military Ocean Terminal Sunny Point

General Description: Encompassing large tracts of managed habitat as well as significant areas of currently unprotected lands; the Green Swamp PARCA is known to support small populations of priority conservation species including the northern pinesnake, mimic glass lizard, eastern chicken turtle, and southern chorus frog. A high potential for conservation exists with the restoration of exceptionally large areas of currently undeveloped but highly degraded habitats.

Habitat Description: The Nonriverine Swamps and Peatlands ecoregion is characterized by flat, poorly drained areas containing organic soils of peat and muck. The dark reddish-brown to black soils, acidic and nutrient-poor, often contain logs, stumps, and other woody matter from bald cypress and Atlantic white cedar trees. Pocosin lakes occur in some areas. The vegetation of the high and low pocosins contains a dense shrub layer, along with stunted pond pine, swamp red bay, and sweet bay. Swamp forests are dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Fire during drought periods, logging, and construction of drainage ditches has affected natural vegetation patterns. Several areas of mineral and shallow organic soils have been drained and cultivated for crops of corn, soybeans, and wheat.

The Mid-Atlantic Floodplains and Low Terraces ecoregion comprises large, sluggish rivers, deep-water swamps, oxbow lakes, and alluvial deposits with abrupt textural changes. Brownwater floodplains originate in or cross the Piedmont and the sediments contain more weatherable minerals than the blackwater floodplains that have their watersheds entirely within the coastal plain. Cypress-gum swamps are common, along with bottomland hardwoods of wetland oaks, green ash, red maple, and hickories.

Focal Species:
Information Needed

Threats:
Information Needed

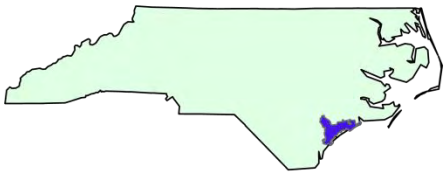
Opportunities:
- NCWRC
- State Parks
- DoD

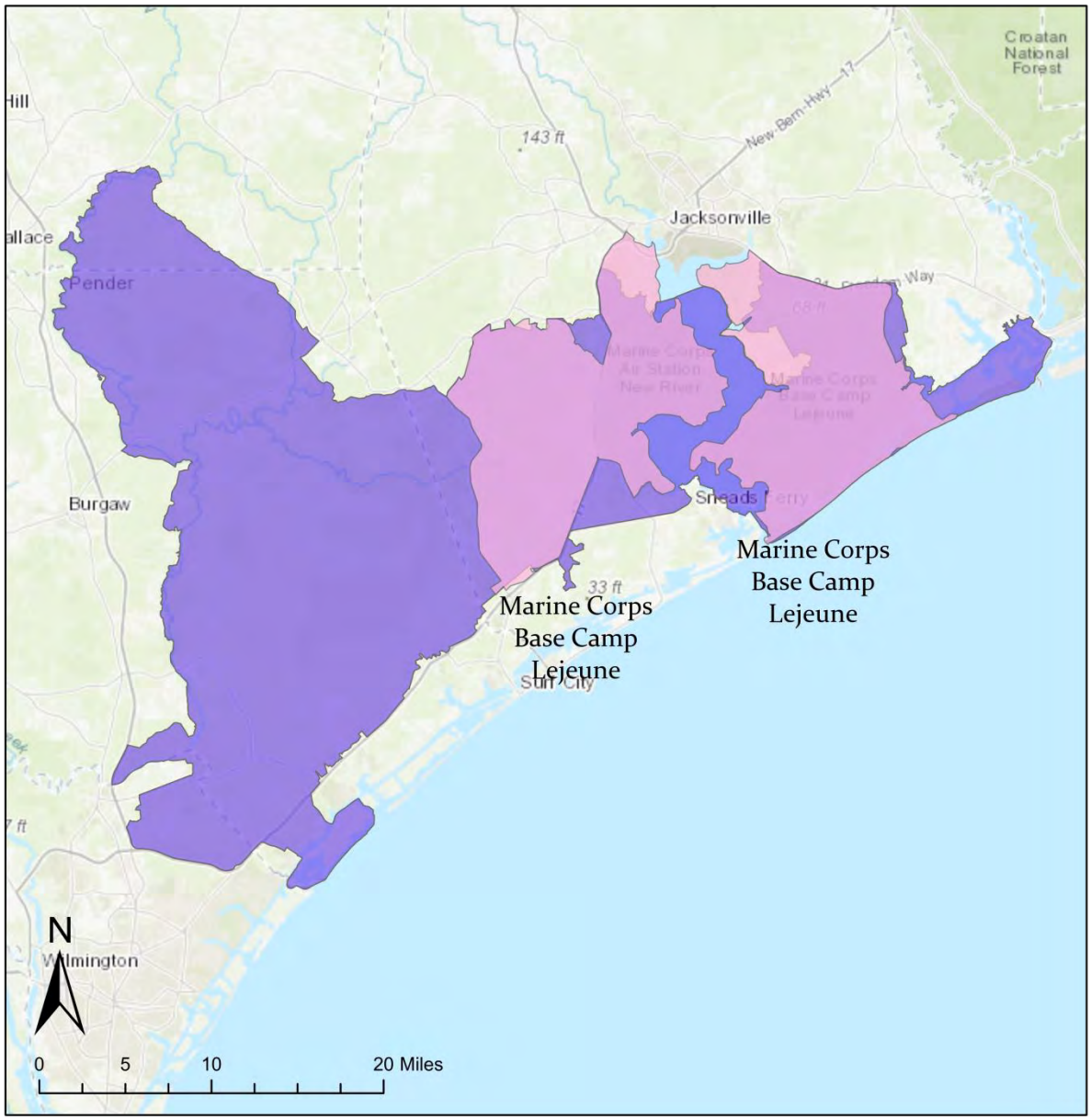
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:

- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- Favor mature hardwood stands, but maintain a mixture of forest types and ages (including some openings)
- Direct foot traffic and trails away from sensitive habitat features embedded in forests such as vernal pools, seeps, ravines, and caves
- Minimize ground disturbance in hardwood forests when possible
- Maintain and, where necessary, restore the nature fire regime to hardwood forests- some hardwood communities do benefit from infrequent burns
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands

HOLLY SHELTER, NORTH CAROLINA





PARCA: Holly Shelter

Overlapping DoD Installation: Marine Corps Base Camp Lejeune

General Description: Largely comprised of Angola Bay, Stone's Creek, and Holly Shelter game lands along with Marine Corps Base Camp Lejeune, the Holly Shelter PARCA supports an extremely high diversity of reptiles and amphibians. Additionally, although these public land holdings are near or adjacent to one another, many opportunities for unprotected land conservation exist. Focal amphibian species include gopher frog, ornate chorus frog, southern chorus frog, and oak toad. Conservation concerns regarding reptiles include the best remaining NC population of eastern diamondback rattlesnake, good populations of chicken turtle, and nesting habitat for the loggerhead sea turtle.

Habitat Description: The Carolinian Barrier Islands and Coastal Marshes ecoregion covers most of the North Carolina coast, extending from Bodie Island in the north to North Myrtle Beach, South Carolina in the south. The maritime forests include live oak, laurel oak, loblolly pine, red cedar, yaupon holly, wax myrtle, and dwarf palmetto. Pamlico Sound is a shallow estuary supporting an important nursery for 90 percent of all the commercial seafood species caught in North Carolina, as well as vast recreational fisheries. Further inland is the Chesapeake-Pamlico Lowlands and Tidal Marshes ecoregion, which occur on the lowest marine terraces with elevations ranging from sea level to about 25 feet. The region is characterized by nearly level plains with some broad shallow valleys, seasonally wet soils (Aquults), brackish and fresh streams, and broad estuaries affected by wind tides. Some major areas of cropland are found in the region, growing corn, wheat, soybeans, and potatoes.

This PARCA also contains some areas of the Nonriverine Swamps and Peatlands ecoregion, characterized by poorly drained areas containing organic soils of peat and muck. The dark reddish-brown to black soils, acidic and nutrient-poor, often contain logs, stumps, and other woody matter from bald cypress and Atlantic white cedar trees. Pocosin lakes occur in some areas. The vegetation of the high and low pocosins contains a dense shrub layer, along with stunted pond pine, swamp red bay, and sweet bay. Swamp forests are dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Fire during drought periods, logging, and construction of drainage ditches has affected natural vegetation patterns. Several areas of mineral and shallow organic soils have been drained and cultivated for crops of corn, soybeans, and wheat.

Focal Species:
Information Needed

Threats:
Information Needed

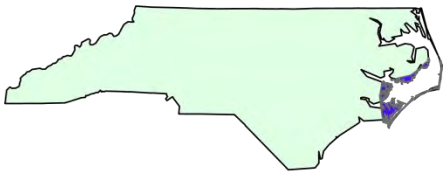
Opportunities:
- NCWRC
- North Carolina Coastal Land Trust
- TNC
- DoD

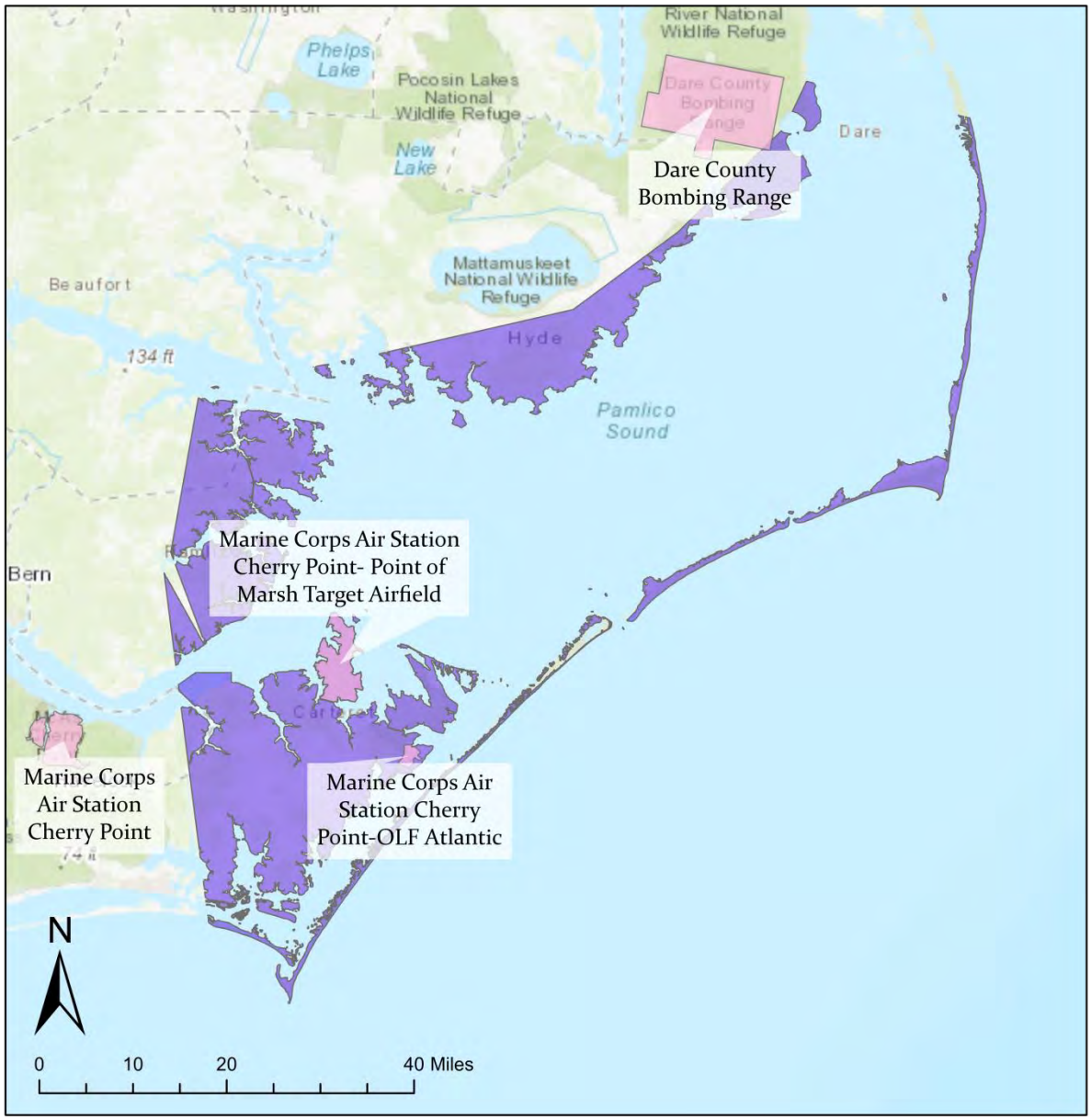
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned

    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands

PAMLICO OUTERBANKS, NORTH CAROLINA





PARCA: Pamlico Outerbanks

Overlapping DoD Installations:
Marine Corps Air Station Cherry Point- Point of Marsh Target Airfield
Marine Corps Air Station Cherry Point- Outlying Field Atlantic

General Description: The Pamlico Outerbanks PARCA covers a very large area of the Pamlico Sound along with a large landmass in the Alligator River area. This PARCA is important for many species of turtles, both freshwater and saltwater. The nesting beaches on the ocean-side in this area are not the highest density in the state, but they tend to be the coolest, hence they likely produce the least female-biased sex ratio of hatchlings. This, in turn, may become increasingly important in the face of climate change and projected warming in the region. The Pamlico Sound and adjacent creeks are "hotspots" for sea turtles, including loggerheads, Kemp's ridleys and green turtles. They are also known to support good populations of diamondback terrapins. The freshwater sites within the Pamlico PARCA support large populations of spotted turtles as well as many other species.

Habitat Description: The Carolinian Barrier Islands and Coastal Marshes ecoregion covers most of the North Carolina coast, extending from Bodie Island in the north to North Myrtle Beach, South Carolina in the south. The maritime forests include live oak, laurel oak, loblolly pine, red cedar, yaupon holly, wax myrtle, and dwarf palmetto. Pamlico Sound is a shallow estuary supporting an important nursery for 90 percent of all the commercial seafood species caught in North Carolina, as well as vast recreational fisheries. Further inland is the Chesapeake-Pamlico Lowlands and Tidal Marshes ecoregion, which occur on the lowest marine terraces with elevations ranging from sea level to about 25 feet. The region is characterized by nearly level plains with some broad shallow valleys, seasonally wet soils (Aquults), brackish and fresh streams, and broad estuaries affected by wind tides. Some major areas of cropland are found in the region, growing corn, wheat, soybeans, and potatoes.

This PARCA also contains some areas of the Nonriverine Swamps and Peatlands ecoregion, characterized by poorly drained areas containing organic soils of peat and muck. The dark reddish-brown to black soils, acidic and nutrient-poor, often contain logs, stumps, and other woody matter from bald cypress and Atlantic white cedar trees. Pocosin lakes occur in some areas. The vegetation of the high and low pocosins contains a dense shrub layer, along with stunted pond pine, swamp red bay, and sweet bay. Swamp forests are dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Fire during drought periods, logging, and construction of drainage ditches has affected natural vegetation patterns. Several areas of mineral and shallow organic soils have been drained and cultivated for crops of corn, soybeans, and wheat.

Focal Species:
Information Needed

Threats:
Information Needed

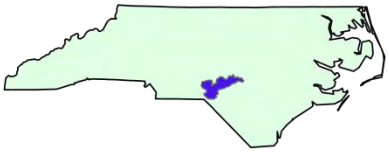
Opportunities:
- NCWRC
- NRCS
    - Wetlands Reserve Program
- USFWS
- Ducks Unlimited
- North Carolina Coastal Land Trust
- DoD
- NPS

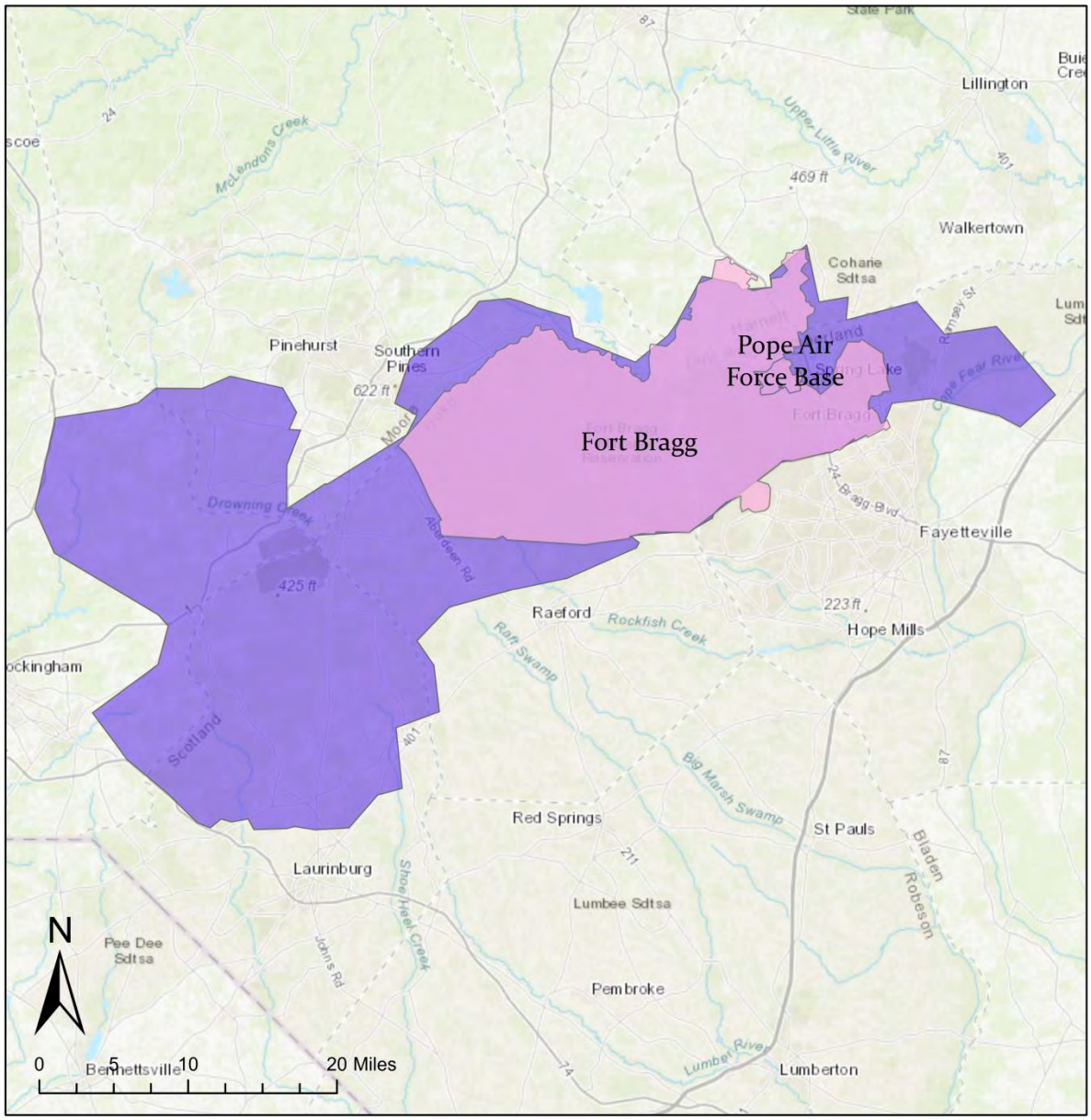
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers

    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands

SANDHILLS, NORTH CAROLINA





PARCA: Sandhills

Overlapping DoD Installations:
Fort Bragg
Pope Air Force Base

General Description: Characterized by deep, well-drained soils, the Sandhills originally supported an extensive fire maintained, longleaf pine-wire grass community. The Sandhills PARCA includes several large tracts of public land that are managed as natural habitat as well as extensive areas of buffer and possible landscape-scale habitat connectors. Priority conservation species including the southern hog-nosed snake, northern pinesnake, eastern chicken turtle, eastern tiger salamander, Pine Barrens treefrog, and gopher frog still occur in limited numbers in the Sandhills PARCA.

Habitat Description: The rolling to hilly Sand Hills ecoregion is composed primarily of Cretaceous-age marine sands and clays, capped in places with Tertiary sands, deposited over the crystalline and metamorphic rocks of the Piedmont. Many of the droughty, low-nutrient soils formed in thick beds of sand, although some soils contain more loamy and clayey horizons. Some upland areas are underlain by plinthite, and side slopes tend to have fragipans that perch water and cause lateral flow and seepage. Stream flow is consistent; streams seldom flood or dry up because of the large infiltration capacity of the sandy soil and the great ground-water storage capability of the sand aquifer. On drier sites, turkey oak and blackjack oak grow with longleaf pine and a wiregrass ground cover. Shortleaf-loblolly pine forests and other oak-pine forests are now more widespread due to fire suppression and logging. The Sand Hills are a center of rare plant diversity in the Carolinas. The region is also known for its peach orchards, golf courses, and horse farms.

Focal Species:
Information Needed

Threats:
Information Needed

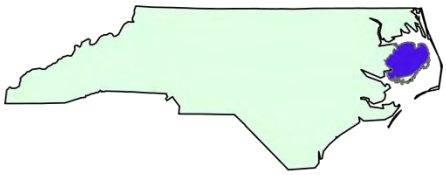
Opportunities:
- NCWRC
- DoD
- State Parks
- Sandhills Area Land Trust
- TNC

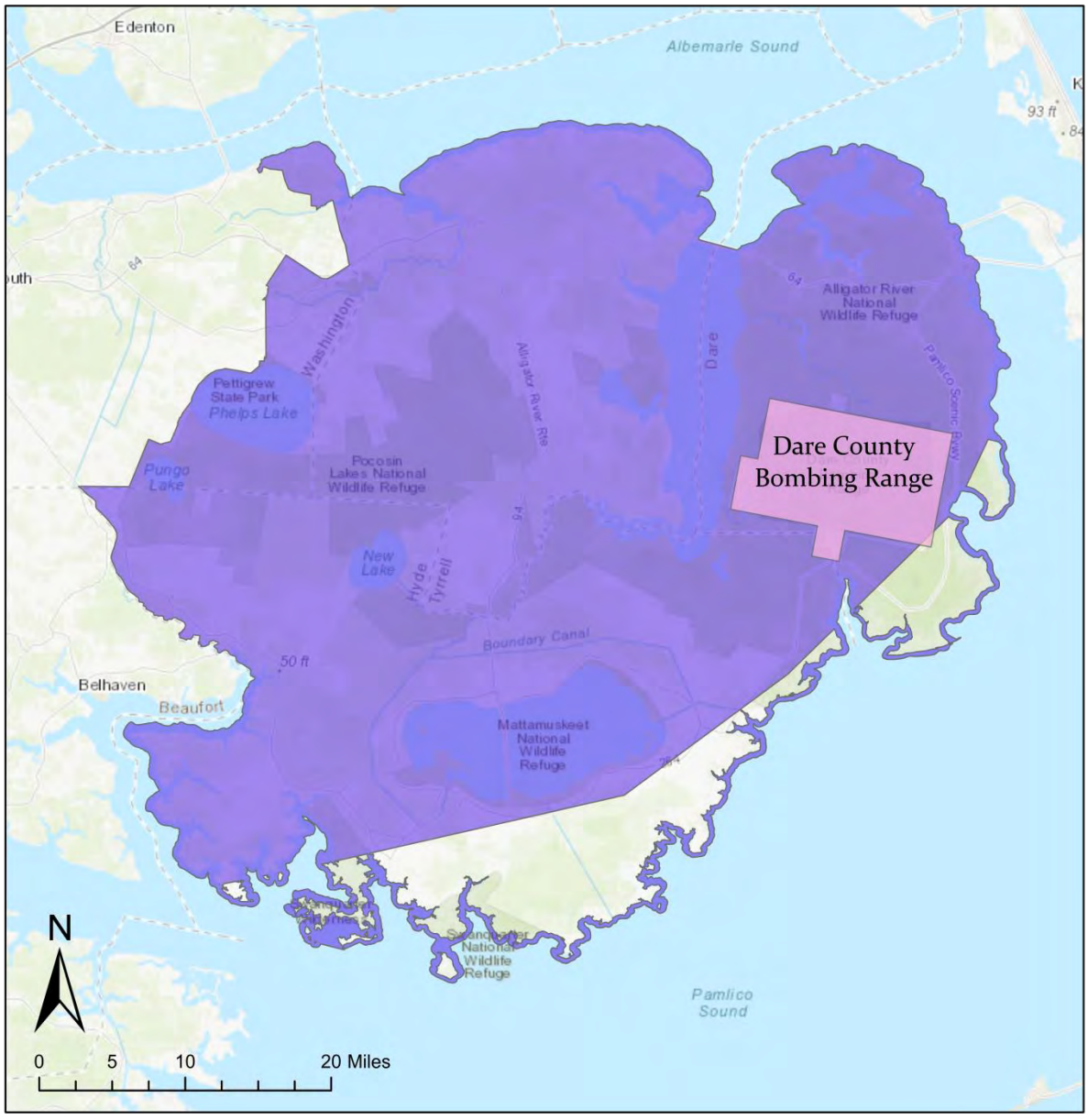
Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:

- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Protect and manage remaining mature forest stands
    - Favor mature stands, but maintain a mixture of forest types and ages (including some openings)
- Identify, maintain, and, where disrupted, restore nature fire frequency, intensity, and seasonality to forests
- Identify and retain embedded habitats in forests such as seasonal wetlands, rock outcroppings, and sandhills
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- Meet or exceed forestry and agricultural BMPs including recommendations for Streamside Management Zones (SMZs)
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes
- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- Restore or protect native stream bank vegetation and structure
- Protect and buffer any remaining natural areas on agricultural land
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Follow pesticide/fertilizer directions very carefully; use precisely where needed and minimum amounts necessary to achieve objectives
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall

PAM ALBEMARLE, NORTH CAROLINA





PARCA: Pam Albemarle

Overlapping DoD Installation: Dare County Bombing Range

General Description: The Pam Albemarle PARCA follows the flows of the Neuse and Tar Rivers. Flowing from the Piedmont to the Coastal Plain, these two long rivers make up the entire known range of the Neuse River waterdog, a salamander endemic to North Carolina. Other priority species found within this PARCA include the lesser siren and rainbow snake.

Habitat Description: The Carolinian Barrier Islands and Coastal Marshes ecoregion covers most of the North Carolina coast, extending from Bodie Island in the north to North Myrtle Beach, South Carolina in the south. The maritime forests include live oak, laurel oak, loblolly pine, red cedar, yaupon holly, wax myrtle, and dwarf palmetto. Pamlico Sound is a shallow estuary supporting an important nursery for 90 percent of all the commercial seafood species caught in North Carolina, as well as vast recreational fisheries. Further inland is the Chesapeake-Pamlico Lowlands and Tidal Marshes ecoregion, which occur on the lowest marine terraces with elevations ranging from sea level to about 25 feet. The region is characterized by nearly level plains with some broad shallow valleys, seasonally wet soils (Aquults), brackish and fresh streams, and broad estuaries affected by wind tides. Some major areas of cropland are found in the region, growing corn, wheat, soybeans, and potatoes. Lake Mattamuskeet, the largest natural lake in North Carolina, provides valuable wintering areas for geese, swans, ducks, and other birds.

This PARCA also contains some areas of the Nonriverine Swamps and Peatlands ecoregion, characterized by poorly drained areas containing organic soils of peat and muck. The dark reddish-brown to black soils, acidic and nutrient-poor, often contain logs, stumps, and other woody matter from bald cypress and Atlantic white cedar trees. Pocosin lakes occur in some areas. The vegetation of the high and low pocosins contains a dense shrub layer, along with stunted pond pine, swamp red bay, and sweet bay. Swamp forests are dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Fire during drought periods, logging, and construction of drainage ditches has affected natural vegetation patterns. Several areas of mineral and shallow organic soils have been drained and cultivated for crops of corn, soybeans, and wheat.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:

- NCWRC
- USFWS
- DoD
- State Parks
- Ducks Unlimited
- TNC
- NRCS
    - Wetlands Reserve Program

Research/ Conservation Needs:

Information Needed

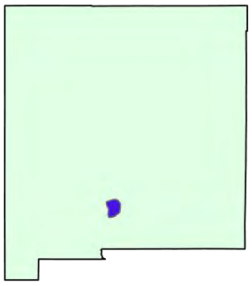
Habitat Management Recommendations:

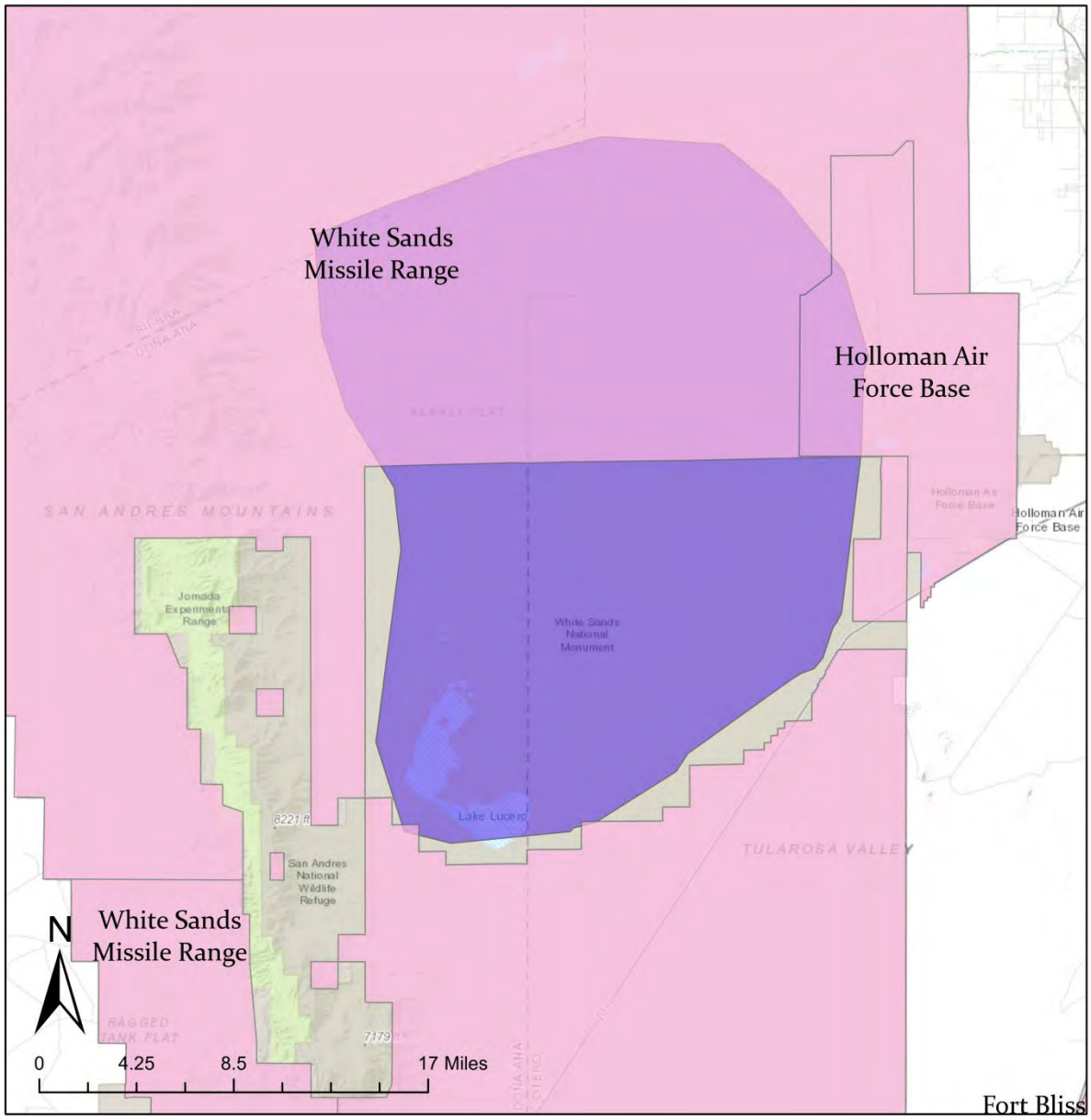
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes
- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season

- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- Protect and buffer any remaining natural areas on agricultural land
    - Develop naturally vegetated corridors between habitat fragments
- Consider restoring natural hydrology to drained wetlands on agricultural land
- Avoid overgrazing and keep livestock out of wetlands
- Follow pesticide/fertilizer directions very carefully; use precisely where needed and minimum amounts necessary to achieve objectives
- Avoid mowing wetlands, shorelines, and ditches mid-spring through mid-fall

New Mexico

WHITE SANDS, NEW MEXICO





PARCA: White Sands

Overlapping DoD Installations:
White Sands Missile Range
Holloman Air Force Base

General Description: The boundary for this small PARCA is essentially the White Sands National Monument, located in the Tularosa Basin over parts of Sierra, Otero, and Dona Ana Counties.

Habitat Description: The habitat of this area is white gypsum sand dunes. Dunes are separated by grasses, rabbitbrush, and various yuccas.

Focal Species: This small area has several instances of species that have adapted to the white sands by taking on pale forms themselves. Examples include the Little White Whiptail, (*Aspidoscelis inornata gypsi*) or the local bleached form of the Common Lesser Earless Lizard, the Bleached Earless Lizard (*Holbrookia maculata ruthveni*).

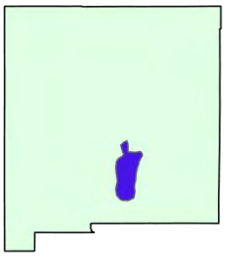
Threats: Few beyond occasional recreational activities.

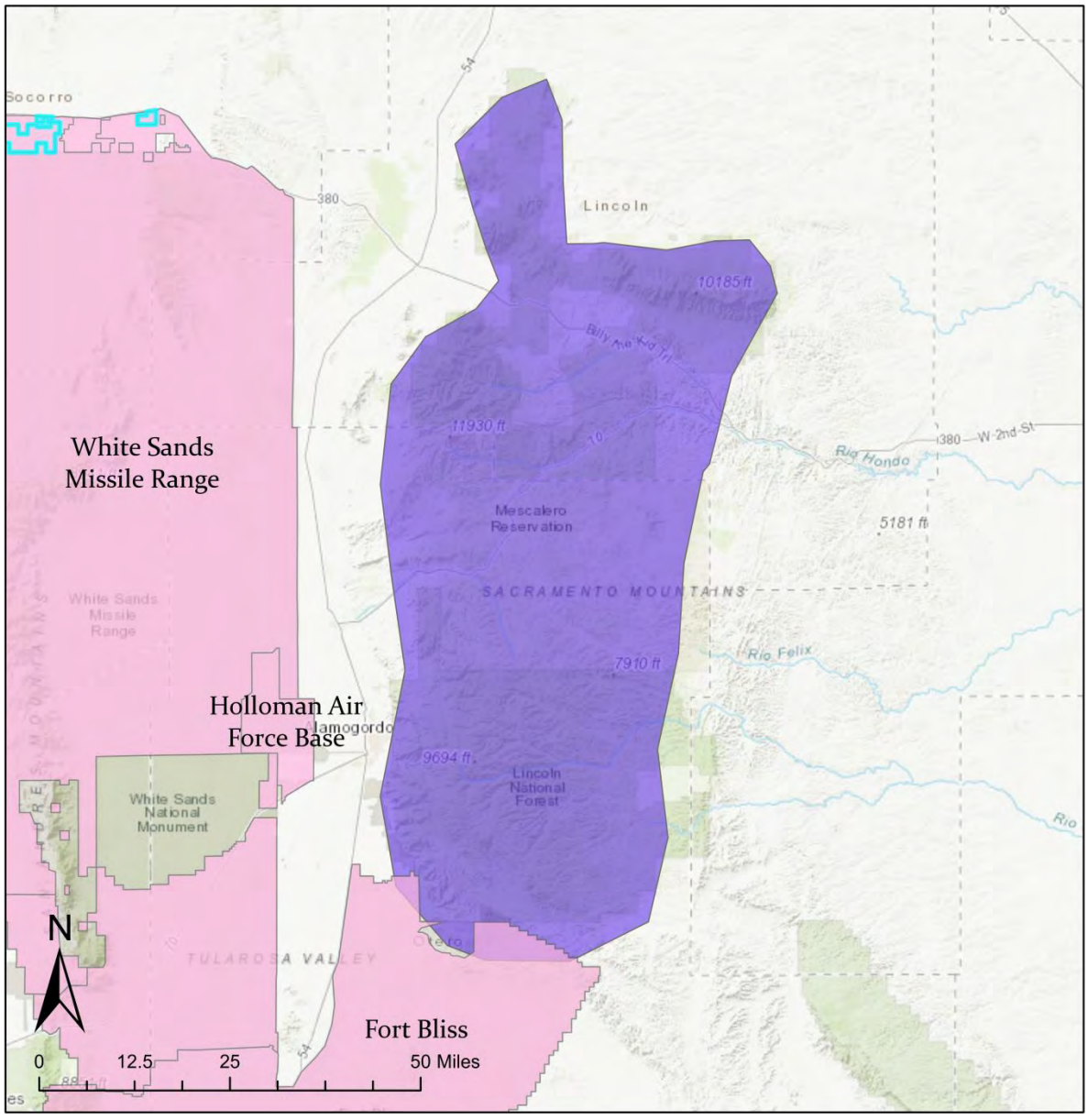
Opportunities: The white sand dunes habitat is managed either by the White Sands National Monument or the adjoining White Sands Missile Range.

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations: Few, as this habitat is managed as a national monument. One consideration is to monitor the impact of recreational activity on the habitat and its herpetofauna.

SACRAMENTO MOUNTAINS, NEW MEXICO





PARCA: Sacramento Mountains

Overlapping DoD Installation: Fort Bliss

General Description: The Sacramento Mountains PARCA is found in south-central New Mexico in the northern Sacramento Mountains. Most of the PARCA is mid to upper elevation. Climates are mid-latitude steppe and subarctic. Temperatures range from 3-19 ^{o}C (37-66 ^{0}F) with half of the annual precipitation occurring from December through March as rain or snow.

Habitat Description: Vegetation consists of chaparral at lower elevations, pinyon-juniper and oak woodlands at mid-elevations, and coniferous forests of ponderosa pine and Douglas fir at higher elevations.

Focal Species:

- Reptiles
    - Smooth Greensnake (*Opheodrys vernalis*)
- Amphibians
    - Sacramento Mountains Salamander (*Aneides hardii*)

Threats:

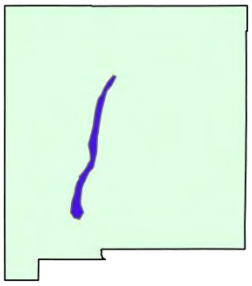
- Wildfire
- Logging activities
- Recreational activities

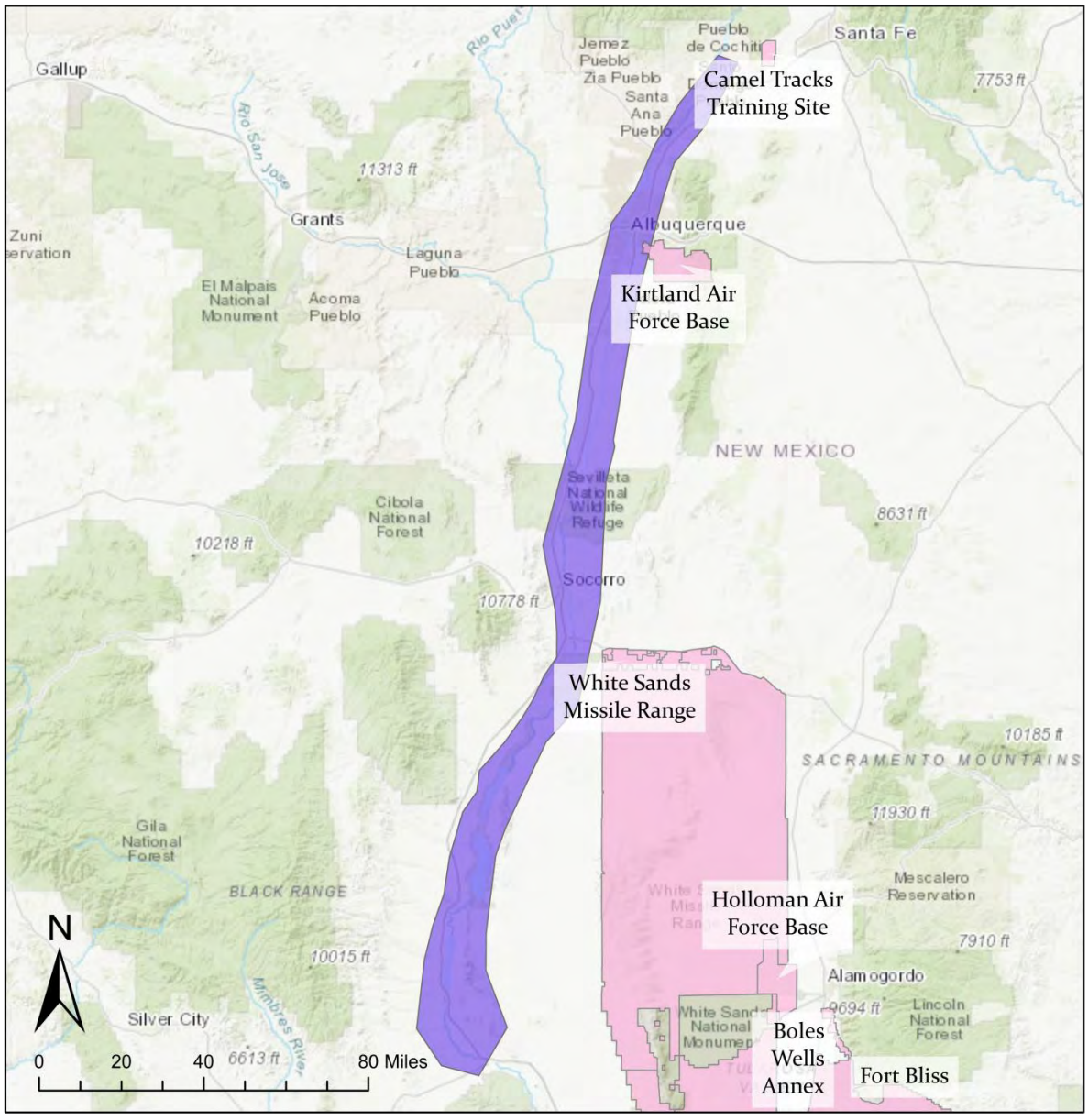
Opportunities: Most land is managed by the US Forest Service.

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations: Collaborate with US Forest Service to improve forest conditions through thinning projects to reduce wildfire.

MIDDLE RIO GRANDE, NEW MEXICO





PARCA: Middle Rio Grande

Overlapping DoD Installation: Kirtland Air Force Base

General Description: This PARCA follows the Rio Grande Valley in central New Mexico from Cochiti Reservoir in Sandoval County south to Caballo Reservoir in Sierra County.

Habitat Description: While most of the PARCA is found within the Chihuahuan Desert ecoregion, the PARCA is patchwork of habitats, including a river system that ranges between fast flowing to virtually non-existent. South of Cochiti Reservoir are two more reservoirs, including the massive Elephant Butte Reservoir. Canals, mainly for use by agriculture also line the fields and both the New Mexico Department of Game and Fish and US Fish and Wildlife Service maintain wildlife refuges that include marshes and ponds. Adjoining riparian zones include Southwest Riparian Forests, composed of broadleaved deciduous trees such as Fremont cottonwood (*Populus fremontii)* and Rio Grande cottonwood (*P. deltoides* var. *wislizenii*) and Introduced Riparian Vegetation, dominated by Russian olive (*Elaeagnus angustifolia)* and saltcedar (*Tamarix ramosissima).* Agricultural and urban habitat is found along this PARCA as well.

Focal Species:

- Reptiles
    - Big Bend Slider (*Trachemys gaigeae gaigeae*)
- Amphibians
    - Northern Leopard Frog (*Lithobates pipiens*)

Threats:

- Habitat loss or alteration
- Recreational activity
- Loss or alteration of native water flows
- Pollution
- Invasive species
    - Release of unwanted pets such as pond sliders, box turtles, and non-native snapping turtles (although the species is native to the area); see “Other Comments” section for more information
- Disease
- Tamarisk beetle

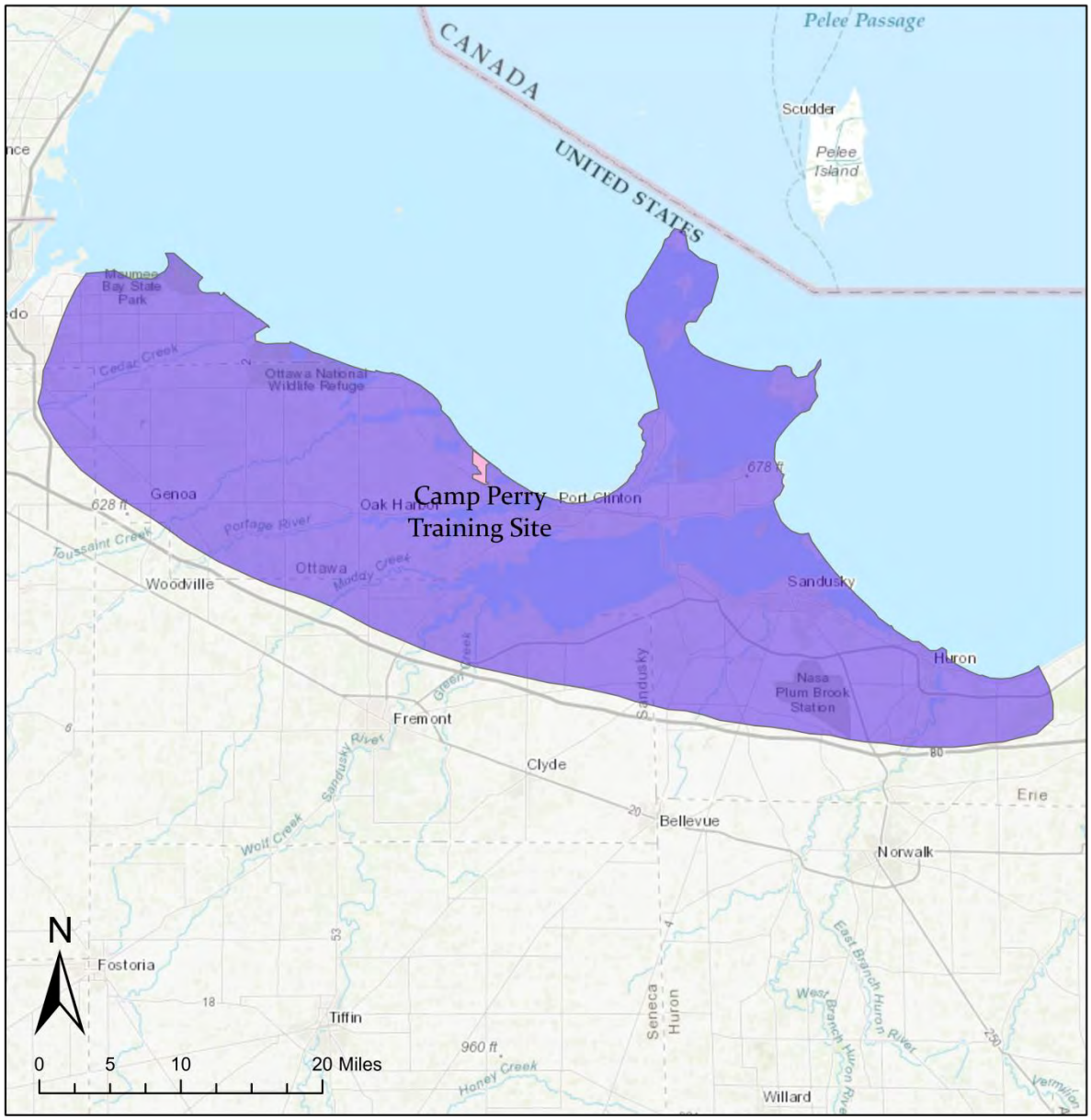
Opportunities: Although large portions of this PARCA are privately-owned, many areas are managed by the US Fish and Wildlife, US Army Corps of Engineers, NM Dept. of Game and Fish, and NM State Parks.

Habitat Management Recommendations: Collaborate with stakeholders to restore native riparian habitats as well as natural water regimes.

Other Comments: Given its proximity to the largest city in the state of New Mexico, the Rio Grande PARCA suffers from the release of unwanted pets. This is very prevalent in turtles, where the release of pond sliders (*Trachemys scripta*), which are not native to the system, are a massive threat to the native Big Bend slider. Box turtles are routinely translocated and, while the species is native to this PARCA, release of non-native snapping turtles (*Chelydra serpentina*) is a growing concern.

Ohio

WESTERN LAKE ERIE BASIN, OHIO



PARCA: Western Lake Erie Basin

Overlapping DoD Installation: Camp Perry Training Site

General Description: The Western Lake Erie Basin starts at the north end near Edison Woods by Toledo and follows south along the Lake Erie shoreline, covering the Lake Erie Islands and Marblehead Peninsula, ending just east of Huron. The Western Lake Erie Basin is situated in a rapidly developing area of the Great Lakes, where development in the form of marinas, homes, industries continues to occur. Wetlands have been encroached upon through this development. This area is heavily farmed, with many wetland areas being converted for agricultural production.

The Western Lake Erie Basin includes the publicly managed lands of the Ottawa National Wildlife Refuge (9,000 acres) and numerous Ohio Department of Natural Resources (ODNR) Division of Wildlife (DOW) - owned properties (Pipe Creek, Pickerel Creek, Willow Point, Little Portage, Toussaint Creek, Metzger Marsh, Magee Marsh, and Mallard Club - 9,758 acres). There are also many opportunities for wetland and upland habitat restoration, enhancement and/or preservation on private lands within this area.

Habitat Description: The Western Lake Erie Basin is found within the Lake Plains physiographic region of Ohio. Limestone and dolomite underlie a large portion of the area including the islands which range in size from 0.5 - 4261 ha. The forests consist of mixed oak and sugar maple, with permanent wetland remnants located along Lake Erie coast. The watershed of the Western Lake Erie Basin has areas of intensive row crop agriculture. Development pressures in the area have also had a detrimental impact on habitat resources. Over time, these land use changes within the Western Lake Erie Basin have led to detrimental effects on the water quality in Lake Erie. Continued partnerships and development of new partnerships within the Western Lake Erie Basin, to target restoration, enhancement and/or preservation of important habitat that will benefit water quality and provide crucial habitat for focal species is imperative.

Focal Species:

- Reptiles
    - Lake Erie Watersnake (*Nerodia sipedon insularum*), only found within this region
    - Eastern Foxsnake (*Pantherophis vulpinus*)
    - Kirtland's Snake (*Clonophis kirtlandii*)
    - Blanding's Turtle (*Emydoidea blandingii*)
- Amphibians
    - Unisexual Ambystoma (*Ambystoma* spp.)
    - Eastern Cricket Frog (*Acris crepitans*)

Threats:

- Habitat loss and fragmentation
- Intensive row crop agriculture
- Development pressures
- Human persecution
- Invasive species
- Snake Fungal Disease (SFD)

Opportunities:

- Long term monitoring and conservation for Lake Erie watersnakes and other snakes on the islands has been continuous since 2000
- Stone Laboratory - Ohio State University (OSU) Biological Field Station on South Bass - supports many courses, workshops, researchers and provides many herpetofaunal outreach opportunities
- Working through partnerships with USFWS Partners for Fish and Wildlife Program and ODNR Division of Wildlife private lands program to target restoration and enhancement of critical habitat that will benefit water quality and provide crucial habitat for focal species
- Current partnership with Great Lakes Fish & Wildlife Restoration Act (GLFWRA) funding (partners include regional 3-state partnership - OH, MI & IN: Ducks Unlimited (DU), USFWS & DNR in each state, and OH Ottawa Soil and Water Conservation District (SWCD)) to conduct wetland and upland habitat restoration within the Western Lake Erie Basin (WLEB), targeting restoration and enhancement of critical habitat that will benefit water quality and provide crucial habitat for focal species
- USDA NRCS programs within WLEB
- TNC
- Pheasants Forever (PF)/ Quail Forever (QF)

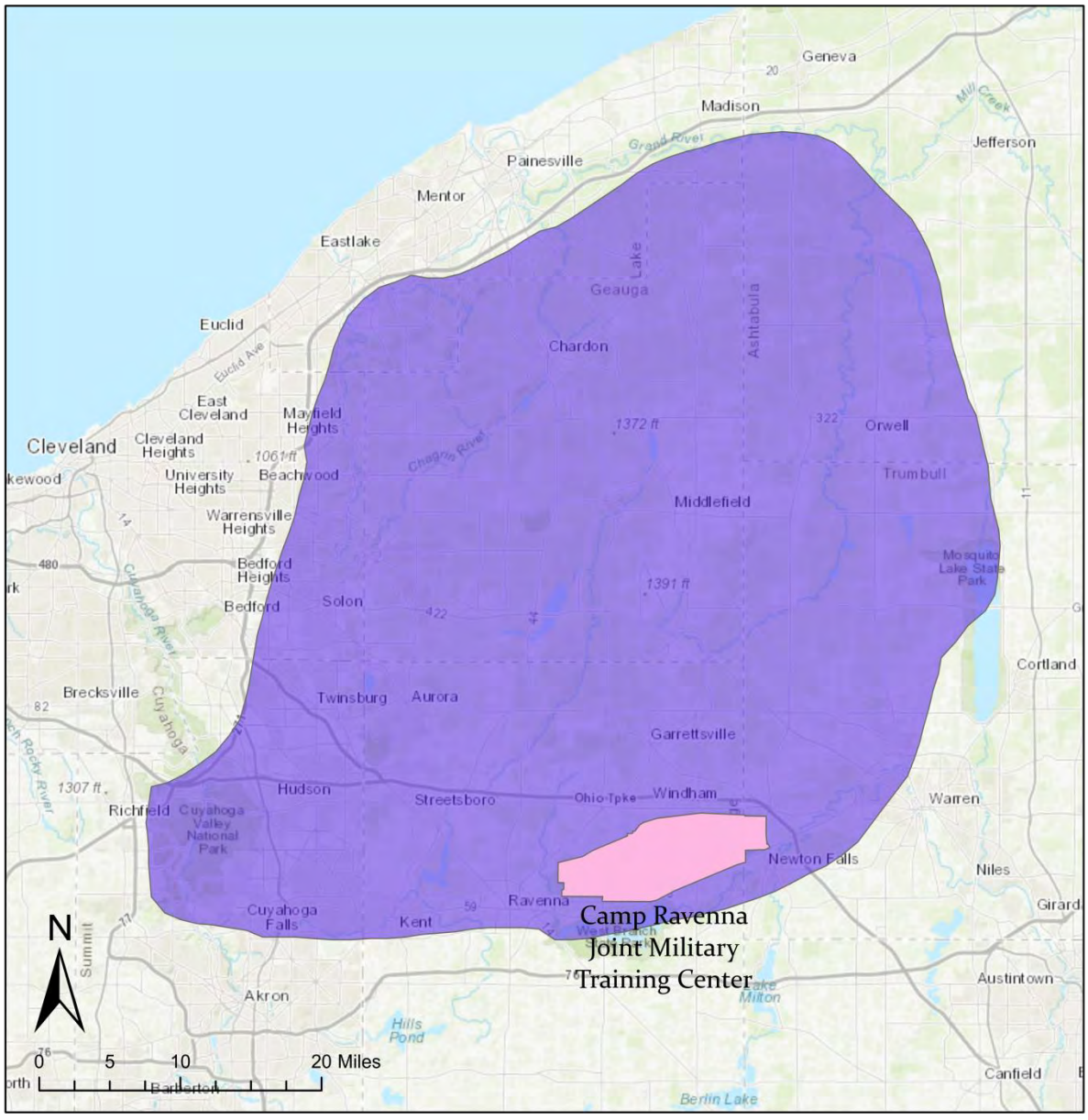
Research/ Conservation Needs:

Information Needed

Habitat Management Recommendations:

- Restoration and/or protection of wetlands
- Increase connectivity between wetland and upland habitats
- Invasive species control/removal
- Promote USFWS Partners for Fish and Wildlife (PFW) & ODNR DOW private lands programs to private property owners
- Promote USDA Farm Bill programs to private property owners
- Promote USDA Lake Erie Conservation Reserve Enhancement Program (CREP) to private property owners

NORTHEAST OHIO GLACIAL WETLANDS, OHIO



PARCA: Northeast Ohio Glacial Wetlands

Overlapping DoD Installation: Camp Ravenna Joint Military Training Center

General Description: The Northeast Ohio Glacial Wetlands PARCA is in the northeast corner of Ohio and encompasses the Cuyahoga Valley National Park, the Ravenna Training and Logistics Site, as well as multiple state parks. The whole PARCA is glaciated, and falls within four ecoregions: the Mosquito Creek/ Pymatuning Lowlands, Low Lime Drift Plain, Erie Gorges, and Summit Interlobate Area.

The Mosquito Creek/ Pymatuning Lowlands are characterized by level to rolling lake and glacial till plains with flat-bottomed valleys, end moraines, and wetlands. Low-gradient, sluggish streams with few riffles occur. The Low Lime Drift Plain ecoregion is characterized by rolling plains with low rounded hills, gentle slopes, and broad valleys; end moraines and outwash landforms occur locally. The Erie Gorges ecoregion is a very dissected area of high relief, steep slopes, and rocky outcrops. Gorges occur along the Cuyahoga, Chagrin, and Grand rivers where erosion rates are high. The Summit Interlobate Area ecoregion is a glaciated plain with numerous kames, kettles, lakes, bogs, deranged stream networks, and sluggish streams.

Habitat Description: The Mosquito Creek/ Pymatuning Lowlands have natural vegetation of dominantly beech forest with mixed mesophytic forest, elm-ash swamp forests, and sphagnum peat bogs. The land use in this area includes dairy and feed crop farming, sugar maple-red oak forests, hemlock swamp forests, and natural gas production. The Low Lime Drift Plain ecoregion's vegetation is mixed mesophytic forest, mixed oak forest, beech forest, oak-sugar maple forest, as well as elm-ash swamp forests. Land use includes dairy, livestock, and crop farming; urban and industrial activity; sugar maple-red oak woodlands; gas wells; and coal mining. The Erie Gorges ecoregion has mixed mesophytic forest. While land use in this area is mostly woodland, there are also recreational developments, public land, scattered farms, and residential areas with some urban industrial activity on fringe. The vegetation of the Summit Interlobate region is mostly mixed oak forests (on sandy soils), mixed mesophytic forest, oak-sugar maple forest (on soils derived from glacial till), and extensive sphagnum peat bogs. The land use in this area includes residential-urban-industrial activity, dairy and feed crop farming, and extensive gravel mining.

Focal Species:

- Reptiles
    - Rough Greensnake (*Opheodrys aestivus*)
    - Eastern Foxsnake (*Pantherophis vulpinus*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Spotted Turtle (*Clemmys guttata*)

- Amphibians
    - Western Chorus Frog (*Pseudacris triseriata*)
    - Red Salamander (*Pseudotriton ruber*)
    - Spring Salamander (*Gyrinophilus porphyriticus*)
    - Blue-Spotted Salamander (*Ambystoma laterale*)
    - Marbled Salamander (*Ambystoma opacum*)
    - Small-mouthed Salamander (*Ambystoma texanum*)
    - Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*)
    - Unisexual Ambystoma (*Ambystoma spp.*)
    - Northern Dusky Salamander (*Desmognathus fuscus*)

Threats:
Information Needed

Opportunities:
- Ohio Department of Natural Resources (ODNR)
- NPS
- DoD
- Western Reserve Land Conservancy
- NRCS
    - Wetlands Reserve Program
- State Parks
- Portage County Commissioners
    - Clean Ohio Farmland
- Cleveland Museum of Natural History
- The Holden Arboretum
- Lake Metroparks

Research/ Conservation Needs:
Information Needed

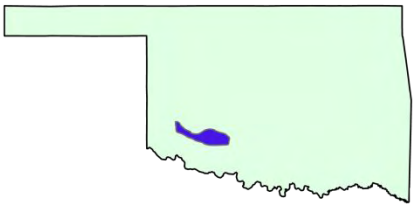
Habitat Management Recommendations:
- Where possible, avoid filling, draining, ditching, damming, and excessive groundwater withdrawal in and around wet meadows, bogs, and fens
- Control woody plant encroachment and succession in bogs and fens
- Maintain native hydrology of wetlands and prevent unnatural drainage
    - Restore basins and hydrological cycles by removing fill, filling ditches, and breaking substrate drainage tiles
- Maintain connectivity among wetlands with natural terrestrial habitats

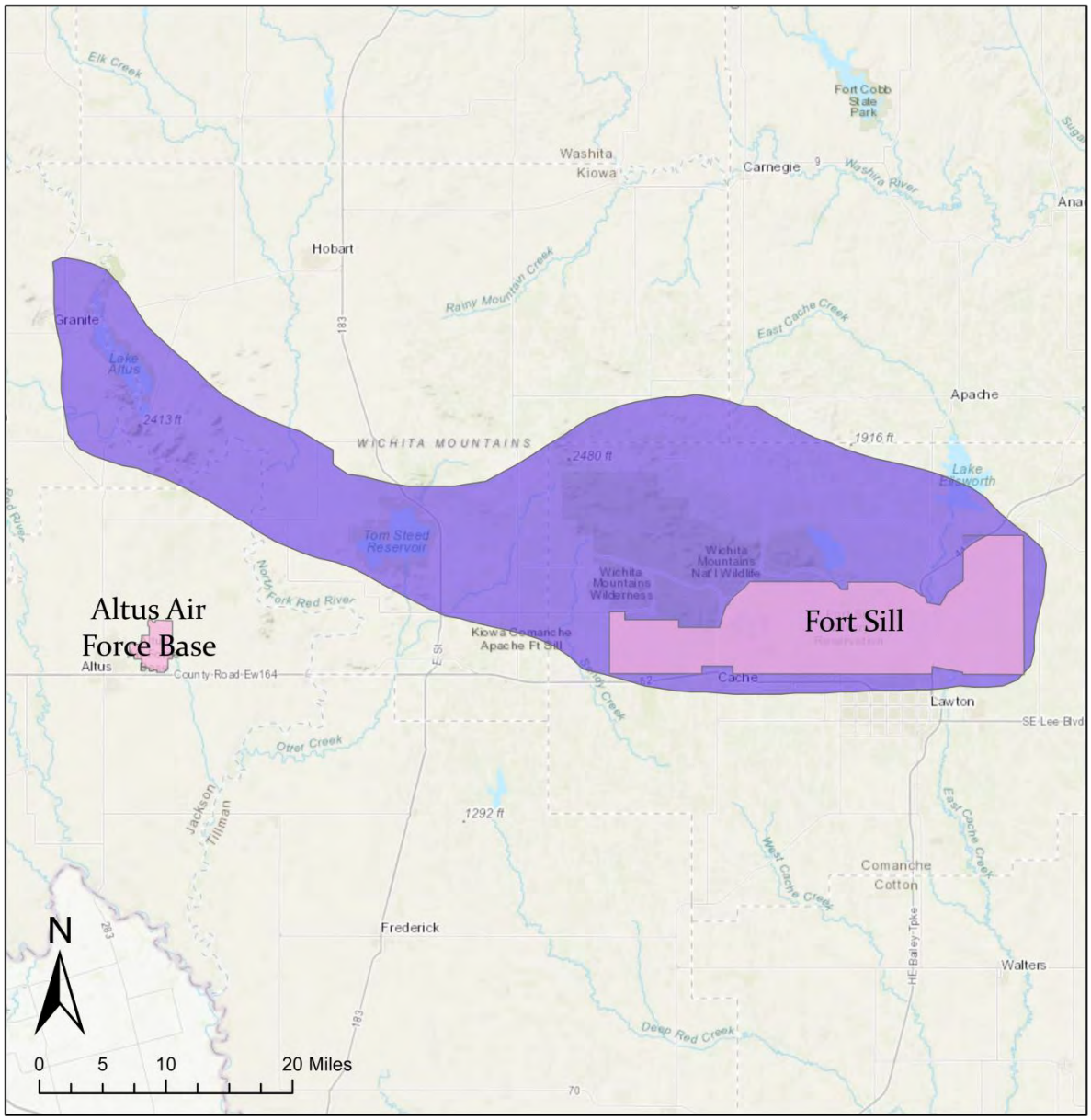
- Meet or exceed forestry and agricultural Best Management Practices and Streamside Management Zones
- Restore natural shoreline habitat in permanent wetlands and streams (e.g. remove retaining walls, rip rap)
- When possible, exclude or limit livestock access to stream, spring, and seepage habitats
- Protect and buffer natural areas in agricultural landscapes
    - If necessary, develop naturally vegetated corridors between habitat fragments
- If possible, avoid mowing wetlands, shorelines, and ditches from mid-spring through mid-fall. When mowing fields, raise deck height to at least 8 inches
- Rotate livestock frequently in order to retain groundcover vegetation as habitat for amphibians and reptiles
- Encourage conservation tillage in agricultural lands if they are located near forested areas containing isolated, seasonal wetlands
- Use native species wood chip berms, hay bales, and staggered siltation fencing for erosion control in areas surrounding wetlands and their terrestrial buffers
- Minimize or eliminate agricultural, industrial, and residential contaminants, nutrients, sediments, and silt in watersheds containing springs and headwater streams
    - Control runoff and production of these various forms of pollution
    - Restrict activities upstream that could introduce contaminants downstream (e.g. mining)
- Provide upland forested buffer habitat along streams' riparian zone
- Avoid clearing or replacing natural vegetation along stream edges
- Retain natural stream channel undulations, backwater areas, and floodplains
- Maintain or restore native forest cover
- Maintain or restore downed woody debris on forest floor
- Give special consideration to unique habitat features within the forest, such as ephemeral wetlands, springs, seepages, and rock outcrops
- Ensure that forest floor structure is maintained in as natural of a state as possible
- Minimize or eliminate barriers to dispersal across the landscape between forest fragments
    - Leave or add windbreaks and hedgerows
- Include existing natural areas in the design and planning of new neighborhoods
- Identify and protect existing special habitat features such as streams, wetlands, rock walls, and rock outcropping
- Consider protection of wetlands, stream corridors, and representative terrestrial habitats during the planning process before development permits are issued
- Protect and maintain riparian and wetland areas, including the maintenance of pre-development hydrological regimes (depth, duration, and frequency of flooding) of streams and wetlands
- Control subsidized predator populations

- Identify or create breeding habitats with associated upland habitat and corridors to connect them. Include road crossings (culverts, ecopassages) where feasible. Use signs in the vicinity of known migration routes
- Encourage and support public education about the functions and values of wildlife

Oklahoma

WICHITA MOUNTAINS, OKLAHOMA





PARCA: Wichita Mountains

Overlapping DoD Installation: Fort Sill

General Description: The Wichita Mountains Wildlife Refuge, Quartz Mountain, Altus Lake, Mountain Park WMA, Great Plains State Park, and Fort Sill (Comanche, Kiowa, Greer, Caddo Co.) all fall within the Wichita Mountains PARCA. The PARCA encompasses the entire Wichita Mountains- an ancient, granite mountain range. A large portion of the region is federally owned by either the US Fish and Wildlife Service (Wichita Mountains Wildlife Refuge) or the Department of Defense (Fort Sill). The rest is privately owned. Areas between granite outcrops are managed either as rangeland or crop fields (primarily winter wheat).

Habitat Description: The most important conservation landscapes within this region are limestone caves, springs, white oak/hickory mesic forest, gravel-bottom streams and associated riparian forests, and herbaceous wetlands. Other important landscapes include shortleaf pine/oak-hickory woodlands, oak/hickory bottomland hardwood forest, post oak/blackjack oak – hickory woodlands and forests, small rivers, and tallgrass prairie. The most common land cover types of the Ozarks Region include post oak/blackjack oak – hickory woodlands and forests and pasture/prairie. White oak/hickory mesic forest also covers significant area, whereas all other types account for 5% or less of the region.

Focal Species:

- Reptiles
    - Ouachita Map Turtle (*Graptemys ouachitensis*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Southern Prairie Skink (*Plestiodon septentrionalis obtusirostris*)
    - Western Diamond-backed Rattlesnake (*Crotalus atrox*)
    - Western Massasauga (*Sistrurus tergeminus*)
    - Plains Hog-nosed Snake (*Heterodon nasicus*)
    - Texas Long-nosed Snake (*Rhinocheilus lecontei tessellatus*)
    - Kansas Glossy Snake (*Arizona elegans elegans*)
- Amphibians
    - Barred Tiger Salamander (*Ambystoma mavortium mavortium*)
    - Chihuahuan Green Toad (*Anaxyrus debilis*)
    - Strecker's Chorus Frog (*Pseudacris streckeri*)

Threats:

- Energy development (wind farms, petroleum, gas)
- Traffic
- Roads

- Fragmentation
- Water quality
- Fort Sill fragmentation
- Farmland and rangeland between the two mountainous portions of the PARCA
- Poaching for rattlesnake roundups
- Invasive species: cedar, feral hogs
- Fire suppression leading to forest thickening
- Issues with bison or longhorn on refuge land
- Tourism
- Disease
    - Wichita Mountains WR: Bd= 85% infected, RV= 13% infected
    - Mountain Park WMA: Bd= 6% infected, RV= 0% infected
    - Great Plains State Park: Bd= 0% infected, RV= 20% infected

Opportunities:

- FWS
- DoD
- Friends of the Wichitas
- Medicine Park Aquarium
- Comanche Nation
- Farm Service Agency (FSA)
- NRCS
- Wind development mitigation
- ODWC
- Bureau of Reclamation
- Quartz Mountain Resort
- OK Arts Institute at Quartz Mountain
- Cameron University
- City of Lawton
- Kiowa Tribe of Oklahoma
- Apache Tribe of Oklahoma
- ODOT
- OTA

Research/ Conservation Needs:

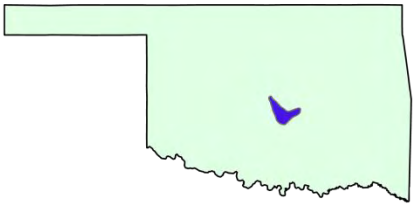
- Species assessments: barred tiger salamander, Chihuahuan green toad, Texas long-nosed snake, plains blind snake, Texas horned lizard, western diamond-backed rattlesnake, prairie rattlesnake, Strecker's chorus frog, Kansas glossy snake, massasauga
- Restoration of native prairie from exotic grasses or cropland

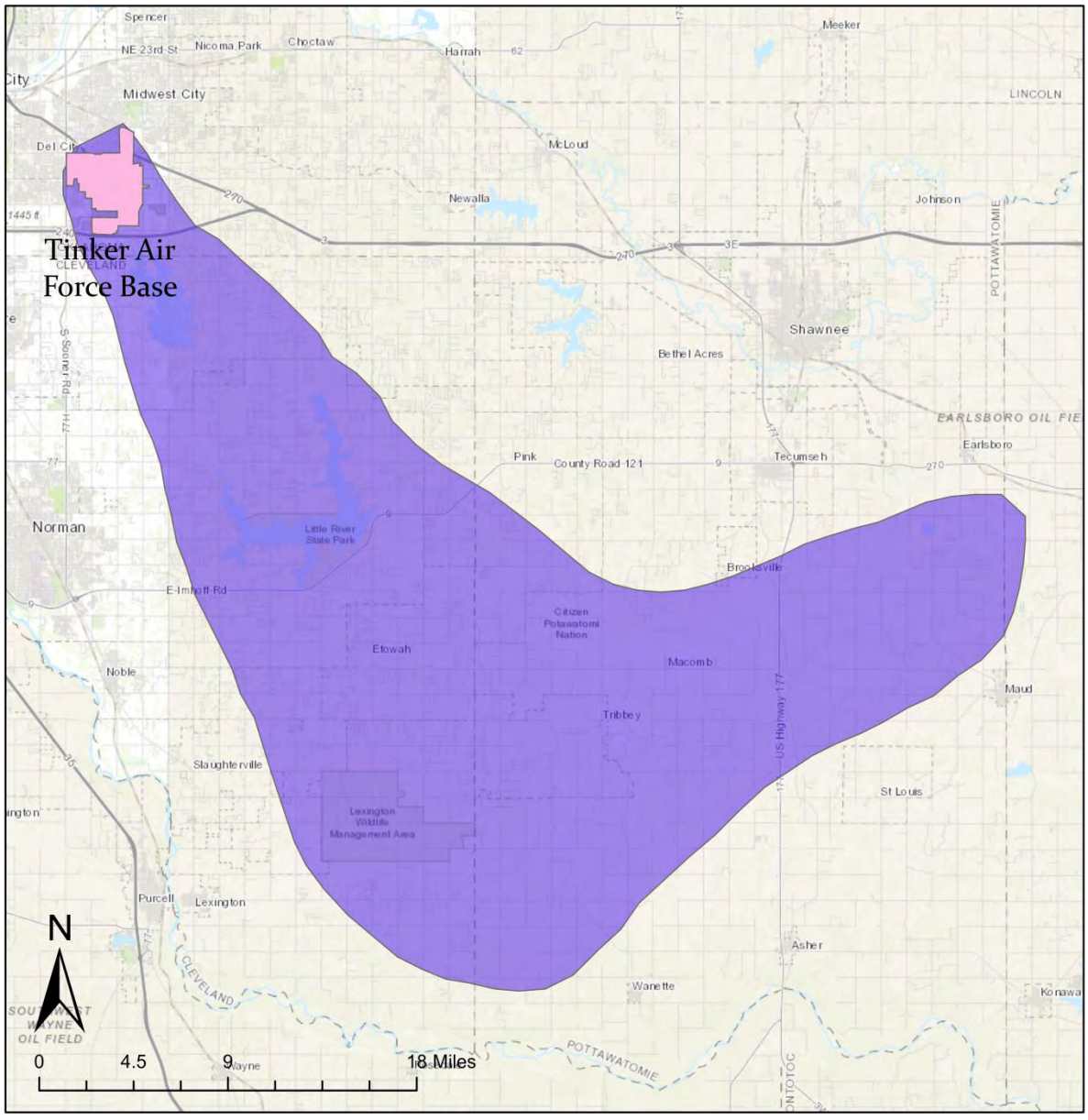
- Control of invasive species (sericia, black locust, old world bluestem, Bermuda grass, feral hogs)
- Examine the effects of growing-season prescribed and wildfire on herpetofauna communities and specific species
- Hall's bull rush (petitioned species-association with amphibians)
- Refuge has designated desired habitat conditions- investigate if they match herpetofauna community needs
- Monitor and assess the impact of rattlesnake roundup events on rattlesnake populations

Habitat Management Needs:

- Encourage prescribed burning, especially in areas supporting grasslands
- Provide financial and technical assistance to private landowners to restore native prairie communities
- Develop and implement BMPs for range management to encourage better stocking rates that track rainfall
- Provide funding and technical assistance for invasive species management
- Create financial incentives to restore grassland and riparian habitat and maintain prairie dog colonies
- Provide cost-share funding to help landowners restore stream channels and riparian vegetation - many of the streams in this PARCA are channelized and incised

THUNDERBIRD, OKLAHOMA





PARCA: Thunderbird

Overlapping DoD Installation: Tinker Air Force Base

General Description: The Thunderbird region falls within parts of Cleveland, Oklahoma, Seminole and Pottawatomie Counties and encompasses the Tinker Air Force Base, Lake Stanley Draper, Lower Canadian/Oklahoma River, Little River, Lake Thunderbird State Park, Sportsman Lake Recreation Area and Lexington Wildlife Management Area (WMA). It is in close proximity to urban, suburban, and agricultural and managed rangeland.

Habitat Description: This community often occurs as a structural mosaic with landscape that is dominated by stands of open oak woodlands interspersed with patches of mixed native and restored grass prairie. Some riparian zones occur within this PARCA. The structure of the landscape is maintained by periodic fires and drought. The dominant trees in this community are the blackjack oak (*Quercus marilandica*) and post oak (*Quercus stellata*) along with smaller numbers of burr oak, chinkapin oak (*Quercus muehlenbergii*), black hickory, black walnut, and eastern redcedar (*Juniperus virginiana*). Other common woody plants include eastern redbud (*Cercis canadensis*), Oklahoma plum (*Prunus gracilis*), winged sumac (*Rhus copallina*), and smooth Sumac. This PARCA is bisected by streams, rivers, and impoundments. The Little River and South Canadian River have sandy bottoms and associated flood plains. The dominant tree community in the riparian areas includes hackberry, elm, cottonwood, and black willow with interspersed ash. Dominant grasses in the mixed grasslands include little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), blue grama, sideoats grama, silver bluestem, Indian grass, and big bluestem (*Andropogon gerardii*).

Focal Species:

- Reptiles
    - Scarletsnake (*Cemophora coccinea*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Plains Hog-nosed Snake (*Heterodon nasicus*)
    - Three-toed Box Turtle (*Terrapene carolina triunguis*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - River Cooter (*Pseudemys concinna*)
    - Smooth Softshell (*Apalone mutica*)
    - Spiny Softshell (*Apalone spinifera*)
    - Ouachita Map Turtle (*Graptemys ouachitensis*)
    - Southern Prairie Skink (*Plestiodon septentrionalis obtusirostris*)
    - New Mexico Threadsnake (*Rena dissectus*)
    - Chicken Turtle (*Deirochelys reticularia*)
    - Eastern Milksnake (*Lampropeltis triangulum*)

    - Timber Rattlesnake (*Crotalus horridus*)
- Amphibians
    - Strecker's Chorus Frog (*Pseudacris streckeri*)
    - Barred Tiger Salamander (*Ambystoma mavortium mavortium*)
    - Hurter's Spadefoot (*Scaphiopus hurterii*)

Threats:

- High urban/suburban fragmentation/ encroachment
- High road mortality
- High human traffic/tourism
- Pets (particularly feral cats)
- Invasive species (fire ants, lacebark elm, callery pears, cedars, honeysuckle)
- Amphibian infectious disease (Norman area: Bd= 27% infected, RV= 14% infected; OKC area: Bd= 58-62% infected, RV= 12-28% infected; Lexington Wildlife Management Area: Bd= 38% infected, RV= 20% infected)

Opportunities:

- DoD- research partnering
- Thunderbird State Park
- DoD conservation easement program
- Lexington Wildlife Management Area (WMA)
- Oklahoma City Zoo
- City of Oklahoma City (OKC)
- OKC Trail initiative
- OKC metro population- citizen support
- NRCS easements
- City of Norman
- Citizen science potential
- Norman Area Land Conservancy
- I-35 corridor for monarchs
- Okies for Monarchs
- Cedar removal for fire protection
- OK native plant society
- OK Biological Survey
- TNC- Oklahoma habitat mapping
- Citizen Potawatomi Nation
- Absentee Shawnee Tribe
- Oklahoma Department of Transportation (ODOT)
- United States Bureau of Reclamation (BOR)- Thunderbird
- US Army Corps of Engineers (USACE)

- Oklahoma City Herpetological and Invertebrate Society
- Field Herpers United

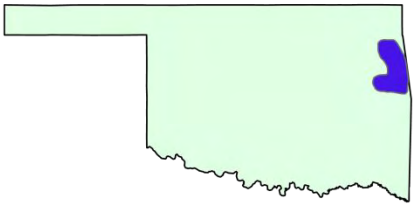
Research/ Conservation Needs:

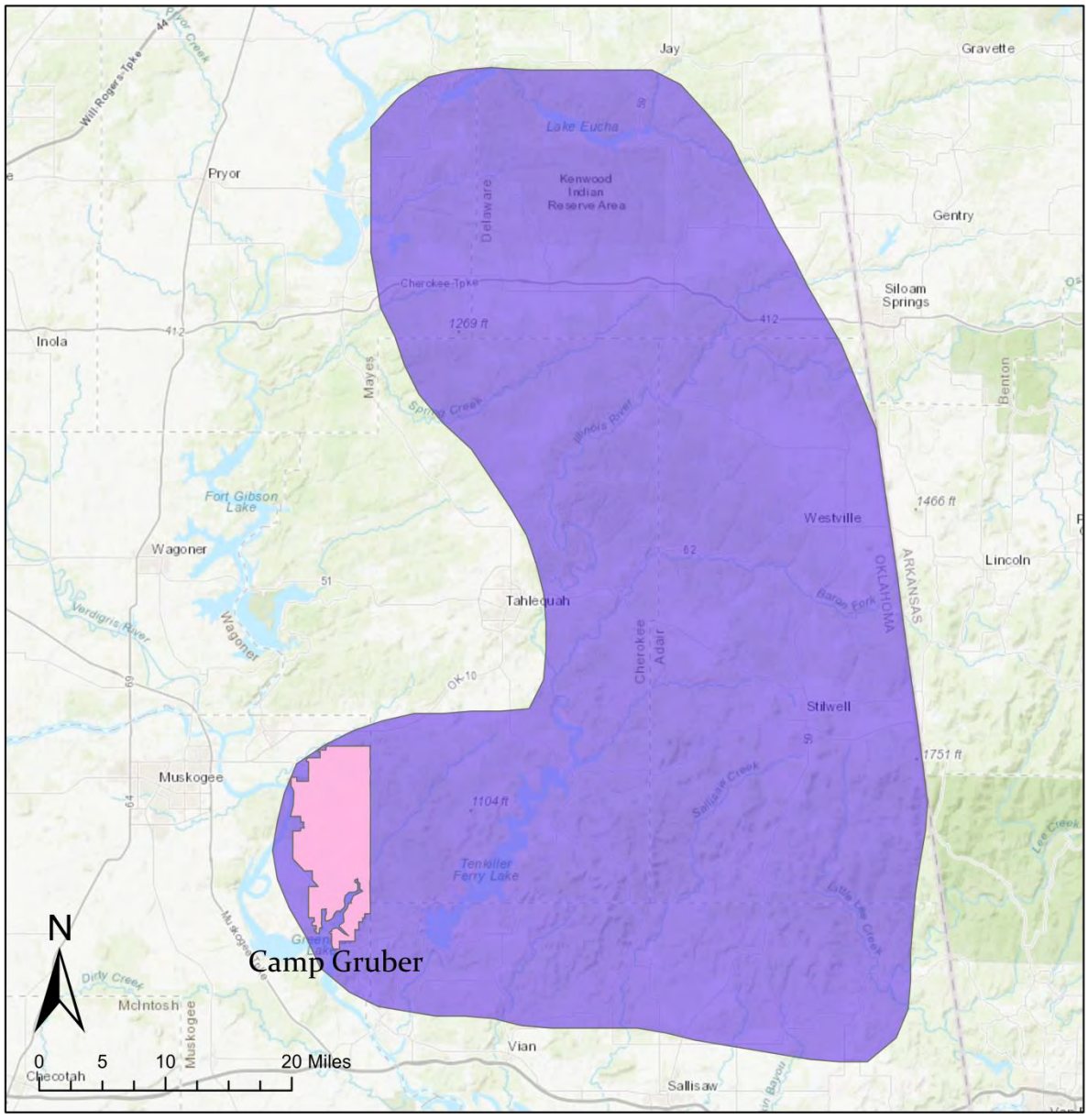
- Reintroduction science - specifically for horned lizards
- Status assessments: Strecker's chorus frog, scarletsnake, chicken turtle, horned lizard
- Impact of growing season burns on reptiles and amphibians
- Impacts of transportation infrastructure
- Expansion of cottonmouths
- Expansion/distribution of fire ants- horned lizard persistence

Habitat Management Recommendations:

- Prairie restoration (particularly in habitat gaps)
- Develop wildlife corridors/under road crossings
- Refrain from heavy pesticide/herbicide usage
- Reduce new urban developments
- Pursuing more conservation easements
- Encourage native plantings in yards, ranches, and along road corridors

OZARKS, OKLAHOMA





PARCA: Ozarks

Overlapping DoD Installation: Camp Gruber Training Center

General Description: The Ozarks Region is ecologically known as the Ozark Highlands and the Boston Mountains. It consists primarily of clear, cold, gravel bottomed streams and oak-hickory forest (*Quercus, Carya* sp.) with scattered stands of shortleaf pine (*Pinus echinata*). This region also has limestone caves, seeps, and crevices along with spring habitats that are significant for reptiles and amphibians. Protected lands within this area include TNC's Nickel Preserve, Spavinaw WMA, Rocky Ford State Park, Ozark Plateau WMA / National Wildlife Refuge, Camp Gruber, Cherokee WMA, Cookson Hills WMA, Greenleaf Tenkiller State Park. The Illinois River watershed is the primary watershed captured within this area. Spavinaw Creek, a tributary of the Neosho/Grand River watershed, is also captured.

Habitat Description: The most important conservation landscapes within this region are limestone caves, springs, white oak/hickory mesic forest, gravel – bottom streams and associated riparian forests, and herbaceous wetlands. Other important landscapes include shortleaf pine/oak-hickory woodlands, oak/hickory bottomland hardwood forest, post oak/blackjack oak – hickory woodlands and forests, small rivers, and tallgrass prairie. The most common land cover types of the Ozarks Region include post oak/blackjack oak – hickory woodlands and forests and pasture/prairie. White oak/hickory mesic forest also covers significant area, whereas all other types account for 5% or less of the region (ODWC CWCS 2015).

Focal Species:

- Reptiles
    - Alligator Snapping Turtle (*Macrochelys temminckii*)
    - Northern Map Turtle (*Graptemys geographica*)
    - Ouachita Map Turtle (*Graptemys ouachitensis*)
    - Mississippi Map Turtle (*Graptemys pseudogeographica kohnii*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Three-toed Box Turtle (*Terrapene carolina triunguis*)
    - Spiny Softshell (*Apalone spinifera*)
    - River Cooter (*Pseudemys concinna*)
    - Western Diamond-backed Rattlesnake (*Crotalus atrox*)
    - Timber Rattlesnake (*Crotalus horridus*)
- Amphibians
    - Ringed Salamander (*Ambystoma annulatum*)
    - Grotto Salamander (*Eurycea spelaea*)
    - Oklahoma Salamander (*Eurycea tynerensis*)
    - Crawfish Frog (*Lithobates areolatus*)

- Hurter's Spadefoot (*Scaphiopus hurterii*)
- Eastern Tiger Salamander (*Ambystoma tigrinum*)
- Ozark Zigzag Salamander (*Plethodon angusticlavius*)

Threats:

- Degradation of water quality is a serious issue because of the karst geology and the strong connection between surface and ground water. Widespread sources of potential water quality degradation are run-off from poultry operations and septic system seepage.
- Cave vandalism for karst species
- Forest health/structure
- Absence of natural fire regime
- Channel instability
- Land use practices such as riparian area
- Gravel mining operations
- Tourism – float operations
- Conversion of lands to fescue
- Illegal turtle harvest
- Disease:
  - Camp Gruber: Bd= 75% infected, RV= 4% infected
  - Cherokee WMA: Bd= 0% infected, RV= 0% infected
  - Cookson WMA: Bd= 63% infected, RV= 36% infected
  - Ozark Plateau NWR: Bd= 41% infected, RV= 4% infected
  - Spavinaw WMA: Bd= 25% infected, RV= 4% infected
  - Tenkiller WMA: Bd= 25% infected, RV= 0% infected

Opportunities:

- Land Legacy
- Ozark Plateau National Wildlife Refuge (NWR)
- Oklahoma Department of Wildlife Conservation (ODWC)
- TNC
- NRCS
- Cherokee Nation
- Several state parks
- DOD
- Scenic Rivers Commission
- Canoe tourism / recreation
- Several large church camps
- Arkansas Game and Fish Commission
- Boy Scouts of America
- Tulsa area grotto

- Northeastern State University
- Metro population- citizen support
- Tulsa Zoo
- University of Tulsa
- San Antonio Zoo- Dante Fenolio
- Tulsa Herpetological Society
- Oklahoma Conservation Commission
- Oklahoma Department of Transportation
- Rogers State University - cave gating project with ODWC

Research/ Conservation Needs:

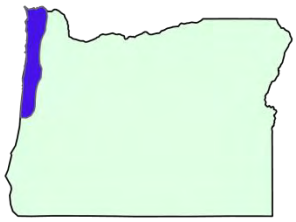
- Conservation easements on caves and springs
- Restoration of springs and riparian areas of streams
- Species assessments: ringed salamander, grotto salamander, eastern tiger salamander, wood frog, more?
- Invasive species management - controlling feral hogs
- Prescribed fire – seasonal burn impacts on herpetofauna
- Stream channel and riparian protection
- Identification and protection of natural spring habitats
- Gravel mining

Habitat Management Recommendations:

- Stream and Riparian Restoration
- Landscape Best Management Practices (BMPs)
- Water quality improvements
- Forest thinning
- Prescribed burning
- Invasive species management
- Cave gating
- Spring identification and protection
- Ephemeral fishless pond identification and protection

Oregon

NORTH COAST, OREGON



PARCA: North Coast

Overlapping DoD Installation: Camp Rilea

General Description: The North Coast PARCA mostly consists of the Oregon Coast Range and some associated lowlands. Much of the area is owned by the federal government and timber companies. Most of the area consists of Douglas fir forests of various ages with some old growth present.

Habitat Description: The Coastal Lowlands ecoregion contains beaches, dunes, and marine terraces below 400 feet elevation. Wet forests, lakes, estuarine marshes, and tea-colored (tannic) streams are characteristic features of the landscape. Wetlands have been widely drained and converted to dairy pastures. Residential, commercial, and recreational developments are expanding in the coastal corridor. The Coastal Uplands includes headlands and low mountains surrounding the Coastal Lowlands. The climate is marine influenced with an extended winter rainy season and minimal seasonal temperature extremes. Abundant fog during the summer dry season reduces vegetation moisture stress. The region includes much of the historic distribution of Sitka spruce. Summer stream flows are more consistent than on the sedimentary rocks of surrounding ecoregions, and streams still support runs of spring chinook salmon and summer steelhead. The Willapa Hills ecoregion is more rolling and has a lower drainage density than other upland areas in the Coast Range. Industrial timberland has almost completely replaced the historic forests of the Willapa Hills due to the region's accessibility. When disturbed, the silt- and clay-textured soils are easily eroded, thereby degrading stream quality. The mountainous Mid-Coastal Sedimentary ecoregion lies outside of the coastal fog zone and is typically underlain by massive beds of sandstone and siltstone. The region is relatively rugged and its Douglas-fir forests are intensively managed for logging. Slopes are prone to failure when disturbed, particularly south of the Siuslaw River. Stream sedimentation is high.

Focal Species:

- Amphibians
    - Coastal Tailed Frog (*Ascaphus truei*)
    - Western Toad (*Anaxyrus boreas*)
    - Cope's Giant Salamander (*Dicamptodon copei*)
    - Columbia Torrent Salamander (*Rhyacotriton kezeri*)
    - Southern Torrent Salamander (*Rhyacotriton variegatus*)
    - Clouded Salamander (*Aneides ferreus*)

Threats:

- Timber harvest that causes increased temperature and/or siltation of headwater streams
- Change in hydrology

- Climate change and shifts in precipitation patterns
- Disease
- Off road vehicles around breeding ponds
- Invasive species
    - Barred owl (*Strix varia*)

Opportunities:

- BLM
- Weyerhaeuser
- USFS
- Clatsop State Forest
- Tillamook State Forest
- Confederate Tribes of Grand Ronde
- Confederate Tribes of Siletz
- Starker Forests
- Oregon Parks and Recreation Department
- Trout Unlimited
- Oregon State University
- Oregon Coast Community College

Research/ Conservation Needs:

- Further understanding of the divergence (e.g. nDNA study) and taxonomic status of early diverging clades of coastal tailed frogs (*Ascaphus truei*) and southern torrent salamander (*Rhyacotriton variegatus*)
- Herpetofaunal surveys in Clatsop County as this area is understudied
- Surveys for western toads and studies of natural history in the Oregon Coast Range and Oregon Coast as these are poorly understood in coastal areas
- Examine Barred owl (*Strix varia*) predation effects on herpetofauna
- Population estimates and monitoring for focal species
    - Use of non-destructive surveys (e.g. damaging decaying logs) for species necessary. Development of new techniques for surveys may be needed if a focal species is not well detected with such techniques. Some species, such as clouded salamanders (*Aneides ferreus*) may be present in areas that are not commonly searched (e.g. talus & rock walls, canopy) or may be more commonly found during times not often surveyed (e.g. rainy nights)

Habitat Management Recommendations:

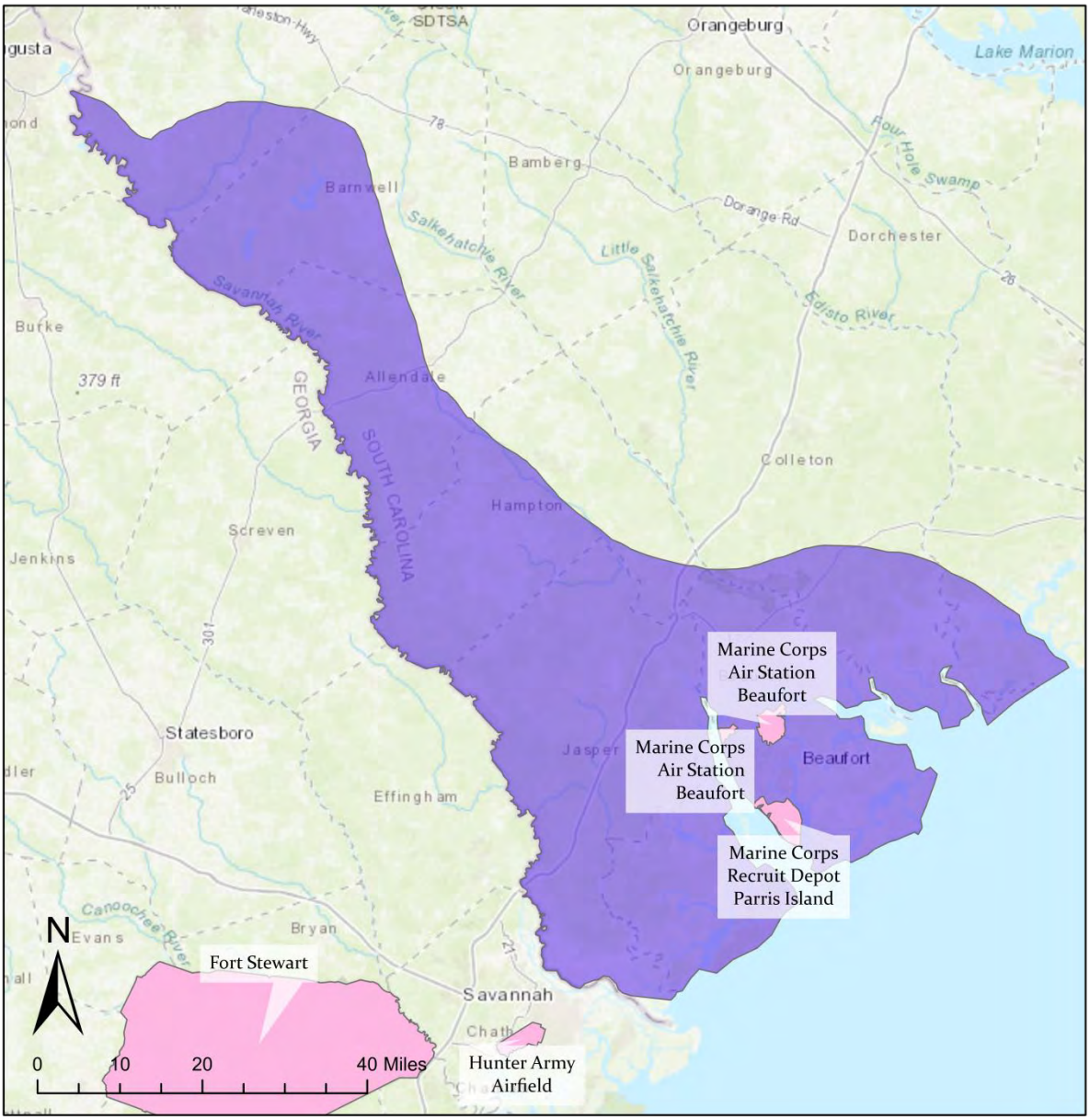
- Maintain or restore specific habitat conditions associated with resident species
- Attempt to replant (native species) and reduce erosion in disturbed areas
- Retain large trees and conserve snags for future recruitment of downed wood

- Maintain natural wetland habitats and nearby uplands using buffers
- Identify likely corridors among habitat features (ponds, seeps, rock outcrops, etc.) and maintain connectivity by minimizing activities in these areas
- Restore natural fire regimes
- Allow natural beaver activity where possible, or reintroduce beaver where they have been lost

Other Comments: Several early diverging clades of coastal tailed frog (*Ascaphus truei*) and southern torrent salamanders (*Rhyacotriton variegatus*) have been identified via mtDNA in the Oregon Coast Range (Nielson et al 2001; Nielson et al 2006; Miller et al 2006). The clouded salamander (*Aneides ferreus*) was one of the more common species encountered by research of Corn & Bury (1991) mostly by searching through decayed logs. This species may be more common than we know but our knowledge may be limited by effective and non-destructive survey methods.

South Carolina

SAVANNAH RIVER LOW COUNTRY, SOUTH CAROLINA



PARCA: Savannah River Low Country

Overlapping DoD Installations:
Marine Corps Air Station Beaufort
Marine Corps Recruit Depot Parris Island

General Description: The large Savannah River Low Country PARCA comprises a wide variety of habitats including longleaf pine flatwoods, mesic savannas and sandhills, blackwater and brownwater rivers and streams, a variety of isolated freshwater wetlands, including Carolina bays and maritime communities including maritime forest, beach dune and swale, and hammocks. This region is home to a significant number of rare and declining amphibian and reptile species including the federally threatened flatwoods salamander, the state endangered gopher tortoise, the state endangered gopher frog, the state threatened southern hog-nosed snake, the state threatened spotted turtle, the pine snake, eastern diamondback rattlesnake, the pine woods snake, bird-voiced treefrog, tiger salamander, and others. This region of South Carolina is one of the most herpetofaunally diverse areas of the state.

Habitat Description: This PARCA falls within 6 ecoregions: Sea Islands/ Coastal Marsh, Southern Coastal Plains Floodplains and Low Terraces, Carolina Flatwoods, Atlantic Southern Loam Plains, Sand Hills, and Southeastern Floodplains and Low Terraces. The habitat types within this region are diverse, including longleaf pine flatwoods, mesic savannas and sandhills, blackwater and brownwater rivers and streams, a variety of isolated freshwater wetlands, including Carolina bays and maritime communities including maritime forest, beach dune and swale, and hammocks.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- South Carolina Department of Natural Resources (SCDNR)
- DoD
- DOE
- USFWS
- NRCS
    - Wetlands Reserve Program
- Ducks Unlimited
- State Parks

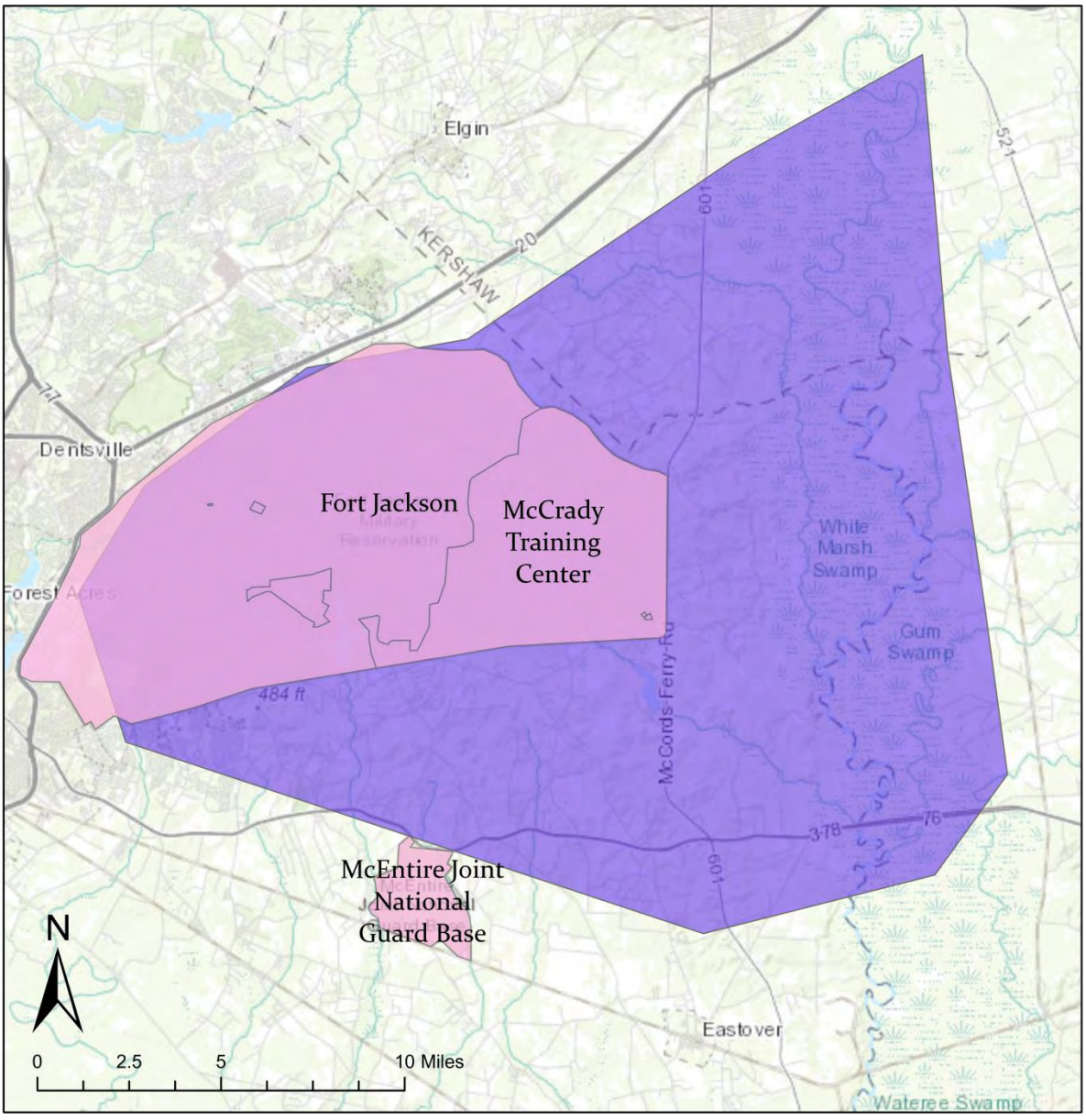
- Central Savannah River Land Trust
- TNC

Research/ Conservation Needs:
Information Needed

Habitat Management Recommendations:
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes

- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate “beach re-nourishment” activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles

UPPER WATEREE, SOUTH CAROLINA



PARCA: Upper Wateree

Overlapping DoD Installations:
Fort Jackson
McCrady Training Center

General Description: The Upper Wateree PARCA is found in central South Carolina and encompasses Fort Jackson Military Reservation; White Marsh, English, and Gum Swamps; and easements held by Ducks Unlimited and the Natural Resources Conservation Service. It follows a stretch of the Wateree River and also includes a few small lakes.

The majority of this PARCA is part of the Sand Hills ecoregion, a rolling to hilly region composed primarily of Cretaceous-age marine sands and clays, capped in places with Tertiary sands, deposited over the crystalline and metamorphic rocks of the Piedmont. Many of the droughty, low-nutrient soils formed in thick beds of sand, although some soils contain more loamy and clayey horizons. Some upland areas are underlain by plinthite, and side slopes tend to have fragipans that perch water and cause lateral flow and seepage. Stream flow is consistent; streams seldom flood or dry up because of the large infiltration capacity of the sandy soil and the great ground-water storage capability of the sand aquifer. Along the Wateree River is the Southeastern Floodplains and Low Terraces ecoregion, a riverine ecoregion that provides important wildlife corridors and habitat. Composed of alluvium and terrace deposits of sand, clay, and gravel, the region includes large sluggish rivers and backwaters with ponds, swamps, and oxbow lakes.

Habitat Description: On drier sites of the Sand Hills ecoregion, turkey oak and blackjack oak grow with longleaf pine and a wiregrass ground cover. Shortleaf-loblolly pine forests and other oak-pine forests are now more widespread due to fire suppression and logging. The Sand Hills are a center of rare plant diversity in the Carolinas. The Southeastern Floodplains and Low Terraces include oak-dominated bottomland hardwood forests, and some river swamp forests of bald cypress and water tupelo. The flood-prone region includes brownwater floodplains and blackwater floodplains. The brownwater floodplains originate in or cross the Piedmont.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:

- SCDNR
- DoD
- NRCS
    - Wetlands Reserve Program
- Ducks Unlimited

Research/ Conservation Needs:

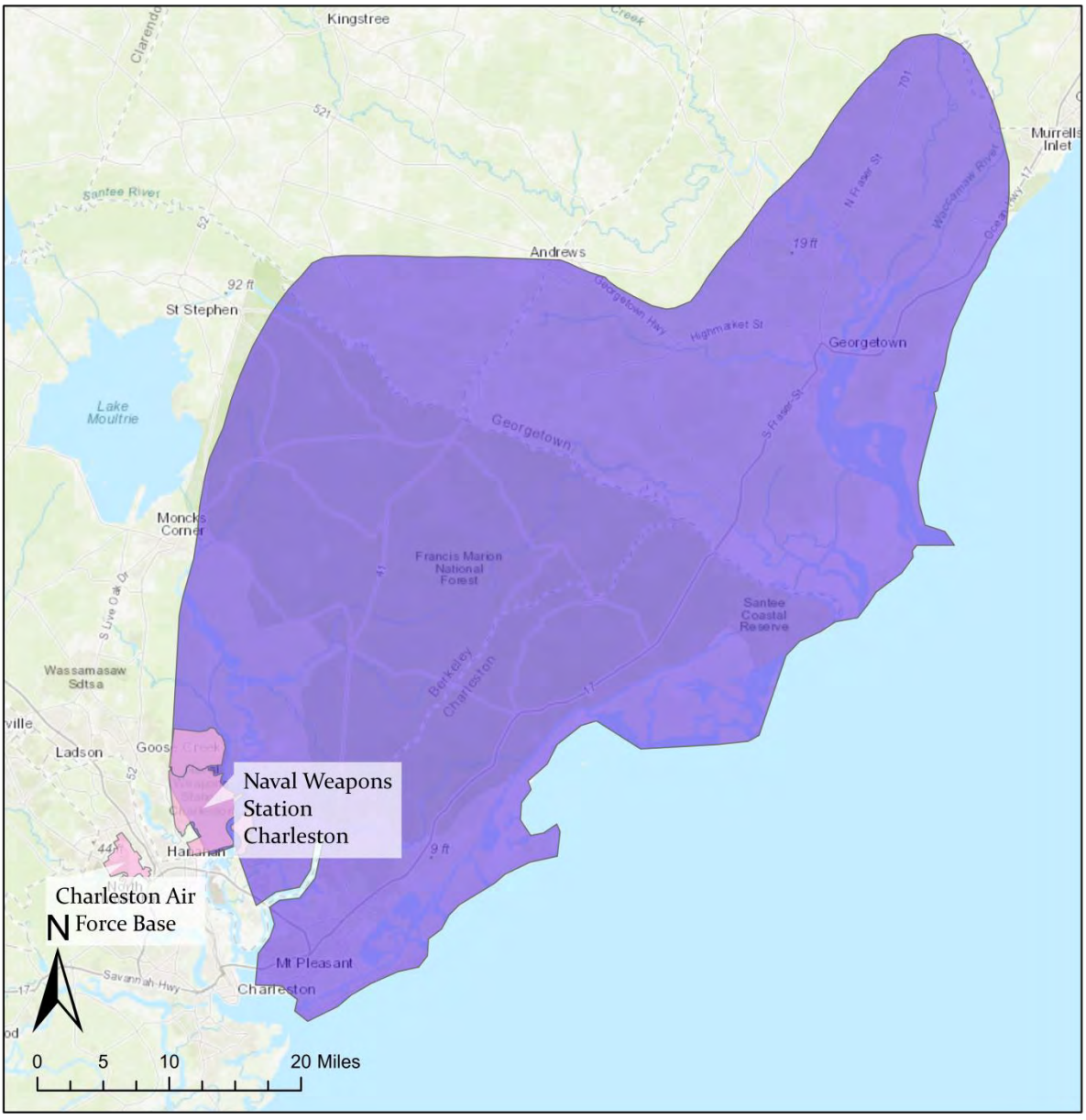
Information Needed

Habitat Management Recommendations:

- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure
- Exclude point source pollution from rivers
- Restore stream microhabitat diversity such as channel meanders, riffles, runs, and pools, and allow natural flood regimes
- Remove invasive exotic plant species from streams unless their removal will destabilize stream banks
- Identify watershed boundaries and protect both groundwater and surface water from contamination via toxins, excessive nutrients, sediments, or silt
- Maintain upstream watershed quality by providing complementary native terrestrial habitats

- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands
- Favor mature hardwood stands, but maintain a mixture of forest types and ages (including some openings)
- Direct foot traffic and trails away from sensitive habitat features embedded in forests such as vernal pools, seeps, ravines, and caves
- Minimize ground disturbance in hardwood forests when possible
- Maintain and, where necessary, restore the nature fire regime to hardwood forests- some hardwood communities do benefit from infrequent burns

FRANCIS MARION, SOUTH CAROLINA



PARCA: Francis Marion

Overlapping DoD Installation: Naval Weapons Station Charleston

General Description: The Francis Marion PARCA is on the coast of South Carolina, and covers the entirety of the Francis Marion National Forest, the Santee Coastal Reserve, and the Naval Weapons Station Charleston. The Sea Islands/Coastal Marsh region contains the lowest elevations in South Carolina and is a highly dynamic environment affected by ocean wave, wind, and river action. Mostly sandy soils are found on the barrier islands, while organic and clayey soils often occur in the freshwater, brackish, and salt marshes.

The nearly level coastal plain of the Carolina Flatwoods was covered by shallow coastal waters during the Pleistocene, the resultant terraces and shoreline-related landforms are covered typically by fine-loamy and coarse-loamy soils, with periodically high water tables. Other areas have clayey, sandy, or organic soils, contributing to the region's plant diversity.

The Mid-Atlantic Floodplains and Low Terraces is a riverine ecoregion with large, sluggish rivers, deep-water swamps, oxbow lakes, and alluvial deposits with abrupt textural changes. Brownwater floodplains originate in or cross the Piedmont and the sediments contain more weatherable minerals than the blackwater floodplains that have their watersheds entirely within the coastal plain.

Habitat Description: Maritime forests of live oak, red cedar, slash pine, and cabbage palmetto grow on parts of the sea islands, and various species of cordgrass, saltgrass, and rushes are dominant in the marshes. The coastal marshes are important nursery areas for fish, crabs, shrimp, and other marine species. During the colonial and antebellum periods in the 1700's and 1800's, a plantation agriculture economy dominated the region, producing rice, indigo, and Sea Island cotton. In the Carolina Flatwoods, Carolina bays and pocosins are abundant in some areas. The region is a significant center of endemic biota, with high biological diversity and rare species. Pine flatwoods, pine savannas, freshwater marshes, pond pine woodlands, pocosins, and some sandhill communities were once common. Loblolly pine plantations are now widespread with an active forest industry. Artificial drainage for forestry and agriculture is common. North Carolina's blueberry industry is concentrated on some of the sandy, acidic soils of the region. The Mid-Atlantic Floodplains and Low Terraces ecoregion is characterized by its large, sluggish rivers, deep-water swamps, and oxbow lakes. Cypress-gum swamps are common, along with bottomland hardwoods of wetland oaks, green ash, red maple, and hickories.

Focal Species:
Information Needed

Threats:
Information Needed

Opportunities:
- SCDNR
- USFS
- DoD
- USFWS
- Mount Pleasant Land Conservancy
- Ducks Unlimited
- Lord Berkeley Conservation Trust
- TNC

Research/ Conservation Needs:
Information Needed

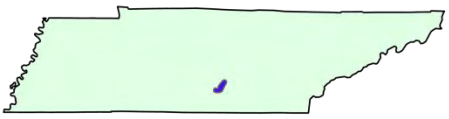
Habitat Management Recommendations:
- Maintain submerged, emergent, and shoreline vegetation in permanent wetlands
    - Retain snags, rocks, and other structure
- Provide open-canopy, well-drained upland terrestrial areas for turtle nesting around permanent wetlands
- Direct recreational use away from permanent wetlands
- In wetlands, restore natural shoreline integrity and submerged native vegetation
    - Limit shoreline development and minimize use of riprap and bulkheads
- Increase awareness of turtle crossing areas near wetlands
    - Install signs along roadways to warn and inform motorists
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- Restore native longleaf pine and wiregrass habitats in coastal plain ecoregions
- In pine flatwoods, thin existing even-aged plantations, extend rotation age, manage toward uneven-aged stands, and restore historic fire frequency and seasonality to allow stands to remain relatively open
- Identify, protect, and manage embedded habitats such as seasonal wetlands, rock outcroppings, and sandhills in flatwood habitats
- When planting in sandhill habitat, use timber species (such as longleaf pine) adapted to sandhill communities and fire regimes
- In scrub and sandhill habitat, consider site preparation techniques that minimize soil disturbance
- Restore pine species to sites where they would naturally occur

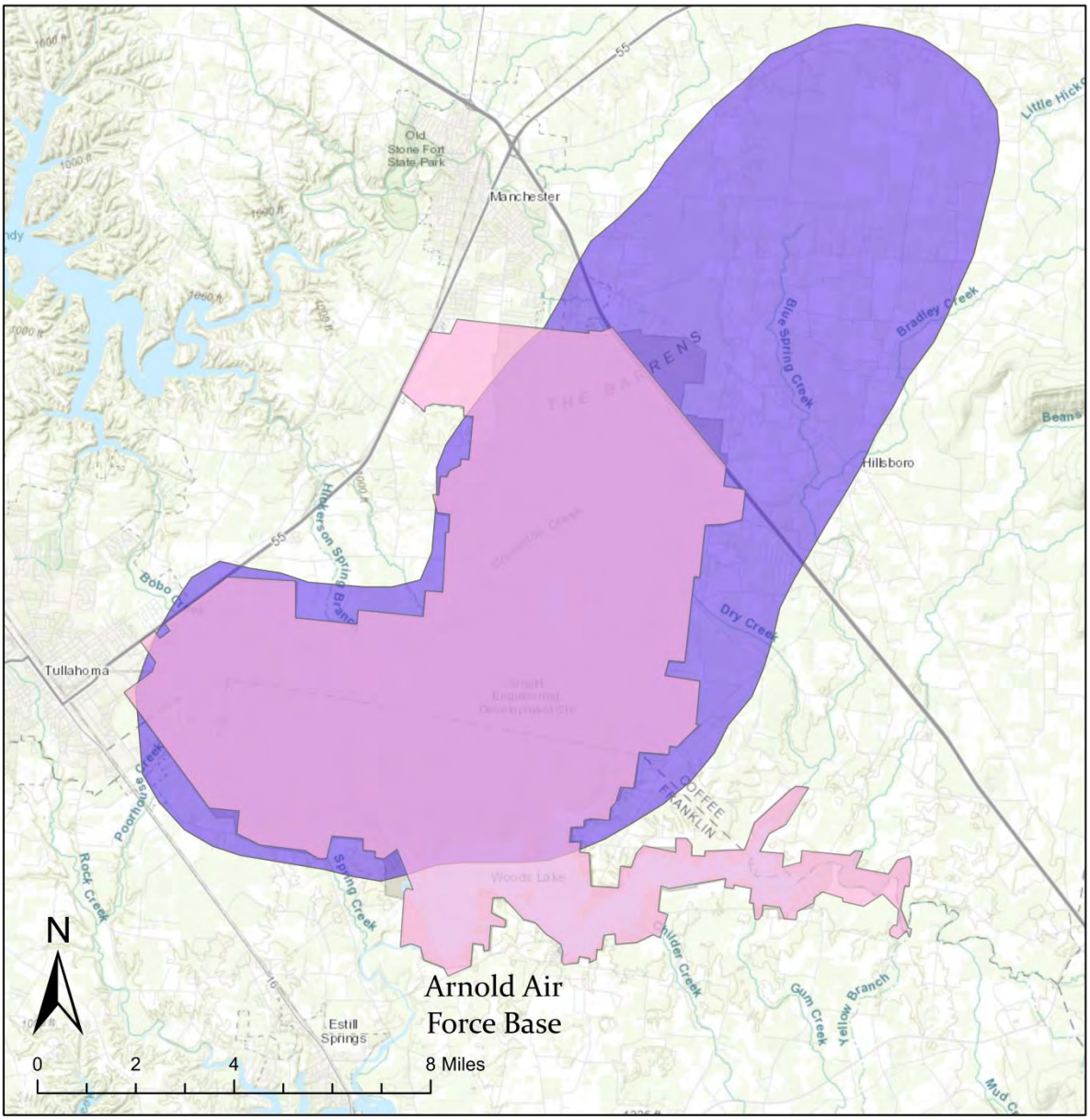
- In scrub and sandhill habitat, identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality
- Exclude access to sandhill and scrub habitat by livestock
- Protect upland sandhill and scrub habitat from development
- On beaches, limit foot traffic (keep foot traffic on boardwalks) and either limit or exclude motorized vehicles, including ATVs, especially during sea turtle nesting season
- Minimize lighting or use low-intensity and/or directional lighting near sea turtle nesting areas
- Coordinate "beach re-nourishment" activities outside of sea turtle nesting season
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Control free-roaming pets, especially dogs, in the vicinity of sea turtle nesting areas
- Maintain and restore natural vegetation, especially where beach and dune stabilization is needed
- Protect sea turtle nests from predators and poachers
    - Determine population levels of predatory raccoons and foxes, and implement control measures if necessary
- Determine sea turtle nesting and hatching periods so that monitoring efforts will aid protection of endangered and threatened sea turtles
- Avoid conversion of maritime forests to non-forest uses
    - When planning developments in maritime forests, provide retention of forest canopy and structure
- Control subsidized natural predators such as raccoons in maritime forests
    - Also keep pets indoors, leashed, or penned
    - Remove feral non-native species such as dogs and cats
- Control or remove non-native species in maritime forests
- Meet or exceed forestry and agricultural BMPs, including Streamside Management Zones (SMZs)
- Minimize activities that alter flow or temperature regimes
- Stabilize eroded and steep river banks to allow turtles access to nesting sites
- Minimize use of riprap for shoreline stabilization
- Control public access to important turtle nesting sites
- Restrict recreational access such as boat landings to as few points as feasible
- Allow natural movement of sand and gravel by avoiding in-stream mineral extraction, vehicular traffic, and other disruptions to streambeds
- Restore river processes that allow the development of channel meanders, oxbows, and sandbars
- Avoid de-snagging around rivers- allow the natural development and movement of woody and rocky structure
- Restore native stream bank vegetation composition and structure

- Exclude point source pollution from rivers
- In floodplain wetlands, allow drift piles and standing dead trees to decompose naturally on the ground
- Retain large trees and canopy cover where feasible in floodplain wetlands
- Restore natural flooding regimes in rivers with floodplain wetlands
- Maintain or restore connectivity between floodplain forest stands
- Minimize unnatural disturbance or alterations of embedded open-canopy wetlands in forests
- Maintain contiguous gradients between floodplain forests and adjacent uplands

Tennessee

THE BONNAROO
BARRENS, TENNESSEE





PARCA: The Bonnaroo Barrens

Overlapping DoD Installation: Arnold Air Force Base

General Description: The Bonnaroo Barrens PARCA occurs in the Barrens region of the Eastern Highland Rim, which includes the headwaters of the Duck, Elk, and Caney Fork rivers. The Barrens are a patchwork of remnant prairies and barrens with soils that support limited tree life. The use of fire by Native Americans played an important role in reducing tree encroachment and maintaining open grassland habitats. Conversion of land for agriculture, urbanization, and succession from open grasslands into forest has dramatically reduced prairie and barren habitats. Public lands in the Bonnaroo Barrens PARCA include Arnold Engineering Development Center Wildlife Management Area, Bark Camp Barrens Wildlife Management Area, Hickory Flat Wildlife Management Area, and May Prairie State Natural Area. The name Bonnaroo Barrens is derived from the large annual music festival that occurs on a 700-acre farm near Manchester in this PARCA.

Habitat Description: The Bonnaroo Barrens PARCA occurs within the Eastern Highland Rim of the Interior Plateau ecoregion. The Eastern Highland Rim is 24 to 32 km wide plateau 305 to 430 m in elevation characterized by gently rolling to flat terrain with oak-hickory to mixed mesophytic forest. The region is underlain with Mississippian-aged limestones, chert, shale, and dolomite. The Barrens are a mosaic of open canopy woodlands and grasslands with fragipan soils and low topographic relief that keep soils saturated in winter yet very dry during summer. Seasonal wetlands are common. This hydrological regime limits forest development and fosters open prairie communities. The Barrens were much larger in extent historically, but anthropogenic altering of hydrology (ditches) and fire suppression have allowed significant forest encroachment. The Barrens support a significant diversity of plants, including many prairie species, such as big bluestem, little bluestem, yellow Indian grass, and switchgrass, as well as disjunct populations of Coastal Plain species, such as asphodel and snowy orchids.

Focal Species:

- Reptiles
    - Timber Rattlesnake (*Crotalus horridus*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Scarletsnake (*Cemophora coccinea*)
    - Eastern Slender Glass Lizard (*Ophisaurus attenuatus longicaudus*)
    - Eastern Pinesnake (*Pituophis melanoleucus*)
    - Copper-bellied Watersnake (*Nerodia erythrogaster neglecta*)
    - Scarlet Kingsnake (*Lampropeltis elapsoides*)
    - Eastern Hog-nosed Snake (*Heterodon platirhinos*)

- Amphibians
    - Four-toed Salamander (*Hemidactylium scutatum*)
    - Gopher Frog (*Rana capito*)
    - Barking Treefrog (*Hyla gratiosa*)
    - Mud Salamander (*Pseudotriton montanus*)

Threats:

- Development
    - Housing development
    - Military infrastructure
- Encroachment and succession
- Impacts from recreational use
- Illegal dumping
- Mesopredator abundance
- Lack of mapping
- Lack of stream buffers
- Stream alteration and water diversion
- Persecution of rattlesnakes
- Incompatible natural resource management
- Climate induced hydrology issues in wetlands
- Harmful algal blooms

Opportunities:

- DoD- Arnold Air Force Base
- Tennessee Wildlife Resources Agency (TWRA)
- Tennessee Department of Environment and Conservation (TDEC)
- Middle Tennessee State University (MTSU)
- Tennessee State University (TSU)
- Vanderbilt
- Austin Peay - Southeast Grassland Initiative
- Native Plant Conservation Alliance
- Bonnaroo
- Jack Daniels and George Dickel

Research/ Conservation Needs:

- The search for the gopher frog continues
- I&M
- Natural history and habitat needs for eastern pinesnakes
- Native grassland habitat management
- Identify compatible fire regimes

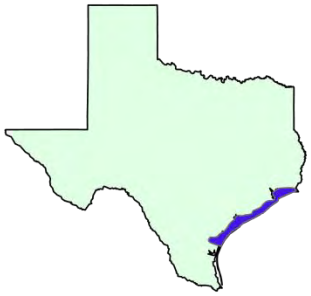
- Invasive fire ants
- Ambystomatid community level research
- Disease sampling (add to all)
- Research into the effects of forest to savannah conversions

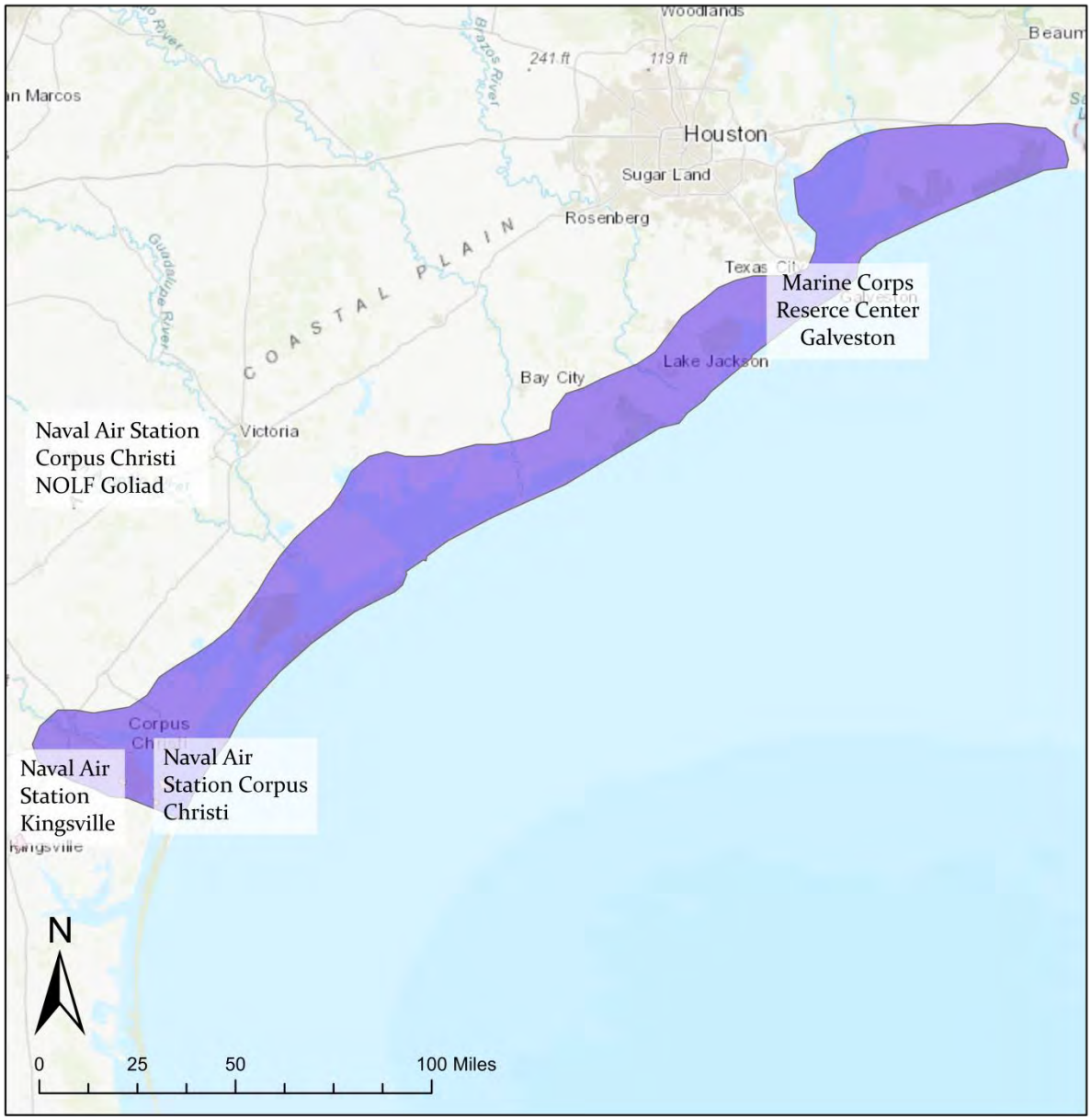
Habitat Management Recommendations:

- Establish compatible burn regimes
- Maintain connectivity between wetlands
- Manage for native habitats

Texas

TEXAS BAYS AND MARSHES, TEXAS





PARCA: Texas Bays and Marshes

Overlapping DoD Installations:
Naval Air Station Corpus Christi- Main Base
Naval Air Station Corpus Christi- Naval Outlying Field Waldron
Naval Air Station Corpus Christi- Naval Outlying Field Cabaniss
Naval Air Station Corpus Christi- Peary Place Transmitter Site
Marine Corps Reserve Center Galveston

General Description: The Texas Bays and Marshes PARCA stretches along the Gulf Coast from Sabine Lake at the Louisiana border down to Corpus Christi Bay. This is a large region, covering about 1,645,434 hectares of the coast. The PARCA encompasses the Aransas, Big Boggy, San Bernard, Moody, Anahuac, McFaddin, and Brazoria National Wildlife Refuges. Multiple oil fields are found throughout the region.

Habitat Description: This area includes the intervening bay systems (Galveston, Trinity, Matagorda, San Antonio, Copano, and Aransas) and their associated barrier islands. The variety of ecological systems along the Gulf Coast is remarkable with coastal freshwater and salty prairie, hardwood bottomlands, and oak woodlands dominating the terrestrial systems. This area also includes extensive tidal marshes, as well as agriculture and significant urban development.

Focal Species:

- Reptiles
    - Smooth Softshell (*Apalone mutica*)
    - Spiny Softshell (*Apalone spinifera*)
    - Snapping Turtle (*Chelydra serpentina*)
    - Alligator Snapping Turtle (*Macrochelys temminckii*)
    - Berlandier's Tortoise (*Gopherus berlandieri*)
    - Cagle’s Map Turtle (*Graptemys caglei*)
    - Diamond-backed Terrapin (*Malaclemys terrapin*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Red-eared Slider (*Trachemys scripta elegans*)
    - Southern Spot-tailed Earless Lizard (*Holbrookia lacerata subcaudalis*)
    - Keeled Earless Lizard (*Holbrookia propinqua*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Slender Glass Lizard (*Ophisaurus attenuatus*)
    - Texas Scarletsnake (*Cemophora lineri*)
    - Western Diamond-backed Rattlesnake (*Crotalus atrox*)

    - Texas Indigo Snake (*Drymarchon melanurus erebennus*)
    - Prairie Hog-nosed Snake (*Heterodon nasicus*)
    - Smooth Greensnake (*Opheodrys vernalis*)
    - Western Massasauga (*Sistrurus tergeminus*)
- Amphibians
    - Woodhouse's Toad (*Anaxyrus woodhousii*)
    - Crawfish Frog (*Lithobates areolatus*)
    - Sheep Frog (Hypopachus variolosus)
    - Cajun Chorus Frog (*Pseudacris fouquettei*)
    - Strecker's Chorus Frog (*Pseudacris streckeri*)
    - Rio Grande Siren - large form (*Siren intermedia texana*)
    - Western Tiger Salamander (*Ambystoma mavortium*)
    - Spotted Dusky Salamander (*Desmognathus conanti*)
    - Black-spotted Newt (*Notophthalmus meridionalis*)

Threats:

- Feral hogs
- Beach renourishment
- Beach off road vehicle use
- Marine debris
    - Entanglement, entrapment, and obstruction in nearshore water and on beaches
- Climate change
    - Sea level rise
    - Increased frequency and veracity of storms
- Freshwater inflows to estuaries
- Beach development and urbanization
- Bulkheads, seawalls, roadways, railroad beds, and canalization impeding migration
- Dredging - changes shallow to deep water, so affect terrapins due to habitat change and elimination of oyster bars; also crushes sea turtles
- Cold stunning periods: barge traffic, coyotes, birds
- Fibropapillomatosis: tumor-causing disease in sea turtles
- Crab traps - lost, abandoned, and no means of excluding turtles = nontarget catch of turtles
- Mesopredators - turtle nest predation
- Introduced fish affects sirens
- Heterogeneous landscape management (e.g., fire suppression)

Opportunities:

- Islands built for birds increases nesting habitat for diamond-backed terrapins
- NPS
- USFWS
- Coastal Bend Bays and Estuaries Programs
- Texas Parks and Wildlife Department (TPWD)
- TNC and other NGOs
    - Galveston Bay Foundation
    - Ducks Unlimited
    - San Antonio Bay Foundation
    - San Antonio Bay Partnership
    - Houston Audubon
- University of Texas (UT) animal rehabilitation at UT marine institute
- Texas Bay Keepers
- Texas A&M University (TAMU) Galveston

Research/ Conservation Needs:

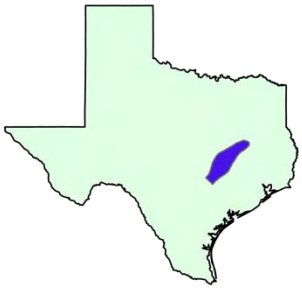
- Habitat preference of southern spot-tailed earless lizards

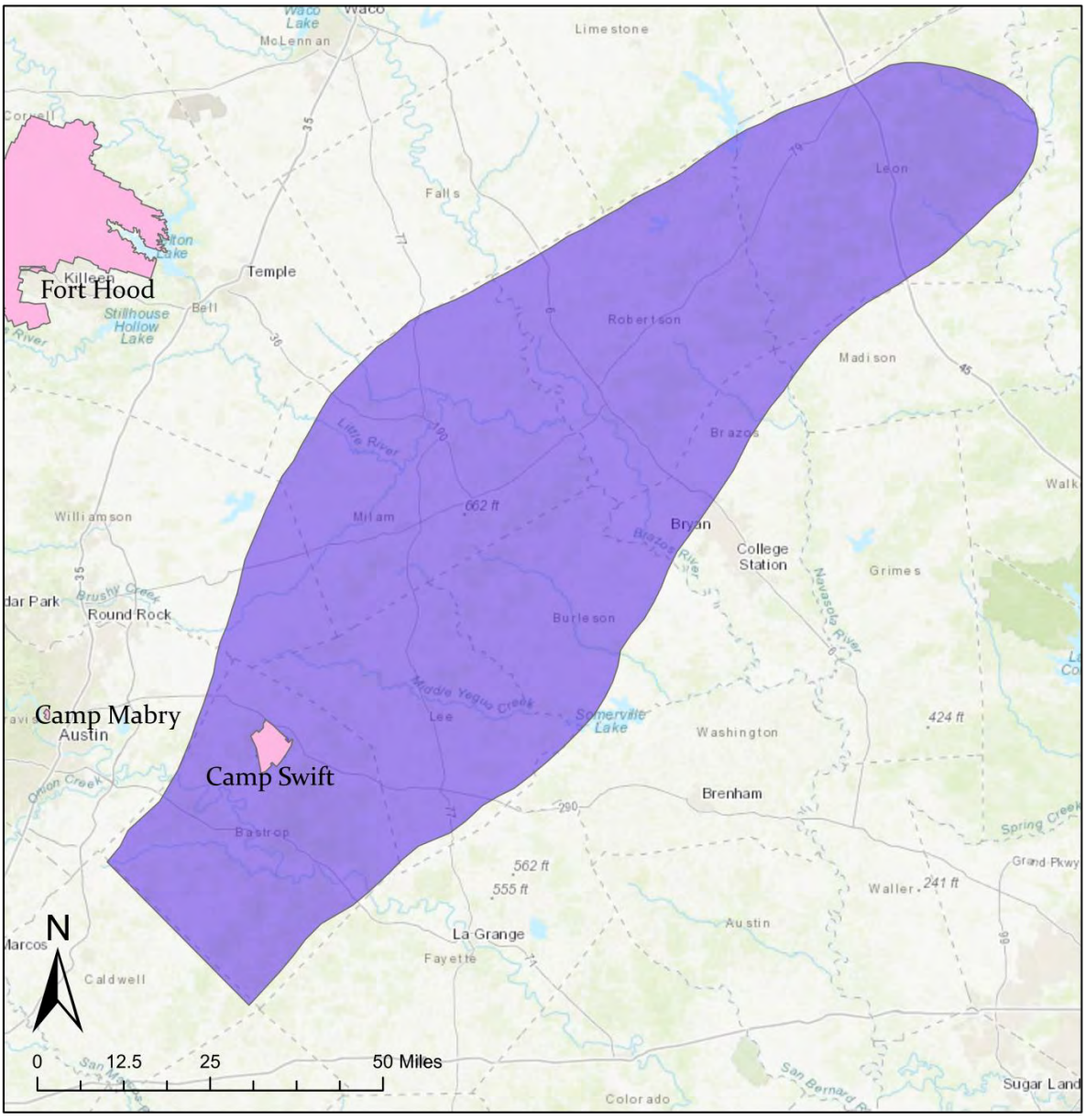
Habitat Management Recommendations:

- Limit foot traffic (i.e. keep foot traffic on boardwalks) and motorized vehicles, including ATVs, on beaches, especially during sea turtle nesting season
- Coordinate beach renourishment activities outside of the seas turtle nesting season
- Maintain and restore natural vegetation to beaches, especially where beach and dune stabilization is needed
- Consider sea turtle nesting needs before constructing or removing pilings, sea walls, and jetties
- Limit shoreline development and minimize use of riprap and bulkheads
- Restore natural shoreline integrity and submerged native vegetation to brackish wetlands
- Maintain or as necessary restore natural hydrological flow patterns in estuaries and bays
- Post signs for motorists that identify areas where diamond-backed terrapins cross roads while searching for nesting sites
    - Reduce roadway speed limits during nesting season (May-June)
- Determine levels of predatory raccoon and fox populations and implement controls if necessary
- Identify intensively-used nesting areas for diamond-backed terrapins and design strategies that reduce female nesting mortality and nest predation
- Encourage the use of turtle-friendly fisheries equipment and monitor recreational and commercial crab trapping activities
- Avoid conversion of maritime forests to non-forest uses

    - When planning developments in maritime forests, provide for retention of forest canopy and structure
- Control or remove non-native species that impact maritime forest habitat
- Maintain and restore natural fire frequency, intensity, and seasonality, including landscape-scale fire in surrounding, complementary habitats where appropriate
    - Where possible, use fire to manage vegetation rather than mowing
- Maintain and restore natural hydrology in wet grasslands
- Protect and maintain riparian and wetland areas in residential areas, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) of streams and wetlands

SUGAR SANDS, TEXAS





PARCA: Sugar Sands

Overlapping DoD Installation: Camp Swift

General Description: The Sugar Sands PARCA follows a band of deep sandy soils that runs from the Colorado River northeast to the Trinity River. Defined at its southern boundary by the Lost Pines, a relictual population of Loblolly Pine that is now isolated from populations further east, this area gradually transitions into the post oak savanna. The deep sandy soils and undulating topography create unique wetlands at the bases of large sand hills where the water is forced to the surface by the underlying clay layer. This PARCA covers what is generally thought to be the range of the federally endangered Houston toad in the northwestern part of its distribution.

Habitat Description: The majority of this PARCA falls within the Southern Post Oak Savanna ecoregion, which historically was a post oak savanna, but current land cover is a mix of post oak woods, improved pasture, and rangeland. Although post oaks (*Quercus stellata*) predominate, the woods can contain other trees, such as blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), and eastern redcedar (*Juniperus virginiana*). Sand exposures within these Tertiary deposits have a distinctive sandyland flora, and in a few areas unique bogs occur with their own unique vegetation.

This PARCA also includes the Bastrop Lost Pines and parts of the San Antonio Prairie, Brazos River, and Colorado River. The Bastrop Lost Pines ecoregion is an outlier of relict loblolly pine (*Pinus taeda*) and hardwood upland forest occurring on some dissected hills just east of the city of Bastrop in Bastrop County. This region also has some small areas of sphagnum bogs containing ferns and carnivorous pitcher plants. The San Antonio Prairie is a narrow, 100-mile long region occurring primarily on the Eocene Cook Mountain Formation. This mostly treeless belt of grassland contrasts with the post oak savanna of the surrounding Southern Post Oak Savanna. Surrounding the Brazos and Colorado Rivers, land cover is mostly cropland and pasture.

Focal Species:

- Reptiles
    - Smooth Softshell (*Apalone mutica*)
    - Spiny Softshell (*Apalone spinifera*)
    - Snapping Turtle (*Chelydra serpentina*)
    - Alligator Snapping Turtle (*Macrochelys temminckii*)
    - Texas Map Turtle (*Graptemys versa*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Ornate Box Turtle (*Terrapene ornata*)

    - Red-eared Slider (*Trachemys scripta elegans*)
    - Western Diamond-backed Rattlesnake (*Crotalus atrox*)
    - Timber Rattlesnake (*Crotalus horridus*)
    - Plains Hog-nosed Snake (*Heterodon nasicus*)
    - Western Massasauga (*Sistrurus tergeminus*)
    - Slender Glass Lizard (*Ophisaurus attenuatus*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
- Amphibians
    - Houston Toad (*Anaxyrus houstonensis*)
    - Woodhouse's Toad (*Anaxyrus woodhousii*)
    - Crawfish Frog (*Lithobates areolatus*)
    - Cajun Chorus Frog (*Pseudacris fouquettei*)
    - Strecker's Chorus Frog (*Pseudacris streckeri*)

Threats:

- Fire suppression
- Wildfire
- Overgrazing
- Feral hogs
- High-speed rail lines
- Energy infrastructure
    - Pipelines
    - Transmission lines
- Urbanization/ development

Opportunities:

- Texas State University (TSU)
- TAMU
- TPWD

Research/ Conservation Needs:

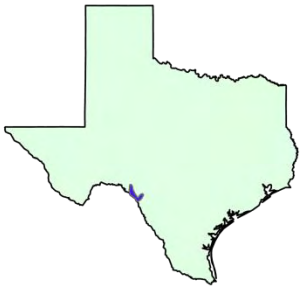
Information Needed

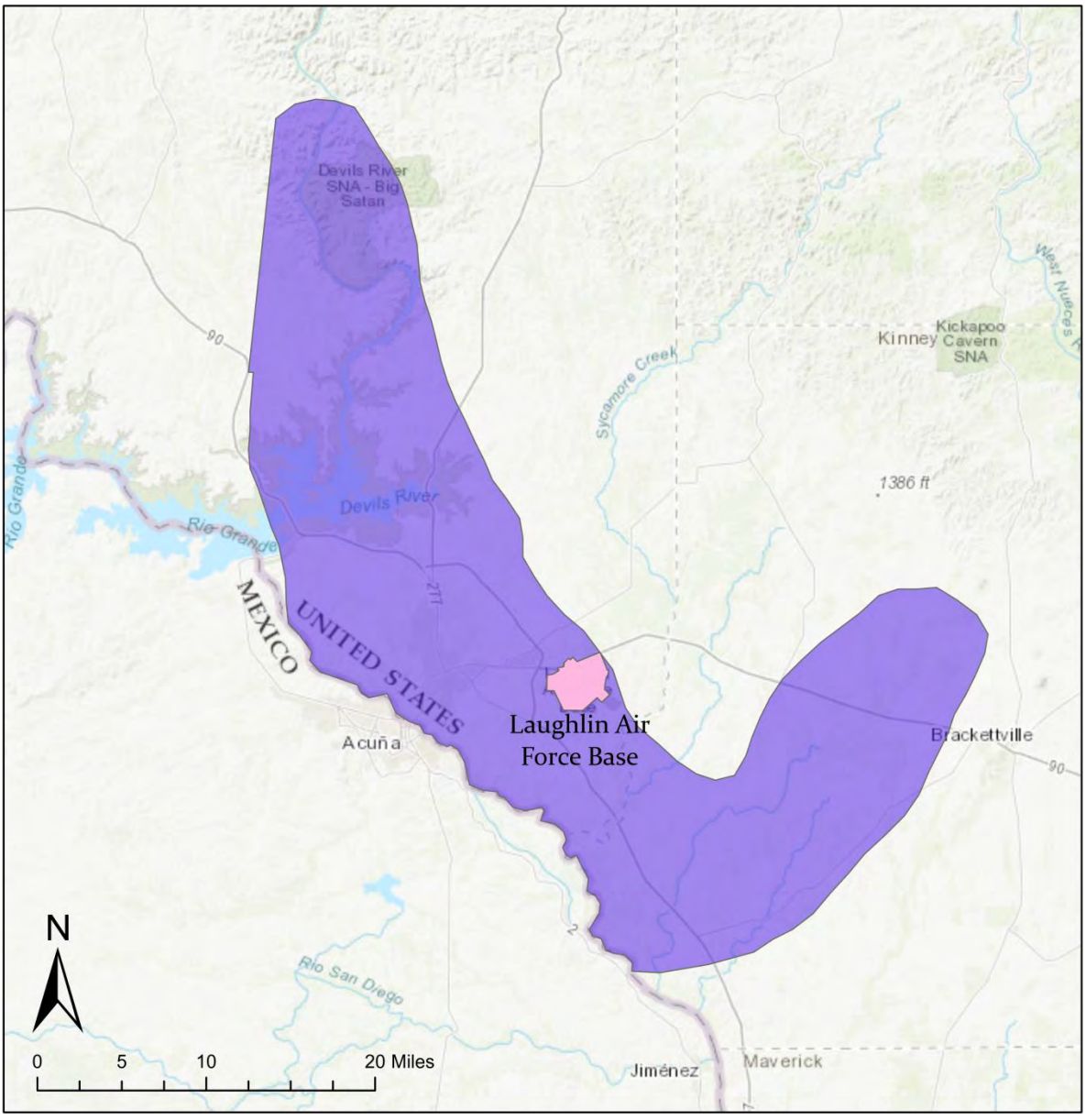
Habitat Management Recommendations:

- Manage for natural fire regimes and other natural disturbance processes
- Use prescribed grazing management techniques to minimize overgrazing
- Protect temporary ponds (i.e. vernal pools, playa lakes, and stormwater ponds) within prairies
- Prevent or control invasion by invasive or exotic species
- Maintain natural hydrological cycles in restored wetlands where possible

    - Discourage center-pivot irrigation and other forms of groundwater discharge
- Maintain old-growth stands of forests whenever possible
- Identify and protect amphibian breeding sites
- Protect nested habitats within woodlands, including wetlands, ephemeral pools, springs, seeps, caves, cliffs, ravines, rock outcrops, and talus slopes
    - Buffer zones should be used to protect targeted features and natural habitats
- Retain naturally vegetated corridors between agricultural areas where possible
- Use native plants, wood chip berms, hay bales, and staggered siltation fencing for erosion control in areas surrounding wetlands and their terrestrial buffer on agricultural land
- Limit livestock access to wetlands where possible
- Protect and maintain riparian and wetland areas in urban settings, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) of streams and wetlands
- Identify and protect existing special habitat features in urban areas such as streams, wetlands and rock outcroppings
- Encourage landscaping with native species
- Encourage and support public education programs about the values of local wildlife (keeping cats indoors, not killing snakes, etc.)

PRONATURA, TEXAS





PARCA: Pronatura

Overlapping DoD Installation: Laughlin Air Force Base

General Description: This region was identified primarily based upon aquatic representation of the herpetofauna because of endemic spring salamanders and to some degree, an aquatic turtle. The geography is bounded by encompassing drainages with perennial surface water and connectivity within the Rio Grande Basin. It includes the entire flowing section of the Devils River in the northwest projection, the confluence of the Devils River with the Rio Grande as Amistad Reservoir, the entire Pinto Creek watershed, and portions of the Rio Grande and spring-fed drainages between Amistad Reservoir and Pinto Creek's confluence with the Rio Grande, most notably San Felipe Del Rio Spring in the city of Del Rio. The drainages and basins extend from uplands down to the Rio Grande riverbottom floodplain. Pinto Creek, San Felipe Creek, and the Devils River are all sustained by springs, and have perennial flow. Pinto Creek can become intermittent or nearly so during drought cycles in its lowest reach above the confluence, but San Felipe and the Devils River are reliably larger permanent inflows to the Rio Grande. Amistad Reservoir is sustained with inflows not just from the Devils River but also by the Pecos River and Rio Grande/Rio Concho. The adjacent Mexican state is Coahuila and there are spring inflows to the Rio Grande downstream of Amistad Dam from Mexico. The watercourses with perennial flows are lined with accompanying riparian vegetation, including some forest portions with large riverbottom tree species such as plateau live oak and pecan, Subirrigated exposed gravel bars and some bedrock reaches have sycamores. Where those woodlands are absent, the banksides may be giant cane thickets or native shrublands, or along the Devils River, expose bedrock ledges and sometimes sheer cliffs and bluffs. The sole major metropolitan area is the city of Del Rio, along with the adjacent Laughlin US Air Force Base. Most rural residents are on private ranches or in small farming communities along the Rio Grande. There is some cultivated farmland or pasture along the river just south of Del Rio, mostly sustained by a diversion canal downstream of Del Rio above the confluence with Pinto Creek. Most of the Pronatura Region is private ranchland with the exception of TPWD state park lands along the Devils and TNC's Dolan Falls Preserve. Within the Devils River Basin, there is approximately 160,000 acres of protected conservation lands, TPWD, TNC, and private-owned ranchlands under conservation easements. The majority of the upland wildlands are rangeland of working ranches or recreational hunting properties. The area was a major sheep and goat ranching area for over a century, with some ranches continuing in that enterprise. Biodiversity of the area has two primary contributors. One is that it is in the interface zone of the Edwards Plateau, the Chihuahuan Desert, and the Tamaulipan Thornscrub, with Plateau representation from the east, Tamaulipan Thornscrub from the south, and Chihuahuan Desert to the west. The other is the biota of the Rio Grande Basin as a subset of the much larger aquatic representation including all contributing perennial rivers of the larger region.

Habitat Description: The uplands habitats include predominantly Tamaulipan Thornscrub in the southern portion, foothills, and toe slopes in the northern portion; Edwards Plateau and Chihuahuan Desert influences on slopes; and plateau tops in the northern (canyon and hills) portion. As above, the entire region includes components and communities of all three intersecting ecoregions. Along watercourses throughout, an Edwards Plateau representation of plateau live oaks and some sycamores is present in floodplain riverbottom forests and as riparian gallery woodlands, with mature pecans in the deeper soils of the floodplains. Cane thickets line segments of the riverbanks of both the Rio Grande and Devils River.

Focal Species:

- Reptiles
    - Texas Indigo Snake (*Drymarchon melanurus erebennus*)
    - Berlandier's Tortoise (*Gopherus berlandieri*)
    - Northern Spot-Tailed Earless Lizard (*Holbrookia lacerata lacerata*)
    - Southern Spot-tailed Earless Lizard (*Holbrookia lacerata subcaudalis*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Rio Grande Cooter (*Pseudemys gorzugi*)
- Amphibians
    - *Eurycea* sp. -undescribed species from San Felipe Del Rio Spring and Devils River, may be two new species

Threats:

- Water extraction from wells in these spring-sustained waterways- Kinney County has a groundwater management regulatory district, Val Verde County doesn't, and coverage in Maverick County is uncertain
    - Fracking (commercial sale possibility and reality in the Devils River basin)
    - Urban use - threat of wells and pipelines for delivery to large metropolitan centers
    - Agriculture – some irrigation water from wells or Rio Grande diversion downstream of Del Rio, minimal use for livestock watering
- Direct impacts to surface habitat (modification of springs)
- Invasive wildlife
    - Feral swine
    - Predatory non-native fish
    - Asiatic clams (may be of no impact to reptiles, unknown)
    - Non-native red-eared sliders - competition
- *Arundo*
- Rangeland conditions – the area was settled and operated as sheep and goat ranches for well more than a century. Many ranches have converted to recreational hunting properties from livestock operations and some of those are under conservation easement in the Devils River basin. Livestock ranches do occur throughout the region still, many of

which are also hunting operations. Two factors exist: one, the historic land use changes from livestock grazing and the other: continuing livestock pasturing and in some cases range improvement such as with brush clearing.

Opportunities:

- TPWD
- TNC
- NPS (Amistad National Recreation Area)
- International Boundary and Water Commission (IBWC)
- Devils River Conservancy
- Laughlin Air Force Base - spot-tailed earless lizard

Research/ Conservation Needs:

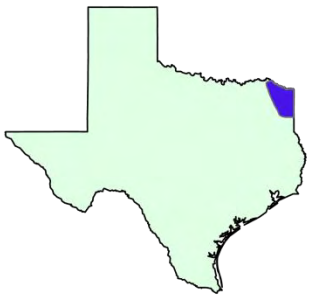
- Inventory and monitoring (e.g., Fort Clark)
- Need formal description of *Eurycea* sp. salamander
- Suitable native habitat for spot-tailed earless lizard- where they're found is human-modified

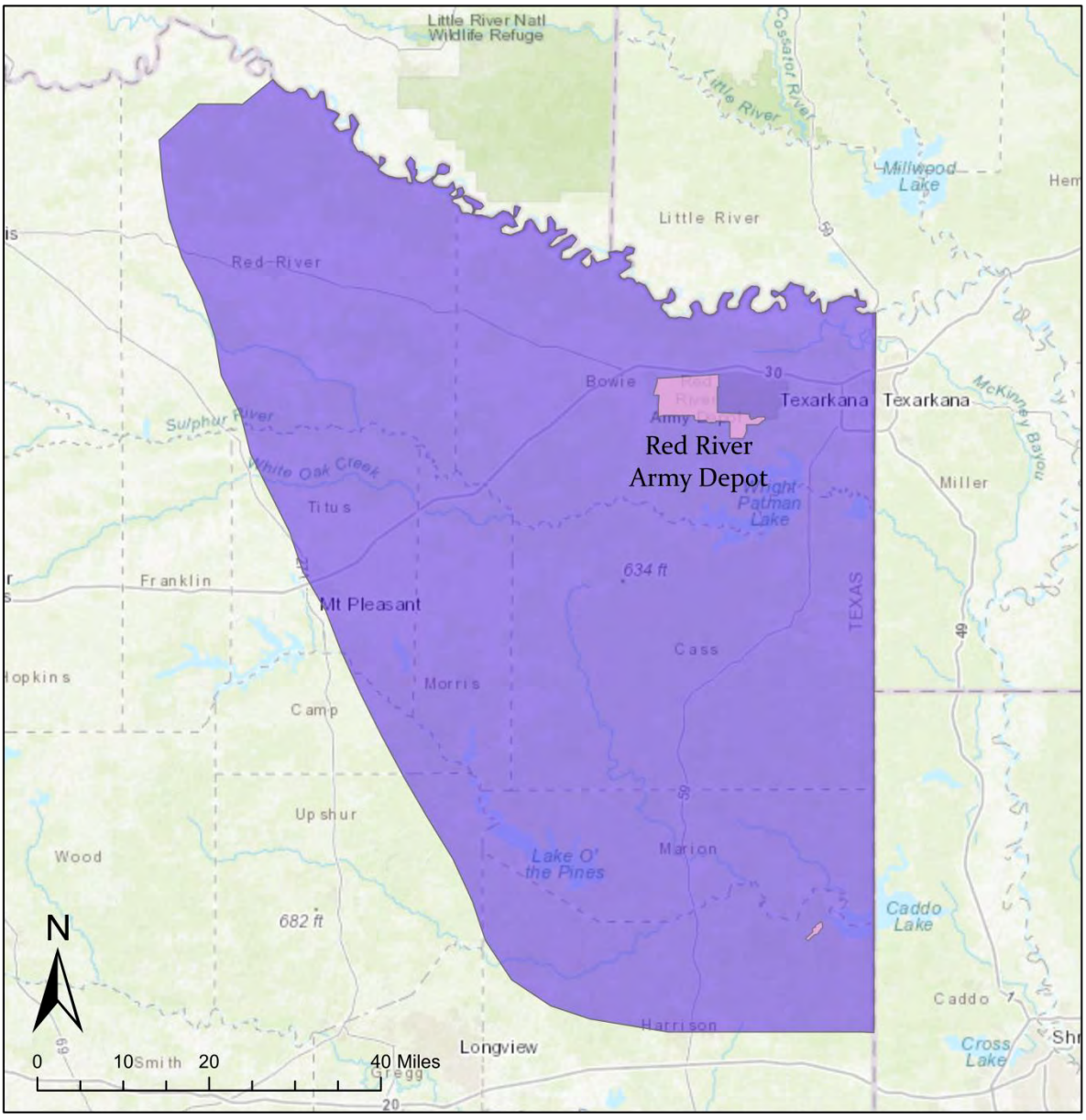
Habitat Management Recommendations:

- Integrity and perennially-sustained discharge of spring outflows
- Providing bankside habitat and alluvial terrace reaches for turtle nesting (giant cane removal)

Other Comments: Reptile diversity is high in the Pronatura region, and even including the rarer ones here, have a wider distribution in each species' case. The rarest species of conservation concern is the earless lizard, at the intersection between the currently named two subspecies which warrants full species recognition for each. The region is a known population center for the Rio Grande Cooter and has been reportedly over-harvested by commercial collectors at San Felipe Springs in at least one episode.

CADDOAN, TEXAS





PARCA: Caddoan

Overlapping DoD Installation: Red River Army Depot

General Description: The Caddoan PARCA is in northeast Texas on the border of Louisiana, Arkansas, and Oklahoma. The area is primarily privately owned with some Department of Defense land, state parks, and conservation easements. The majority of this PARCA falls within the South Central Prairie Tertiary Uplands and Northern Post Oak Savanna ecoregions and includes parts of the Sulfur River, White Oak Creek, and the Black Cypress, Big Cypress, and Little Cypress Bayous.

Habitat Description: The landscape of the South Central Prairie Tertiary Uplands is rolling, gently to moderately sloping, and dissected by numerous small streams. The region contains a diversity of habitats and species. The natural vegetation has been altered by multiple timber harvests and commercial pine plantation activities. The pine-hardwood forests includes tree of loblolly pine (*Pinus taeda*), shortleaf pine (*P. echninata*), southern red oak (*Quercus falcata*), post oak (*Q. stellata*), white oak (*Q. alba*), hickory (*Carya spp.*), and sweetgum (*Liquidamber styraciflua*), and mid and tall grasses such as yellow Indiangrass (*Sorghastrum nutans*), pinehill bluestem (*Schizachyrium scoparium var. divergens*), narrowleaf woodoats (*Chasmanthium sessiliflorum*), and panicums (*Panicum spp.*). American beautyberry (*Callicarpa americana*), sumac (*Rhus spp.*), greenbriar (*Smilax spp.*), and hawthorn (*Crataegus spp.*) are part of the understory. Many areas of the ecoregion are replanted to loblolly pine for timber production, or are in improved pasture. Lumber and pulpwood production, livestock grazing, and poultry production are typical land uses. Oil and gas production activities are also widespread.

The Northern Post Oak Savanna ecoregion is characterized by level to rolling irregular plains that are moderately dissected and low to moderate gradient streams with sandy substrates. The deciduous forest or woodland is composed mostly of post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), eastern redcedar (*Juniperus virginiana*), and black hickory (*Carya texana*). The understory can include yaupon (*Ilex vomitoria*), farkleberry (*Vaccinium arboreum*), winged elm (*Ulmus alata*), and American beautyberry (*Callicarpa americana*). Prairie openings contained little bluestem (*Schizachyrium scoparium*) and other grasses and forbs. Some coniferous trees occur, especially on the transitional boundary with the South Central Prairie Tertiary Uplands. Loblolly pine (*Pinus taeda*) has been planted in several areas.

There is a small region of the Northern Prairie Outliers ecoregion where vegetational influences from surrounding ecoregions come together, allowing dense pine and hardwood forests to surround disjunct patches of open blackland prairie. Burning was important in maintaining grassy openings, and woody invasions have taken place in parts of the region in the absence of fire. Current land cover of the region is mostly pasture, with some cropland.

Focal Species:
Information Needed

Threats:
- Unsustainable timber practices
- Forest conversion and clearing
- Fire suppression
- Reservoir expansion
- Invasives: feral hogs, vegetation (Chinese tallow, Chinese privet, water hyacinth, *Lygodium*, *Salvinia*)
- Loss of prairie remnants
- Trotlining (any indiscriminate fishing methods will affect turtles)
- Natural resource mining (salt, sand, coal, etc.)
- Loss of bottomland hardwood habitat; this area has the best bottomland left in the state

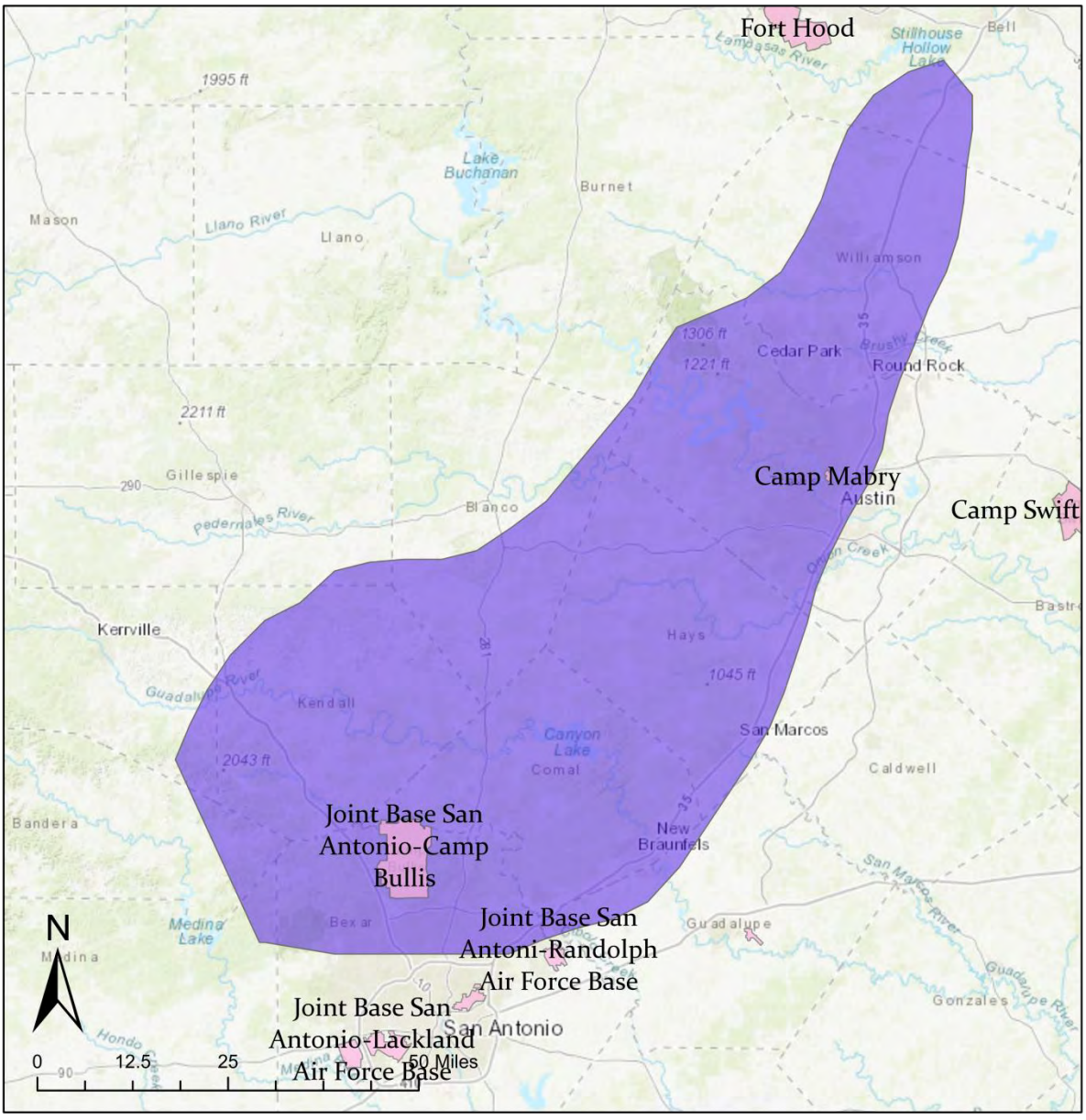
Opportunities:
- TAMU/Texas Forest Service
- Private land incentives
- TWPD - LIP (Landowner Incentive Program), parks, WMAs
- FWS - Partners in Wildlife program
    - Wetland mitigation fund
- NRCS farm bill programs EQIP, ACEP
- Corps water management
- TNC (sanctuaries, conservation easements)
- River authorities (e.g., Neches)
- Timber Investment Management Organizations (e.g., Campbell, Hancock)
- Wetland mitigation banks (fill section 404 requirements)
- Land trusts
- NFWF
- The Conservation Fund - lending program to help acquire land for conservation
- Texas Land Conservancy
- Caddo Lake Institute

Research/ Conservation Needs:
- Landowner educational programs- specifically for venomous snakes
- Inventory and monitoring for all herpetofauna, but would be good to learn more specifically about wormsnakes and American toads; so much private land so don't know much about what's out there

Habitat Management Recommendations:

- During timber harvest, preserve mature stands, but maintain a mixture of forest types and ages (including some openings)
- Avoid or minimize logging sensitive habitats such as vernal pools, seeps, and ravines
- Protect and manage mature hardwood stands
- Maintain and, where necessary, restore the natural fire regime
- Direct foot traffic on and trails away from sensitive embedded habitats such as vernal pools, seeps, ravines, and caves
- In prairies, exclude and remove invasive exotic plant species, woody encroachment, and woody succession
- Maintain and restore natural hydrology in wet grasslands

BALCONIAN, TEXAS



PARCA: Balconian

Overlapping DoD Installations:
Joint Base Antonio- Camp Bullis
Camp Mabry

General Description: The Balconian PARCA is in east-central Texas, spanning south to just north of San Antonio, west to Comfort, and north to Salado. This region includes the Balcones escarpment, Jollyville Plateau, Lake Travis, and Canyon Lake. The Balconian PARCA falls within the Balcones Canyonlands ecoregion, which forms the southeastern boundary of the Edwards Plateau. The Edwards Plateau was uplifted during the Miocene epoch at the Balcones Fault Zone, separating central Texas from the coastal plain.

Habitat Description: The Balcones Canyonlands are highly dissected through the erosion and solution of springs, streams, and rivers working both above and below ground; percolation through the porous limestone contributes to the recharge of the Edwards Aquifer. High gradient streams originating from springs in steep-sided canyons supply water for development on the Texas Blackland Prairies at the eastern base of the escarpment. This ecoregion supports a number of endemic plants and has a higher representation of deciduous woodland than elsewhere on the Edwards Plateau, with escarpment black cherry, Texas mountain-laurel, madrone, Lacey oak, bigtooth maple, and Carolina basswood. Some relicts of eastern swamp communities, such as baldcypress, American sycamore, and black willow occur along major stream courses. It is likely that these trees have persisted as relics of moister, cooler climates following the Pleistocene glacial epoch. Toward the west, the vegetation changes gradually as the climate becomes more arid. Plateau live oak woodland is eventually restricted to north and east facing slopes and floodplains, and dry slopes are covered with open shrublands of juniper, sumac, sotol, acacia, honey mesquite, and ceniza.

Focal Species:

- Reptiles
    - Northern Spot-Tailed Earless Lizard (*Holbrookia lacerata lacerata*)
    - Common Lesser Earless Lizard (*Holbrookia maculata*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Texas Gartersnake (*Thamnophis sirtalis annectens*)
- Amphibians
    - *Eurycea* sp 1 (Pedernales River basin) (Chippindale et al 2000)
    - *Eurycea* sp 2 (Hillis et al section 6 report – ask Tom Devitt; publication in preparation)

- *Eurycea* sp 3 (Hillis et al section 6 report – ask Tom Devitt; publication in preparation)
- Salado Salamander (*Eurycea chisolmensis*)
- Cascade Caverns Salamander (*Eurycea latitans*)
- San Marcos Salamander (*Eurycea nana*)
- Georgetown Salamander (*Eurycea naufragia*)
- Texas Salamander (*Eurycea neotenes*)
- Fern Bank Salamander (*Eurycea pterophila*)
- Texas Blind Salamander (*Eurycea rathbuni*)
- Blanco Blind salamander (*Eurycea robusta*)
- Barton Springs Salamander (*Eurycea sosorum*)
- Jollyville Plateau Salamander (*Eurycea tonkawae*)
- Comal Blind Salamander (*Eurycea tridentifera*)
- Austin Blind Salamander (*Eurycea waterlooensis*)

Threats:

- Habitat loss and fragmentation (terrestrial species)
- Urbanization in the form of residential housing and associated infrastructure
- Invasive species (fire ants, exotic grasses, domestic cats)
- Long-term changes in habitat (may be due to changes in land management practices and/or climate change)

Opportunities:

- TDFW
- DoD
- USFWS
- BOR
- TNC
- City of San Antonio Conservation Easements
- City of Austin Conservation Easements
- State Parks
- NRCS
    - Farm and Ranch Lands Protection Program
- Municipal Parks

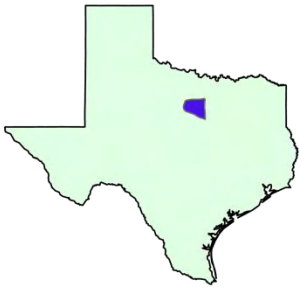
Research/ Conservation Needs:

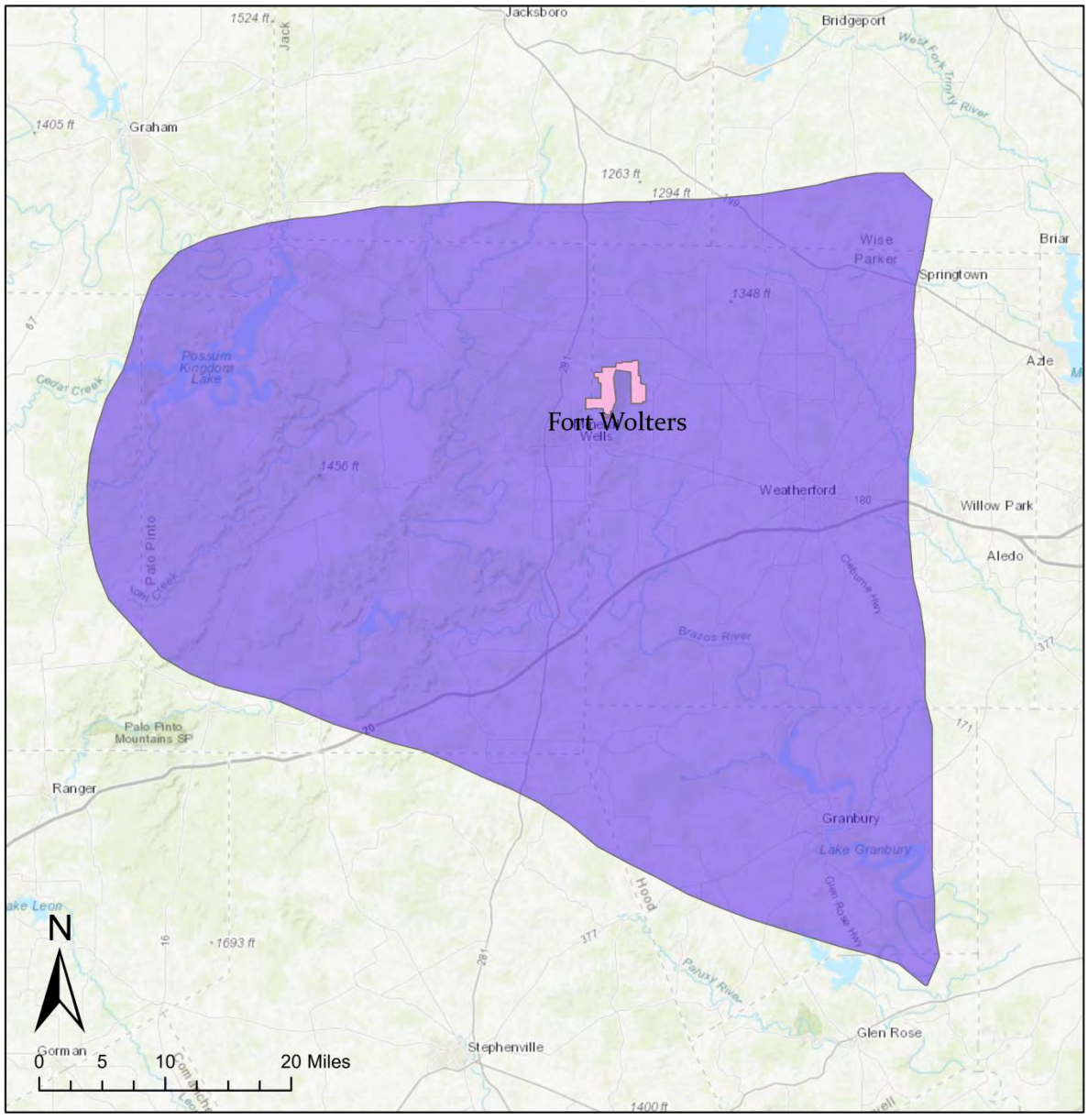
Information Needed

Habitat Management Recommendations:

- Protect and maintain riparian and wetland areas in urban settings, including the maintenance of pre-development hydrology (depth, duration, and frequency of flooding) of streams and wetlands
- Identify and protect existing special habitat features in urban areas such as streams, wetlands and rock outcroppings
- Encourage landscaping with native species
- Minimize the effects and spread of invasive species
- Encourage and support public education programs about the values of local wildlife (keeping cats indoors, not killing snakes, etc.)
- Encourage use of educational signage at animal migration routes
- Promote a diversity of habitats within woodlands where possible
- Maintain or mimic natural disturbance processes to reset succession
- Minimize habitat fragmentation when converting woodlands to other uses
- Maintain old-growth stands od deciduous and mixed forest wherever possible
- Buffer zones should be used to protect targeted features and natural habitats
- Retain buffers along streams in woodlands bordering riparian zones
- Identify and protect amphibian breeding sites

WESTERN CROSS TIMBERS AND PRAIRIES, TEXAS





PARCA: Western Cross Timbers and Prairies

Overlapping DoD Installation: Fort Wolters

General Description: This region is somewhat arbitrarily designated because it does not have a biophysical boundary to define it as containing a unique ecosystem such as a single river basin. However, much of it contains a Brazos River basin portion that encompasses much of the range of Brazos River watersnake. It is an amalgamation of the prairie, western crosstimbers, and riverbottom forests defined by soil types. The terrain includes steep Brazos and associated drainages' bluffs, rolling to level prairie lands with wooded watercourses, and riverbottom floodplains. Very relevant to this geography is the presence and expansion of urban/suburban centers with several cities and towns as well as the westward commuter expansion of the Fort Worth portion of the Metroplex.

Habitat Description: The three primary terrestrial habitat types that characterize the region are the Western Crosstimbers (an identifiable ecosystem type mapped in Texas based on sandy substrates), remnants of the tall- to mid-grass prairies on limestone-derived soils on rolling slopes and hills, and riverbottom alluvial floodplains and terraces along larger rivers and streams. Prairies also have ephemeral drainages which are important breeding habitat for anurans (primarily chorus frogs), the smallmouth salamander, and the Texas gartersnake.

Focal Species:

- Reptiles
    - Smooth Softshell (*Apalone mutica*)
    - Canebrake Rattlesnake (*Crotalus horridus atricaudatus*)
    - Chicken Turtle (*Deirochelys reticularia*), occurrence uncertain
    - Common Lesser Earless Lizard (*Holbrookia maculata*)
    - Brazos River Watersnake (*Nerodia harteri*)
    - Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*)
    - Texas Horned Lizard (*Phrynosoma cornutum*)
    - Eastern Massasauga (*Sistrurus catenatus*)
    - Pygmy Rattlesnake (*Sistrurus miliarius*)
    - Eastern Box Turtle (*Terrapene carolina*)
    - Ornate Box Turtle (*Terrapene ornata*)
    - Texas Gartersnake (*Thamnophis sirtalis annectens*)
- Amphibians
    - Small-mouthed Salamander (*Ambystoma texanum*)
    - Woodhouse's Toad (*Anaxyrus woodhousii*)

Threats:

- Urbanization (metroplex expansion and suburban growth at "commuter" cities) with ranchland subdivision for suburban development
- Land condition: erosion, fire suppression and woody encroachment altering prairie integrity and expense and overgrazing – needs clear look at true impact on prairie herpetofauna
- Altered hydrologic regimes
- Oil & gas extraction – padsites, pipelines and service roads, increased vehicular traffic
- Exotics: Chinaberry, privet, non-native grasses, feral swine, feral domestic cats and dogs

Opportunities:

- Native Prairie Association of Texas
- TPWD- some state park lands within region
- Fort Worth Nature Center and Refuge
- Other urban park and greenway developments

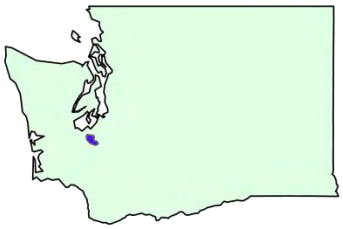
Research/ Conservation Needs:

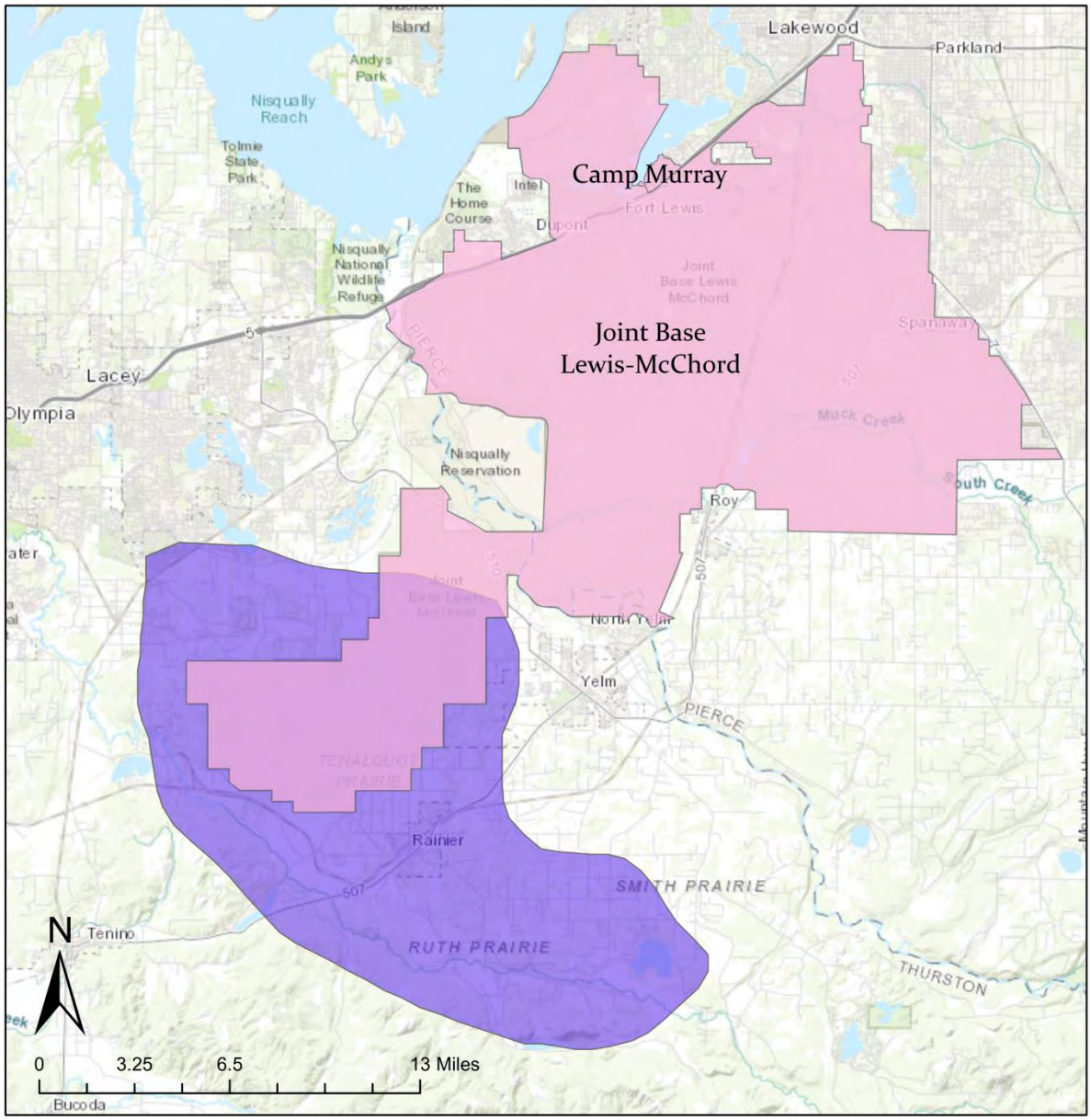
- Continued status and inventory of Texas gartersnake
- Monitor for decline and status of Woodhouse's toad
- Vigilance in monitoring and updating status of Brazos River watersnake

Habitat Management Recommendations: No recommendations were identified at present given that this is predominantly a private lands landscape and outside of public conservation/natural resource lands like state parks. Little impetus or emphasis is placed on private lands habitat improvement.

Washington

NISQUALLY, WASHINGTON





PARCA: Nisqually

Overlapping DoD Installation: Joint Base Lewis-McChord

General Description: The Nisqually region is located in the Puget Lowland Forests ecoregion in Thurston County, the majority of which is part of Joint Base Lewis-McChord's Rainier Training Area. The region also includes part of the town of Rainier and some busy local roads.

Habitat Description: The focal breeding habitat is comprised of many small pothole and kettle wetlands. Coniferous forest and native prairie dominate the upland portions of this PARCA.

Focal Species:

- Reptiles
    - Northern Rubber Boa (*Charina bottae*)
- Amphibians
    - Coastal Giant Salamander (*Dicamptodon tenebrosus*)
    - Western Toad (*Anaxyrus boreas*)
    - Oregon Spotted Frog (*Rana pretiosa*)
    - Northern Red-legged Frog (*Rana aurora*)

Threats:

- Climate change
- Recreation
- Logging activity (currently mitigated with timing restrictions near Western toad breeding wetlands)

Opportunities:

- Northern rubber boa surveys
- Education and outreach to private landowners and the local community
- Partnership potential- city, town, county critical areas managers, per the Growth Management Act and Critical Area Ordinances, which include wildlife habitat conservation areas such as PARCAs
- Oregon spotted frog repatriation efforts at Joint Base Lewis-McChord

Research/ Conservation Needs:

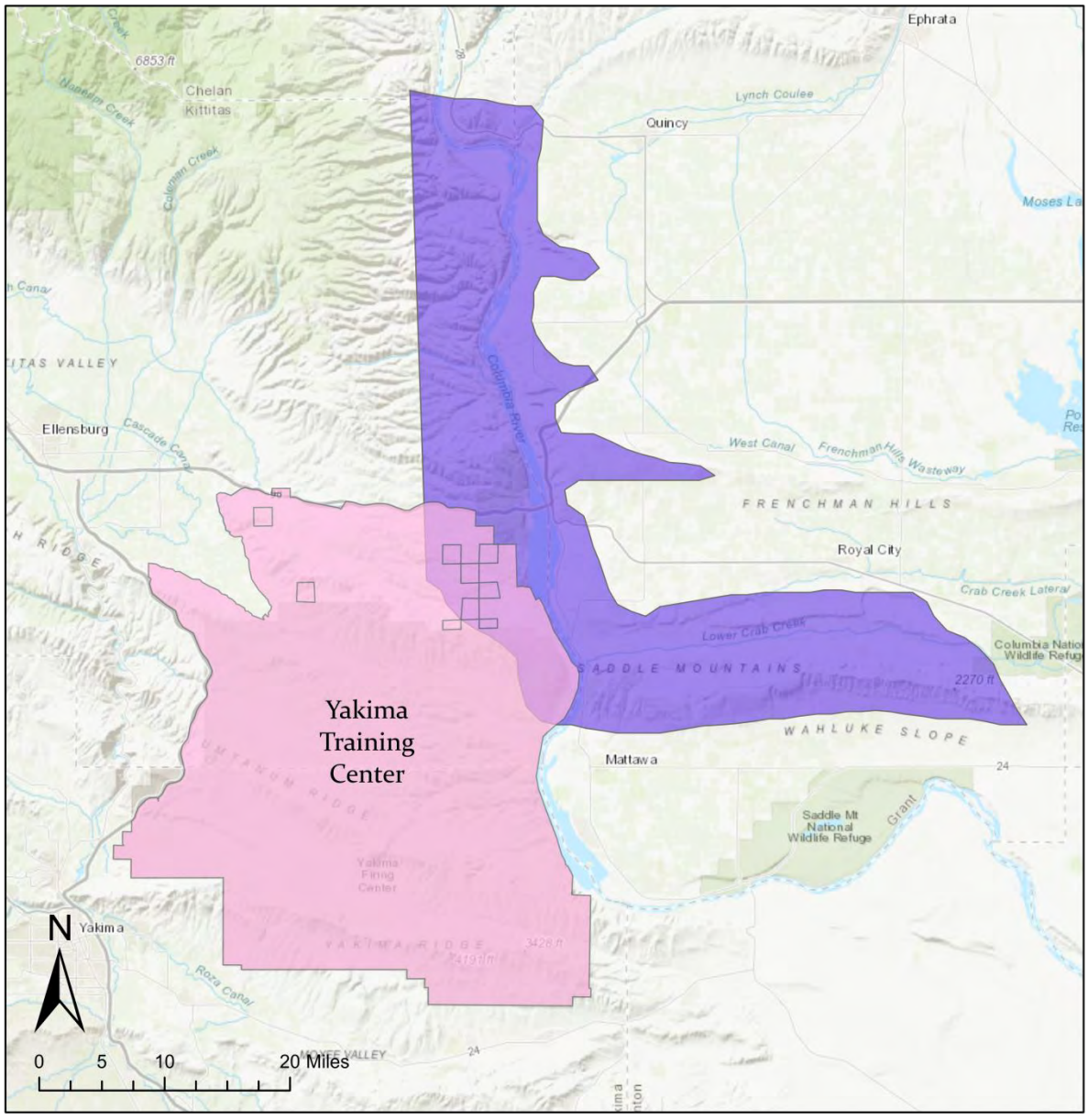
- Determine how toads are using landscape post breeding to better understand seasonal movement, particularly if there is a time of year they are deeper in the soil
- Understanding impacts of changes in hydrologic patterns on toads
- Inventory to understand full extent of occurrence; toads travel for miles (can travel 5 km in 5 months, and that's a straight-line distance) and end up on private lands

- Examine habitat use by toads during timber sale activities in order to adjust logging activity timing

Habitat Management Recommendations: Maintain existing restrictions in Integrated Resource Natural Management Plan (INRMP). Although the Western toad is not a federally listed species, it has some protections under Joint Base Lewis-McChord's INRMP.

Other Comments: Although Western toads are present in significant numbers within other PARCAs, this PARCA was designated as significant due to the dramatic loss in lowland toad populations.

WANAPUM, WASHINGTON



PARCA: Wanapum

Overlapping DoD Installation: Yakima Training Center

General Description: The Wanapum PARCA is located near the Wanapum Dam in an Ice Age flood-carved basalt landscape that is interspersed with sand dunes. Ownership is a mix of federal and private lands. Much of the native shrub-steppe landscape in the vicinity has been converted to irrigated agriculture.

Habitat Description: Wanapum contains shrub-steppe dominated habitat in the driest areas of the central Columbia Basin. The geology is a result of Miocene basalt lava flows, Spokane Floods, and Columbia River sand deposition. Vegetation on the basalt outcrops is sparse with a variety of small shrubs including stiff sage and purple sage. Soils surrounding the basalt outcrops are sandy and supported larger shrubs including big sage and spiny hopsage. Native grasses in the sandy areas are primarily needle-and-thread grass and Indian ricegrass. Cheatgrass and other exotic invasive weeds are present but cover is typically low on the basalt outcrops, shallow lithosols, and in sandy habitats exposed to wind. Native habitat is fragmented primarily by agriculture. Irrigation water seeps to the surface in some areas resulting in changes to the native vegetation and colonization by willow and non-native phragmites.

Focal Species:

- Reptiles
    - Pygmy Short-horned Lizard (*Phrynosoma douglasii*)
    - Sagebrush Lizard (*Sceloporus graciosus*)
    - Side-blotched Lizard (*Uta stansburiana*)
    - Striped Whipsnake (*Coluber taeniatus*)
    - Desert Nightsnake (*Hypsiglena chlorophaea*)
- Amphibians
    - Tiger Salamander (*Ambystoma mavortium*)

Threats:

- Heavy ATV and other destructive recreational use
- Fire
- Invasives: cheatgrass, phragmites
- Water inundation from agriculture
- Heavy traffic and other road threats
- Increased agricultural activity
- Population growth
- Basalt harvesting/mining

Opportunities:

- Bioblitz
- Citizen science programs
- Outreach and education
    - Ice Age Flood Trail (interpretive centers)
    - Ice Age Floods Institute
    - Ginkgo Petrified Forest State Park
- Development of site management plans for striped whipsnakes
- Need for fine scaled species management plans (e.g. fire suppression/dozers, chemical management/retardant)
- The Wanapum Natural Area Preserve site has been approved by the state's Natural Heritage Advisory Council- once established, DNR's goal is to acquire all lands identified as eligible for inclusion in the Wanapum Natural Area Preserve project area
- Partnership potential- city, town, county critical areas managers, per the Growth Management Act and Critical Area Ordinances, which include wildlife habitat conservation areas such as PARCAs

Research/ Conservation Needs:

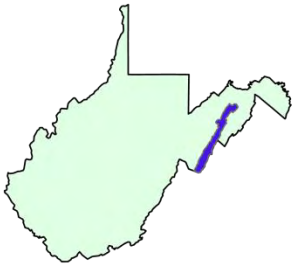
- Determine the effectiveness of outreach and education for snake protection
- Inventory and monitoring on private lands
- Invasive plant species control

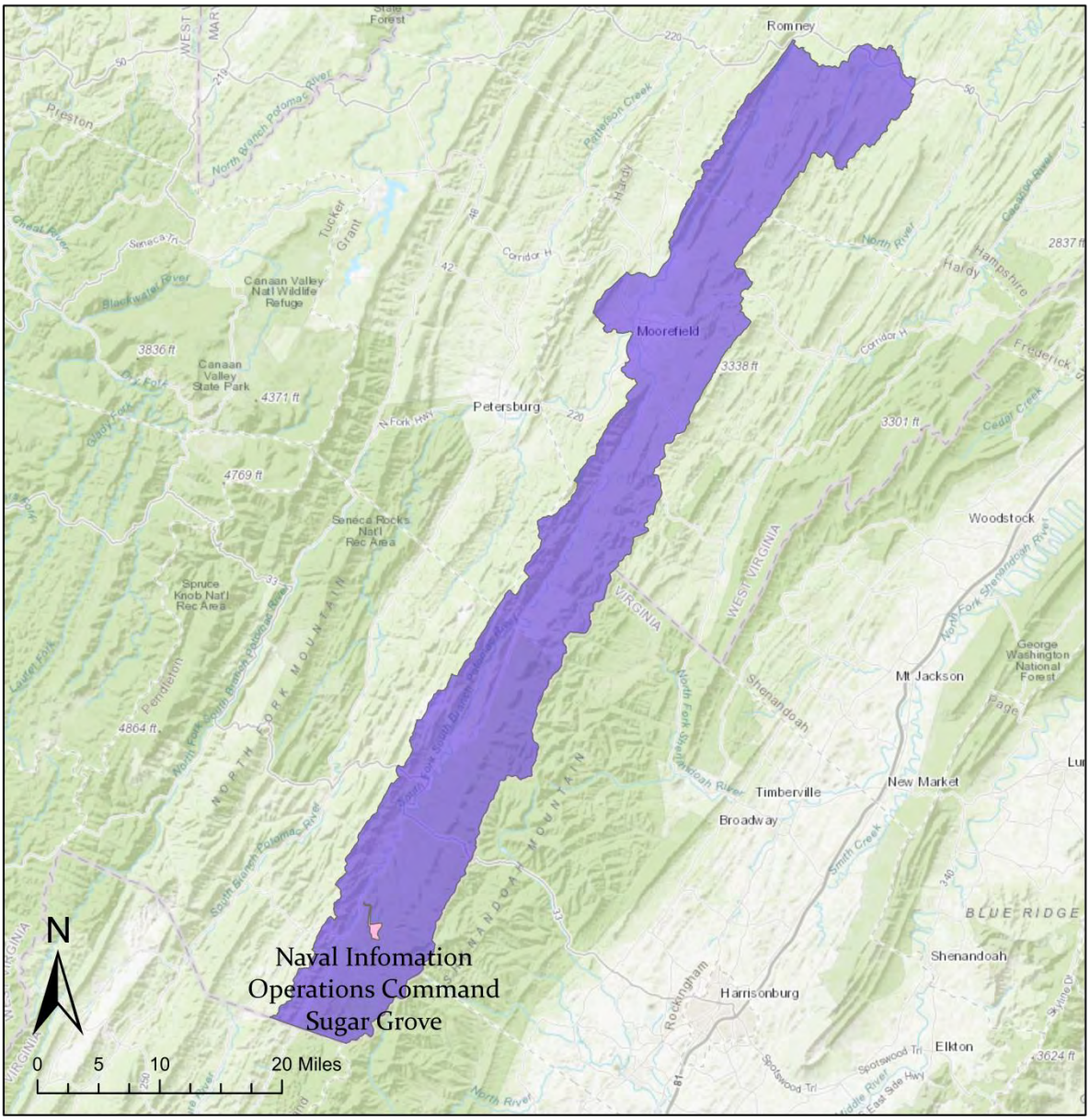
Habitat Management Recommendations:

- Den site protection
- Outreach and education
- Maintain connectivity (road underpasses)
- Protect sand dunes from destructive recreational use and conversion to agriculture
- Protect the basalt from removal and alteration on the public lands within the PARCA

West Virginia

COW KNOB, WEST VIRGINIA





PARCA: Cow Knob

Overlapping DoD Installation: Navy Information Operations Command Sugar Grove

General Description: The Cow Knob PARCA occurs in the Valley and Ridge physiographic province, one of the driest regions in the Appalachians. Shenandoah Mountain is characterized by a long, steep, narrow, sandstone-capped ridgeline and high elevations (up to 1340 m). Talus is common throughout the area. The land cover is almost entirely forested, with mixed oak as the dominant forest type. The three ecoregions within this PARCA are the Northern Shale Valleys, the Northern Sandstone Ridges on the west side, and the Northern Dissected Ridges and Knobs on the east side.

Habitat Description: The Northern Shale Valleys ecoregion is characterized by rolling valleys and low hills and is underlain mostly by shale, siltstone, and fine-grained sandstone. Local relief varies from about 50 feet to 500 feet (15-152 m). The natural vegetation is mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south; bottomland forests also occurred. Today, farming predominates, with woodland occurring on steeper sites.

The Northern Sandstone Ridges ecoregion is characterized by high, steep, forested ridges with narrow crests. Crestal elevations range from about 1,000 feet to 4,300 feet (305-1,311 m) and local relief typically ranges from 500 to 1,500 feet (152-457 m). The natural vegetation is mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, extensive forest covers this ecoregion.

The natural vegetation of the Northern Dissected Ridges and Knobs ecoregion is mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, forest covers most of this ecoregion, but there are also some pastures. Shale barrens occur on steep west and south facing slopes; they consist of stunted trees (including eastern red cedar (*Juniperus virginiana*), Virginia pine (*Pinus virginiana*), and chestnut oak (*Quercus prinus*)), thickets of shrubs (including hawthorn (*Crataegus uniflora*), Allegheny plum (*Prunus alleghaniensis*), huckleberry (*Gaylussacia baccata*)), and herbaceous vegetation (including mountain parsley (*Taenidia montana*), moss pink (*Phlox subulata*), barrens ragwort (*Senecio antennariifolius*), birdfoot violet (*Viola pedata*) and Kate's mountain clover (*Trifolium virginicum*).

Focal Species:

- Amphibians
    - Cow Knob Salamander (*Plethodon punctatus*)
    - Shenandoah Mountain Salamander (*Plethodon virginia*)

Threats:

- Climate change (warming at high elevations)
- Tree mortality from invasive species (gypsy moth and hemlock woolly adelgid)
- Runoff from dirt and gravel roads

Opportunities:

- Research partnerships with West Virginia University

Research and Conservation Needs:

- Field validation of Carl Jacobsen's *Plethodon punctatus* habitat suitability model
- Conservation genetics for isolated *Plethodon punctatus* populations, and addition genetics work to determine if *P. punctatus* should be a subspecies of *P. wehrlei*
- Research focused on vulnerability of *Plethodon punctatus* and *Plethodon virginia* to climate change
- Research focused on general ecology and habitat selection of *Plethodon punctatus* and *Plethodon virginia*

Habitat Management Recommendations:

- Maintain or restore native forest cover, downed woody debris on forest floor, and natural forest floor structure
- Give special consideration to unique habitat features within forests, such as ephemeral wetlands, springs, seepages, and rock outcrops
- To the extent possible, mimic natural disturbance patterns, such as wind-throws and fire, when conducting forest management activities
- Carefully monitor the use of insecticides for control of gypsy moth and other invasive insects
- Limit land disturbance such as clearing and grading and cut fill to reduce erosion and sediment loss
- Limit disturbance of natural drainage features and vegetation
- Develop and implement runoff pollution controls for existing road systems to reduce pollutant concentrations and volumes

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