



DoD Environmental Planning and Conservation Webinar Series



Building Capacity for Managing At-Risk Species to Enable Mission Readiness on Military Installations: Spotted Turtle Status Assessment and Surveys

January 25, 2023

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Building Capacity for Managing At-risk Species on Military Installations: Spotted Turtle (*Clemmys guttata*) Status Assessment and Surveys

Thomas Akre¹ & Jessica Meck¹

with contributions from

Lisabeth Willey², John Garrison², Lori Erb³, and Houston Chandler⁴

¹Conservation Ecology Center, Smithsonian National Zoo & Conservation Biology Institute

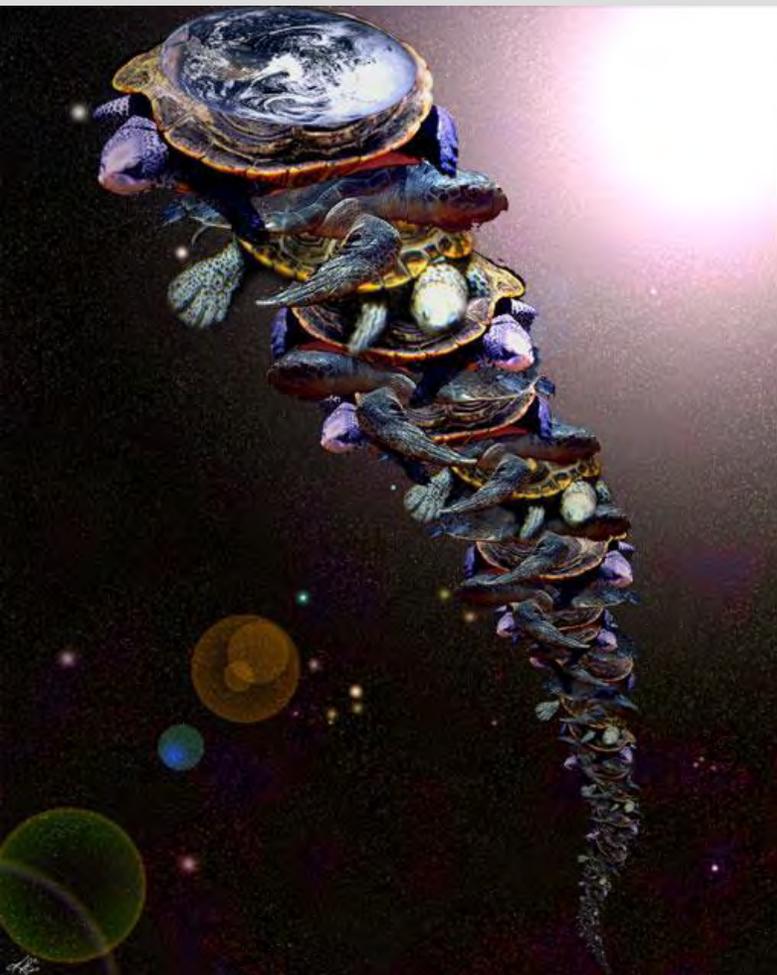
²American Turtle Observatory

³Mid-Atlantic Center for Herpetology and Conservation

⁴The Orianna Society



Turtles all the way down...



Thank you! DoD Legacy Resource Mgmt Program



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DoD Legacy Resource Management Program

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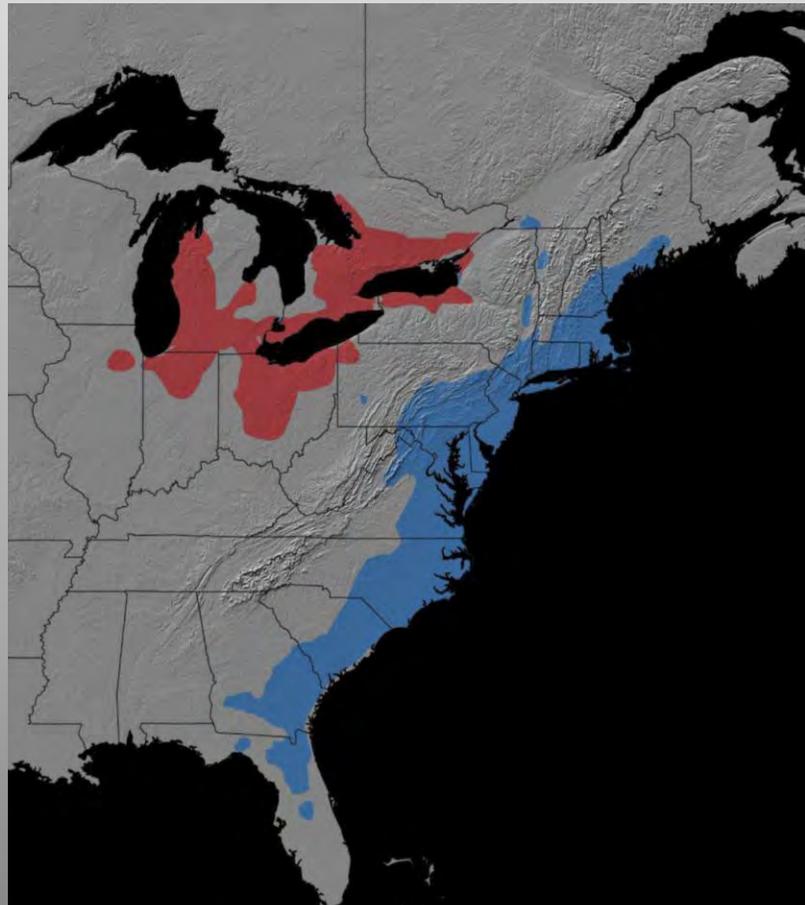
Welcome to the Department of Defense Legacy Resource Management Program

Search DoD Legacy Resource M.

Objectives

- 1) The Spotted Turtle (background and relevance to mission readiness)
- 2) The Purpose of the Cooperative Agreement
- 3) The Approach
- 4) The Results and Conclusions
- 5) Follow-on Actions and Next Steps

Spotted Turtle (*Clemmys guttata*)



J. Meck



J. Meck

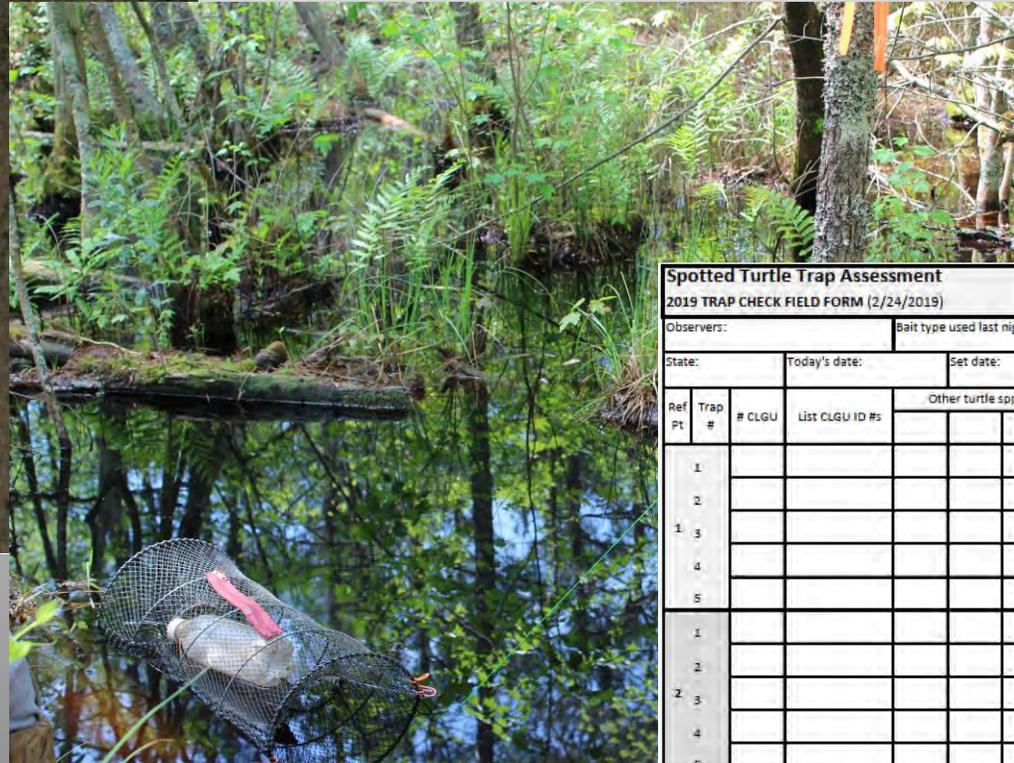
A Regional Status Assessment

Proposal for a Status Assessment
of the Spotted Turtle (Clemmys guttata)
in the Eastern United States



- U.S. Fish and Wildlife Service Competitive State Wildlife Grant (2017-2023)
 - Supplemented with a NEAFWA Regional Conservation Needs (RCN) Grant
 - Maintain populations of Spotted Turtles at or above current levels across participating states and to achieve zero net loss of suitable habitat at high priority sites
 - Project I: Quantify Distributional Trends and Baselines
 - Project II: Assess Population Status at Multiple Scales
 - Project III: Manage Habitat and Populations

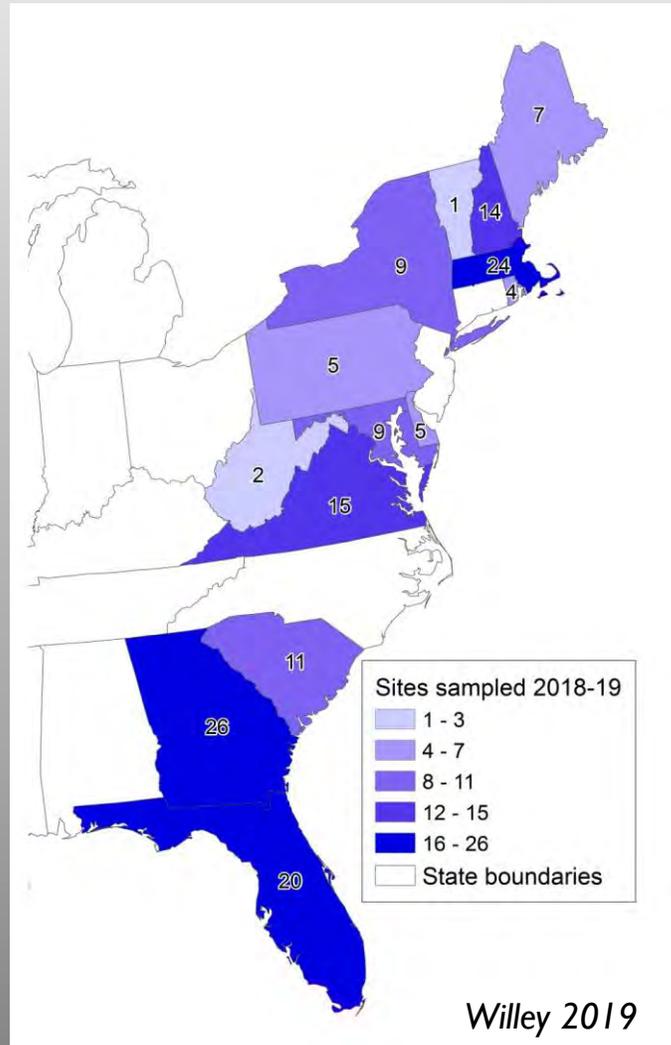
Standardized Monitoring Protocol



Spotted Turtle Trap Assessment							<input type="checkbox"/> TRA	Site Code/Name:	
2019 TRAP CHECK FIELD FORM (2/24/2019)							<input type="checkbox"/> DA		
Observers:			Bait type used last night:			Check this column if the trap is not working			
State:		Today's date:		Set date:		Check this column if predated by racoon			
Ref Pt	Trap #	# CLGU	List CLGU ID #s	Other turtle spp.		Other bycatch	↓	Air Temp (C)	H2O Temp (C)
1									
2									
1	3								
4									
5									
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2									
2	3								
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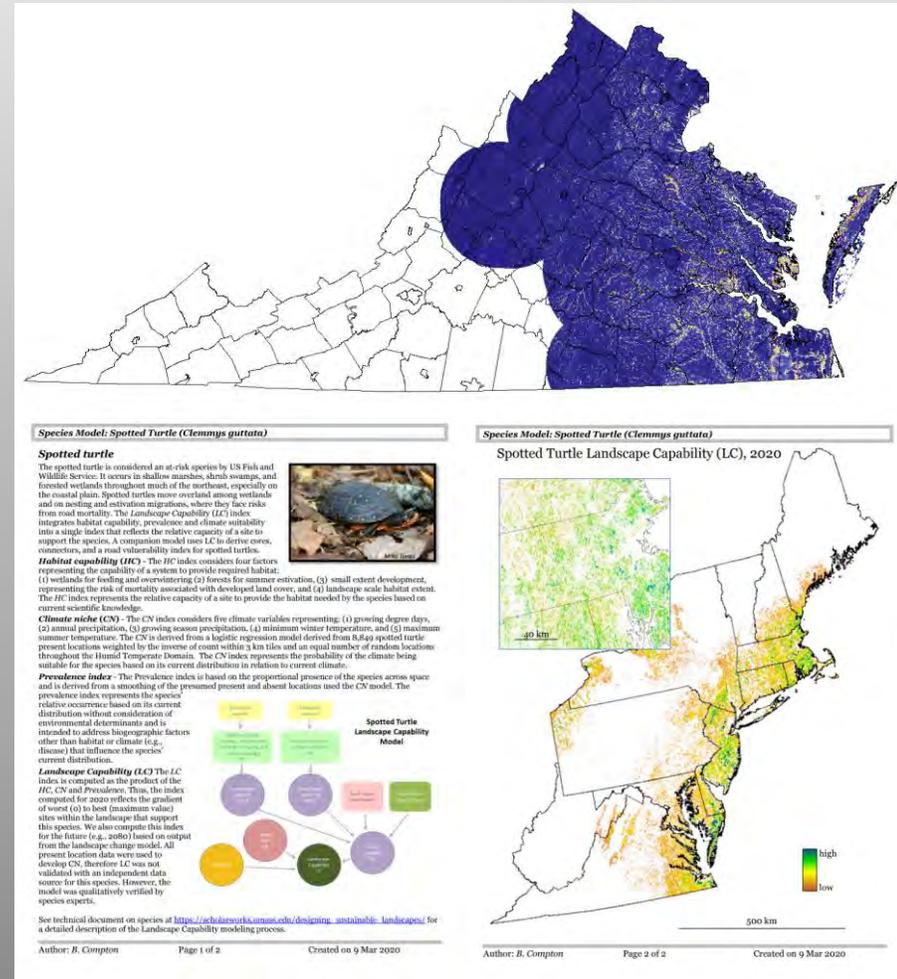
Region-Wide Monitoring (2018-2019 & beyond)



- Virginia Efforts (part of CSWG)
 - 15 Sites
 - 2260 Trap Nights
 - 333 captures
 - 2020 efforts had to be postponed
- North Carolina Efforts (USFWS IAA in support of CSWG)
 - Delayed from 2020 to 2021
 - 5 Sites (USFWS refuges, USFS lands, NC WRC lands)
 - 680 Trap Nights
 - 138 trap captures; 30 hand captures
 - 2020 efforts had to be postponed

Complimentary Models

- CSWG Project I → Species Distribution Model
 - “Predictive Relative Probability of Occurrence”
 - Topographic, climate, and landcover variables
 - Multiple Spatial Scales
- UMass Landscape Ecology Lab → Designing Sustainable Landscapes Project
 - “Landscape Suitability Model (where Spotted Turtles COULD occur)”
 - Habitat Capability
 - Climate Niche
 - Prevalence Index



The Importance of DoD lands to Biodiversity Conservation (T & E species and ecosystems)

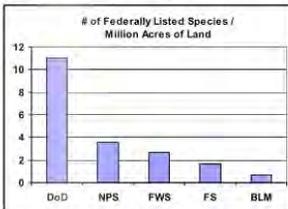


Threatened and Endangered Species on Department of Defense Lands



Background

The U.S. Fish and Wildlife Service (FWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries have the lead for guiding implementation of the Endangered Species Act (ESA); however, the ESA states that all Federal agencies are responsible for conserving threatened and endangered (T&E) species as part of their normal activities. Department of Defense (DoD) agencies play a vital role in the conservation of many rare plant and animal species. DoD manages approximately 29 million acres on about 425 major military installations throughout the United States. Access limitations due to security and safety concerns have sheltered many military lands from development pressures and large-scale habitat loss. As a result, some of the finest remaining examples of rare wildlife habitats are found within these lands. In fact, there are more T&E species per acre on DoD lands than for any other federal public land management agency, as shown in the following figure:



KEY: DoD - Department of Defense, NPS - National Park Service, FWS - Fish and Wildlife Service, FS - Forest Service, BLM - Bureau of Land Management

Currently, the DoD is responsible for 320 T&E species on 252 separate installations. These installations are located in different ecosystems, and require different needs for both species protection and military training. Through open communication and cooperation, FWS has collaborated to establish successful partnerships with DoD and its associated military services. These partnerships have enabled the military to carry out its mission on its bases, while ensuring the continued use of sound science in the conservation and protection of threatened and endangered species.

DoD T&E Expenditures

Each fiscal year (FY), the services are required to file a report with the FWS outlining T&E species expenditures. These

data summarize the costs of managing for T&E species and include such actions as species surveys, monitoring, research, and on-the-ground conservation efforts. The FWS reports the expenditures of all agencies to Congress. This fact sheet provides a summary of DoD reported expenditures from FY1991-FY2004.

The numbers of T&E species as of May 2004, affected installations, and individual service T&E expenditures from FY1991 to FY2004 are:

Service	# of Species ¹	# of Installations ²	Expenditures FY91-FY04
Air Force	76	43	\$ 105,147,019
Army	173	96	\$ 177,820,470
Marine Corps	56	15	\$ 55,798,765
Navy	138	98	\$ 55,971,671
Total	520	252	\$ 374,737,925

¹ Many species are managed by more than one service.
² # of installations refers only to those installations with at least one federally listed T&E species.

The top five most invested species from FY1991 to FY2004 for all DoD are:

- Red-cockaded Woodpecker \$67.4 million
- Desert Tortoise \$29.6 million
- San Clemente Loggerhead Strike \$17.3 million
- Mexican Spotted Owl \$16.4 million
- Black-capped Vireo \$13.5 million

The species most invested in from FY1991 to FY2004 per service is:

- Air Force, Desert Tortoise \$15.9 million
- Army, Red-cockaded Woodpecker \$50.3 million
- Marine Corps, Least Bell's Vireo \$4.0 million
- Navy, San Clemente Loggerhead Strike \$17.3 million



The Desert Tortoise, *Gopherus agassizii*, is a federally listed threatened species found on 11 DoD installations.

Federal Lands and Endangered Species: The Role of Military and Other Federal Lands in Sustaining Biodiversity

BRUCE A. STEIN, CAMERON SCOTT, AND NANCY BENTON

The US government has multiple responsibilities for the protection of endangered species, many of them stemming from its role as the nation's largest landowner. To explore how endangered and imperiled species are distributed across the federal estate, we carried out a geographic information system (GIS)-based analysis using natural heritage species occurrence data. In this 10-year update of a previous analysis, we found that the Department of Defense and the USDA Forest Service harbor more species with formal status under the Endangered Species Act (ESA) than other US agencies. The densities of ESA status species and imperiled species are at least three times higher on military lands—2.92 and 3.77, respectively, per 100,000 hectares—than on any other agency's lands. Defense installations in Hawaii are especially significant; more than one-third of all ESA status species on military lands are Hawaiian. These findings highlight the continued importance of public lands for the survival of America's plant and animal species.

Keywords: endangered species, biodiversity, federal lands, Department of Defense, natural heritage

The federal government owns more than 264 million hectares (ha) across the United States, representing nearly one-third (29%) of the nation's land area, and one-fifth (21%) just in the lower 48 states. These lands span a wide array of ecosystems, from frozen tundra in the north to subtropical hardwood hammocks in southern Florida. In turn, these habitats support diverse assemblages of native wildlife, including many that are rare or have suffered serious declines. Such rare or declining species are of particular scientific and conservation interest because of their heightened risk of extinction.

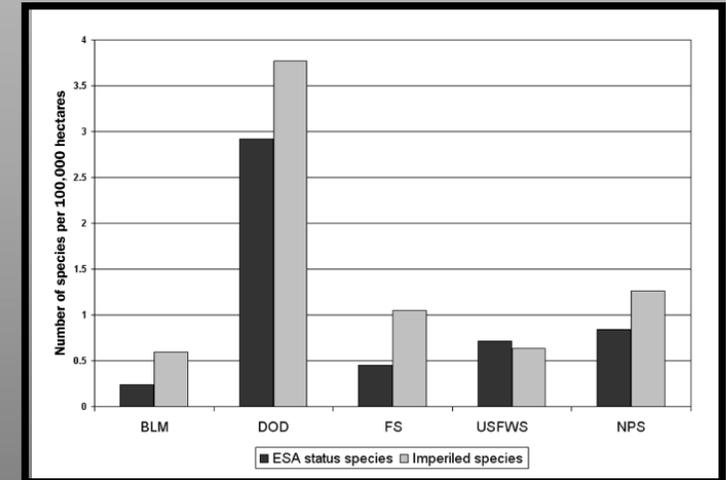
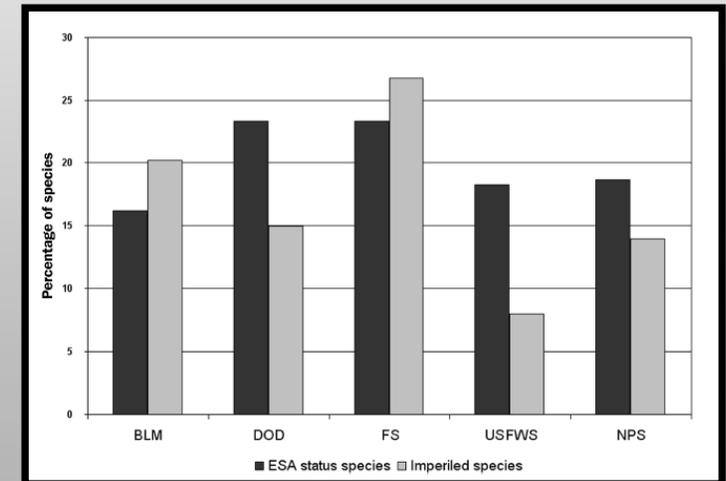
The Endangered Species Act (ESA) of 1973 represents a formal expression of the American people's concern about the loss of plant and animal species to extinction. The federal government has dual responsibilities under this act. Administration and enforcement of the act's provisions are federal obligations of the US Fish and Wildlife Service (USFWS) within the Department of the Interior, and the National Marine Fisheries Service (NMFS) within the Department of Commerce. A second area of responsibility relates to the federal government's role as the nation's largest landowner and manager, with broad responsibilities for managing the resources under its control. The mandates of federal agencies vary widely; consequently, land-management objectives range from a focus on protection and preservation, as in the case with the National Park Service (NPS), to multiple uses of the land,

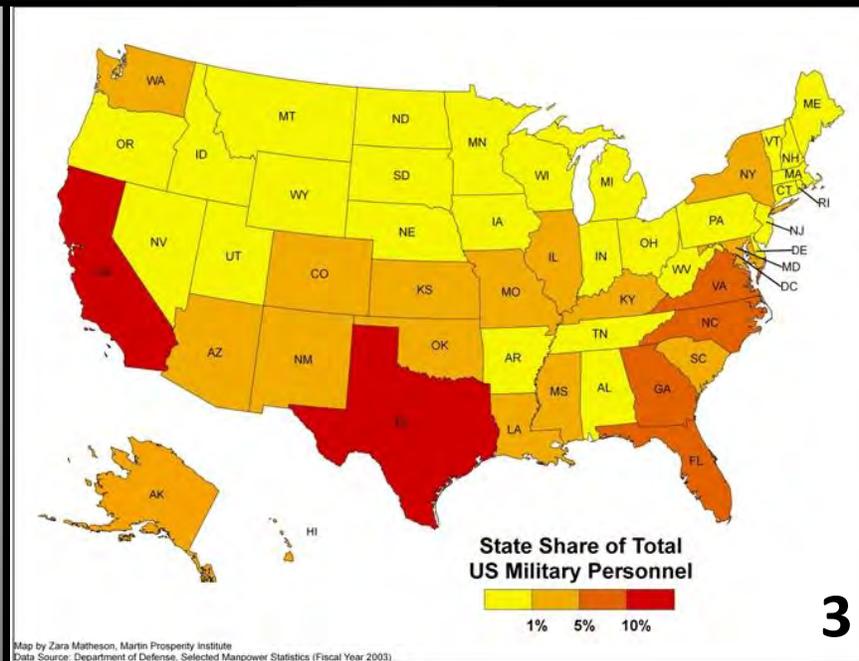
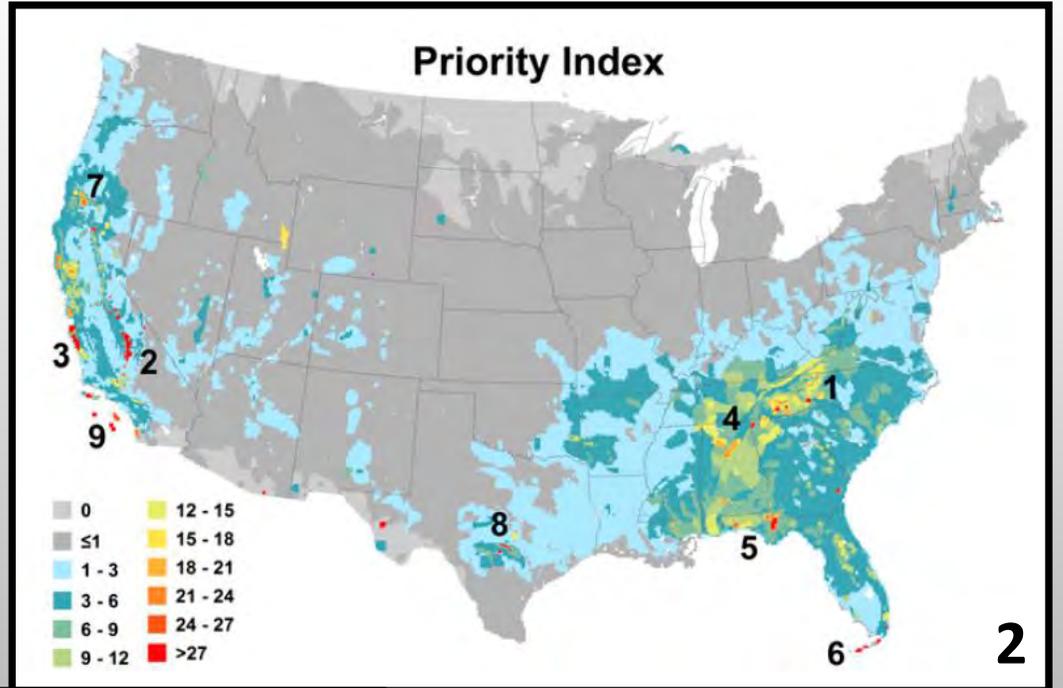
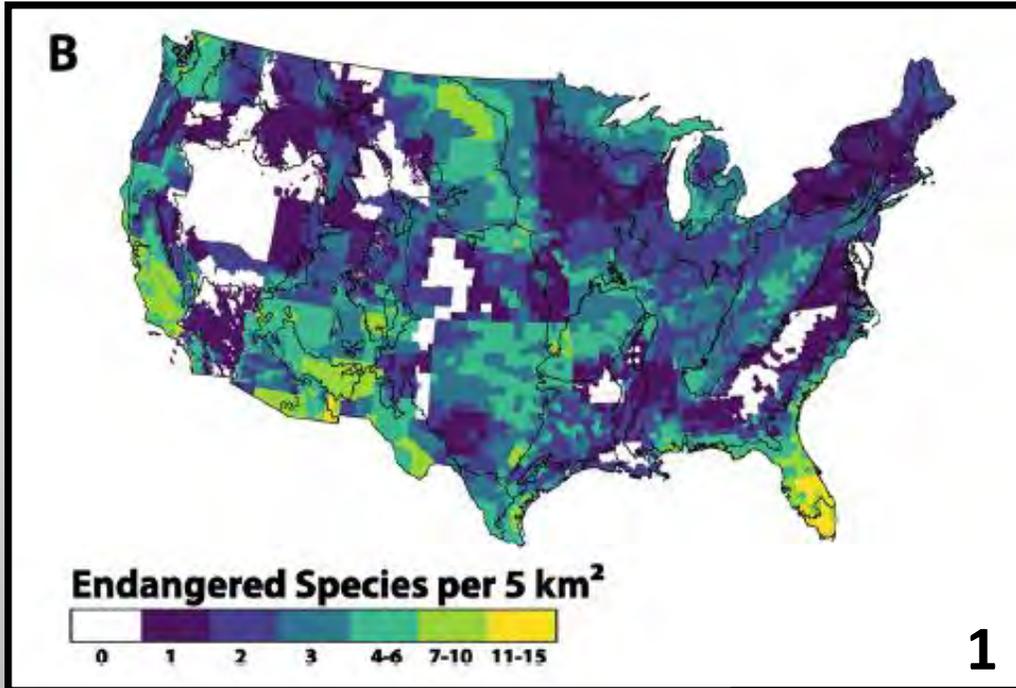
including resource extraction, as with the USDA Forest Service and the Bureau of Land Management (BLM).

Despite these differences in objectives, all federal land-management agencies are obligated to comply with federal environmental laws and regulations such as the ESA. Thus, while considerable attention in recent years has rightfully focused on how to better protect endangered and threatened species on private lands, federal lands must play a key role in any national strategy for preserving the nation's rich array of wildlife species. Protection of threatened or endangered plant species under the ESA, for example, differs depending on whether the plant is found on federal property or on private property. The no-take provisions under the act, which prohibit landowners from causing harm to listed species, apply only to animals. Plant species on private lands are, in general, protected only where a federal action (e.g., regulatory permit) is involved. In contrast, listed plants occurring on federal lands receive full protection under the act.

What then is the scope of federal land management responsibilities for endangered species? Several previous

Bruce A. Stein (e-mail: bruce_stein@naturservice.org) is vice president and chief scientist. Cameron Scott is a conservation data analyst, and Nancy Benton is a project manager at Naturservice in Arlington, Virginia. © 2008 American Institute of Biological Sciences.





1) Clancy et al. (2020) Scientific Reports

2) Jenkins et al. (2015) PNAS

3) Florida. (2010) The Atlantic (Data: DoD)

Department of Defense Partners in Amphibians and Reptile Conservation (DoD PARC)



Department of Defense

Partners in Amphibian and Reptile Conservation



The U.S. Department of Defense Partners in Amphibian and Reptile Conservation (DoD PARC) network launched in 2009 to provide leadership, guidance, and support for the conservation and management of amphibians and reptiles on DoD lands in ways that help sustain the military's testing, training, and operational mission activities. DoD PARC is voluntary, proactive, and non-regulatory, and consists of over 550 military and civilian personnel. For the last 11 years, the network has served as a model of excellence for amphibian and reptile management and conservation on military lands, and we thank all who have contributed to our collective success.

How DoD PARC Benefits the Military Mission:

DoD PARC enhances military readiness by promoting healthy landscapes that support long-term testing and training requirements. In addition, the network increases the effectiveness of resource management on DoD lands through the development of proactive, science-based conservation and management strategies and tools.

DoD PARC increases communication and partnerships among the DoD community, facilitates collaborative implementation of guidance and problem solving, and saves money by sharing costs across the Military Services and with our non-DoD partners. The network helps to conserve the nation's biological heritage by developing partnerships that work across boundaries to help prevent species declines, which in turn helps DoD avoid mission restrictions and increases mission flexibility.

DoD PARC Program Goals:

- ◇ Provide sound, science-based strategies, tools, and information for managing amphibian and reptile populations that can be incorporated into existing natural resources and land management programs.
- ◇ Reduce or eliminate population declines of both common and at-risk species, thus helping preclude or minimize Endangered Species Act (ESA)-listings and critical habitat designations.
- ◇ Promote partnerships and collaborative efforts among the military community and external stakeholders to develop win-win outcomes that support military readiness and conservation.
- ◇ Promote awareness, involvement, communication, and coordination both within DoD and among national, regional, and local experts to achieve DoD mission and stewardship goals.



Rainbow Snake-J.D. Wilson



Blue-spotted Salamander-Robert Brodman



Eastern Box Turtle-David Burkwal



Green Anole-Paul Block



AMPHIBIANS AND REPTILES OF UNITED STATES DEPARTMENT OF DEFENSE INSTALLATIONS

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Abstract.—The U.S. Department of Defense (DoD) occupies approximately 10.1 million ha of land within the U.S. spanning most ecosystems contained therein. To date, no comprehensive agency-wide inventory of amphibian and reptile species has been compiled. We developed an amphibian and reptile species inventory for 415 DoD installations/sites and evaluated species diversity. The amphibian and reptile species confirmed present on DoD sites represent 66% of the total native species documented in the continental U.S. Snakes are the most widespread group found on DoD lands. Of the military services, Army sites have the greatest number of confirmed species, federally listed, state-listed, and At-risk species. There are 24 federally listed (threatened or endangered), 55 state-listed, and 70 At-risk species confirmed present on DoD sites. Thirty non-native and native transplant amphibian and reptile species/subspecies are also confirmed present on DoD sites. Lastly, we verified that approximately half of the military sites evaluated in this study have at least one venomous snake species confirmed present. Our study results assist directly with ongoing management and conservation of amphibian and reptile species on DoD lands and confirm military lands comprise a significant contribution to biodiversity conservation.

Key Words.—Endangered Species Act; Sikes Act; at-risk species; biodiversity; inventory; military; non-native; venomous

INTRODUCTION

The U.S. Department of Defense (DoD) manages approximately 10.1 million ha of land spanning a diversity of ecosystems. The primary purpose of these lands is to train military personnel and test weapons in support of national defense. Despite the constant and long-term use of military lands for this mission, several studies have documented the critical role these lands play in maintaining biodiversity (e.g., Groves et al. 2000; Stein et al. 2008; Ayerig et al. 2015; Zentelis and Lindenmayer 2015). For example, DoD lands have the greatest density of Endangered Species Act (ESA)-status species and NatureServe (G1-G2)-impaired species of any federal land management agency (Stein et al. 2008; Ayerig et al. 2015). Furthermore, even though DoD lands comprise only 5% of the total area of federal lands, they represent 82.6% of the diversity of ecological systems in the contiguous U.S. (Ayerig et al. 2015). In fact, DoD lands contain the second-highest number of ecological systems of all federal land management agencies, second to the National Park System, which contains 27% more land area than the DoD (Ayerig et al. 2015).

The DoD takes an ecosystem-based approach to natural resources management, which is implemented at installations using Integrated Natural Resource Management Plans (INRMPs). The Sikes Act (16 U.S. Code [U.S.C.] 670a–670o, 74 Stat. 1052), as amended,

requires DoD to prepare and implement INRMPs for installations that have been determined to have significant natural resources. The primary purpose of an INRMP is to create a single comprehensive ecosystem-based plan that ensures natural resources conservation measures and military operations are integrated and consistent with environmental stewardship, laws and regulations, and the military mission. The management and conservation of amphibians and reptiles on military lands is performed primarily through the implementation of specific management guidelines, protocols, and associated projects within INRMP for each installation.

The DoD strives to maintain healthy amphibian and reptile populations on their lands in support of military readiness because these species often surpass other vertebrate groups in terms of abundance, diversity, and biomass (Klemens 2000; Stuart et al. 2008; Vitt and Caldwell 2009; Ernst and Lovich 2009) and serve as indicators of environmental health (Hayes et al. 2006; Pounds et al. 2006; Johnson et al. 2007). The DoD has a network of subject matter experts in the field of herpetology (DoD Partners in Amphibian and Reptile Conservation) that distribute information and develop products that assist with meeting military mission goals, while promoting stewardship and conservation for amphibians and reptiles. The DoD is the first and only U.S. agency to date with a comprehensive Strategic Plan for Amphibians and Reptiles (Lovich et al. 2015), although species/habitat protection is not its primary

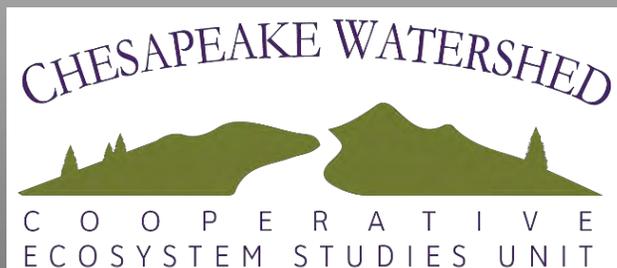
- DoD PARC has confirmed that the Spotted Turtle occurs on 39 (now 41) installations of all divisions (Air Force, Army, Army National Guard, Navy and Marine Corps) and potentially occurs on an additional 60 (~58) installations

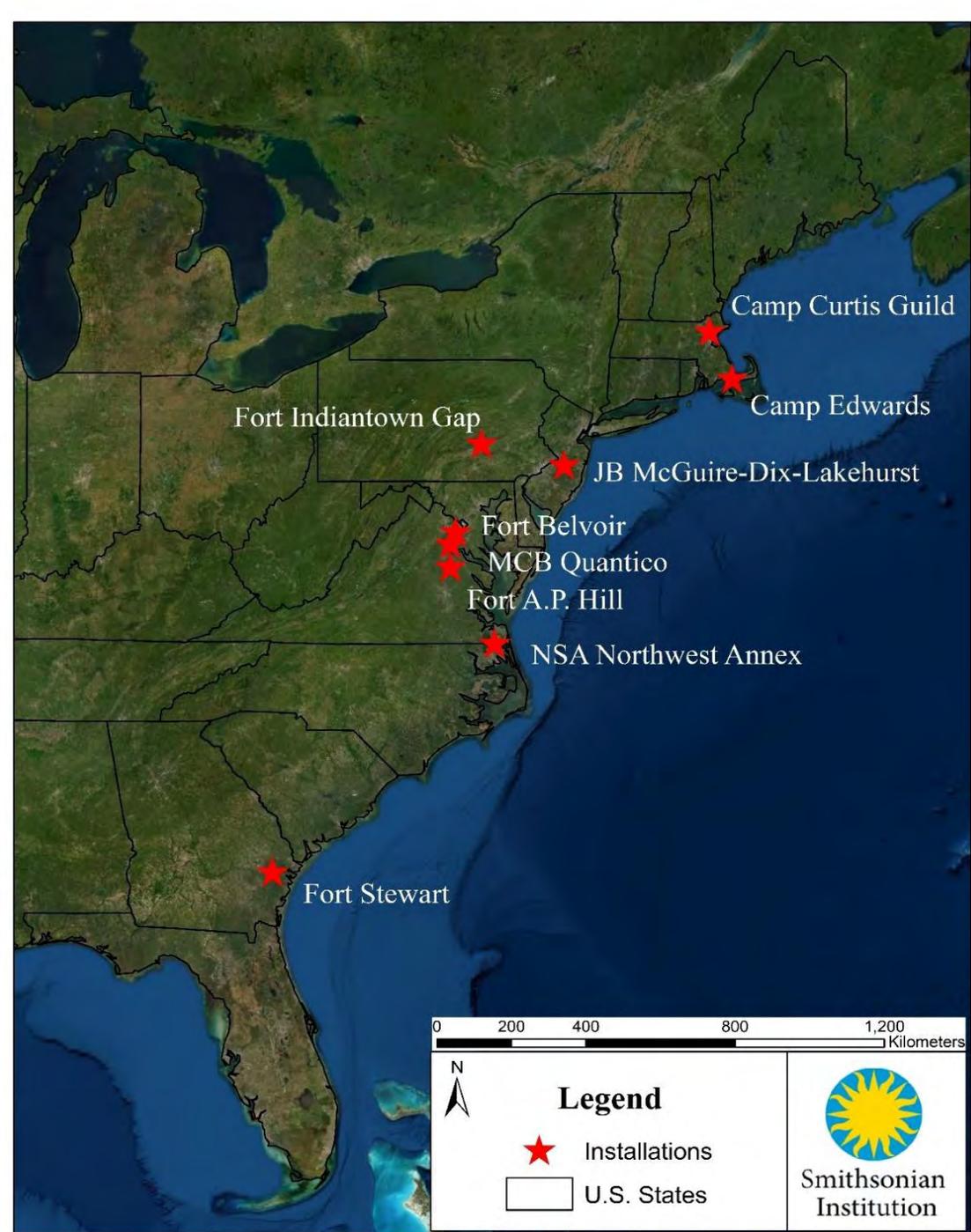
The DoD – SI Cooperative Agreement through the Chesapeake Watershed CESU

“Building Capacity for Managing At-risk Species to Enable Mission Readiness on Military Installations: Spotted Turtle Status Assessment and Surveys”

- Objectives:

- Improve the understanding of the abundance and distribution of Spotted Turtles on installations
- Create a replicable model for a conservation approach for military installations across the species’ range (both installations with confirmed observations and those with potential habitat)
- Raise awareness for this approach for dissemination to military installations across the DoD





A general summary table for the nine installations participating in the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness Cooperative Agreement (CA) between the Department of Defense (DoD) and the Smithsonian Institution (SI).

DoD Installation	DoD Branch	Ecoregion	State	DoD Representative	CA Partner Representative*
Camp Curtis Guild (CCG)	Army National Guard	Northeastern Coastal Zone	Massachusetts	Annie Curtis	Molly Parren
Camp Edwards (CPED)	Army National Guard	Atlantic Coastal Pine Barrens	Massachusetts	Annie Curtis	John Garrison
Fort Indiantown Gap (FIG)	Army National Guard	Ridge and Valley	Pennsylvania	Rebecca Picone	Lori Erb
Joint Base McGuire-Dix-Lakehurst (JBMDL)	Air Force	Atlantic Coastal Pine Barrens	New Jersey	Mark Stevenson	Lori Erb
Fort Belvoir (FB)	Army	Southeastern Plain	Virginia	John Pilcicki	Jessica Meck
Marine Corps Base Quantico (MCBQ)	Marine Corps	Southeastern Plain	Virginia	Kenneth Erwin	Jessica Meck
Fort A.P. Hill (FAPH)	Army	Southeastern Plain	Virginia	Kyle Crafts	Jessica Meck
NSA Northwest Annex (NSANA)	Navy	Middle-Atlantic Coastal Plain	Virginia	Taylor Austin	Jessica Meck
Fort Stewart (FS)	Army	Southern Coastal Plain	Georgia	Lawrence Carlile	Houston Chandler
Total	9	5	6	5	8

*CA is an abbreviation of convenience in this table for Cooperative Agreement.

The Cooperative Agreement Team

- Thirty-seven (37) personnel
- Twelve (12) institutions; all six (6) branches of the DoD – Army, National Guard, Navy, Air Force, Marine Corps
- Nine (9) installations in five (5) states; Massachusetts, Pennsylvania, New Jersey, Virginia, Georgia
- Nine (9) different roles in support of the CA among ca. eighteen (18) positions across SI, DoD and NGOs.

A project development summary table for nine installations participating in the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness CA. The table summarizes installation reconnaissance dates and the Department of Defense (DoD) and CA partner personnel involved in coordination and initial site visitation.

DoD Installation	Date	DoD Personnel	CA Partner Personnel*
Camp Curtis Guild	April 24, 2021	Annie Curtis, Matthew Penella	Molly Parren, John Garrison
Camp Edwards	April 12, 2021	Annie Curtis, Matthew Penella	Molly Parren, John Garrison
Fort Indiantown Gap	April 12, 2021	Rebecca Picone, Annie Haines	Lori Erb
Joint Base McGuire-Dix-Lakehurst	March 3, 2021	Paul Mahon, Michael Luna, Mark Stevenson	Lori Erb, Brandon Ruhe, James White
Fort Belvoir	March 4, 2021	John Pilcicki	Jessica Meck, Emily Sikora
Marine Corps Base Quantico	March 3, 2021	Kenneth Erwin	Jessica Meck, Emily Sikora
Fort A.P. Hill	Feb. 2018 & Mar. 2019	Andrew Satterwhite, Kyle Crafts	Thomas Akre, Jessica Meck, Jill Newman
NSA Northwest Annex	February 27, 2019	Taylor Austin	Jessica Meck, Emily Sikora
Fort Stewart	March 15, 2021	Lawrence Carlile, Rachel Rourke	Houston Chandler, Ben Stegenga, Andrea Colton
Totals	9	ca. 12 days	14

Camps Curtis Guild and Edwards, Massachusetts



Joint Base McGuire-Dix-Lakehurst and Fort Belvoir, NJ and VA



Marine Corps Base Quantico and Fort A.P. Hill, Virginia



Naval Support Facilities Northwest Annex and Fort Stewart, VA and GA



Detection of an At-Risk Species





A Standardized Trapping Protocol (ESTWG 2017)

- Visual Encounter Surveys
- Trap Rapid Assessments
- Demographic Assessments
- Inventory Trapping

A



B

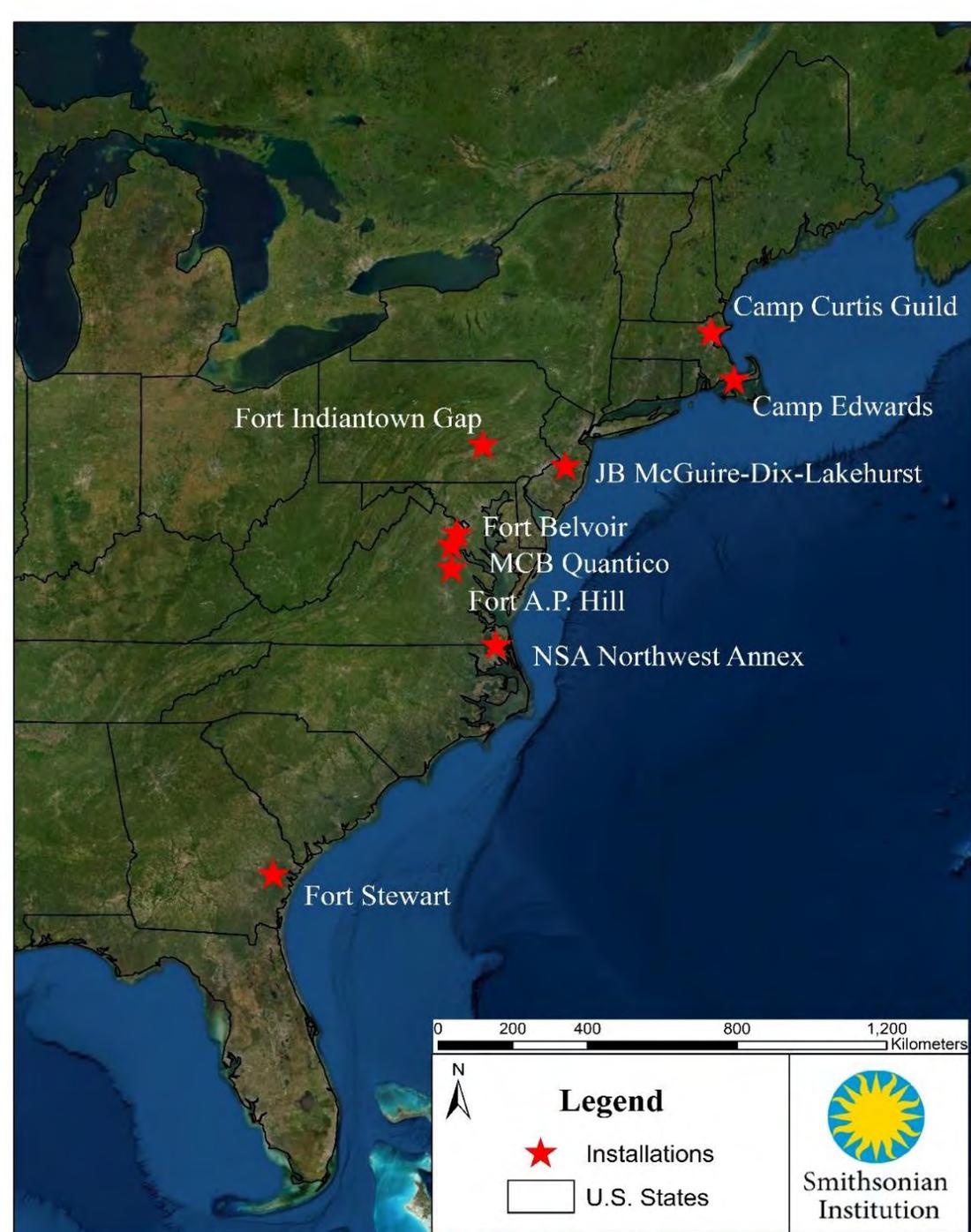
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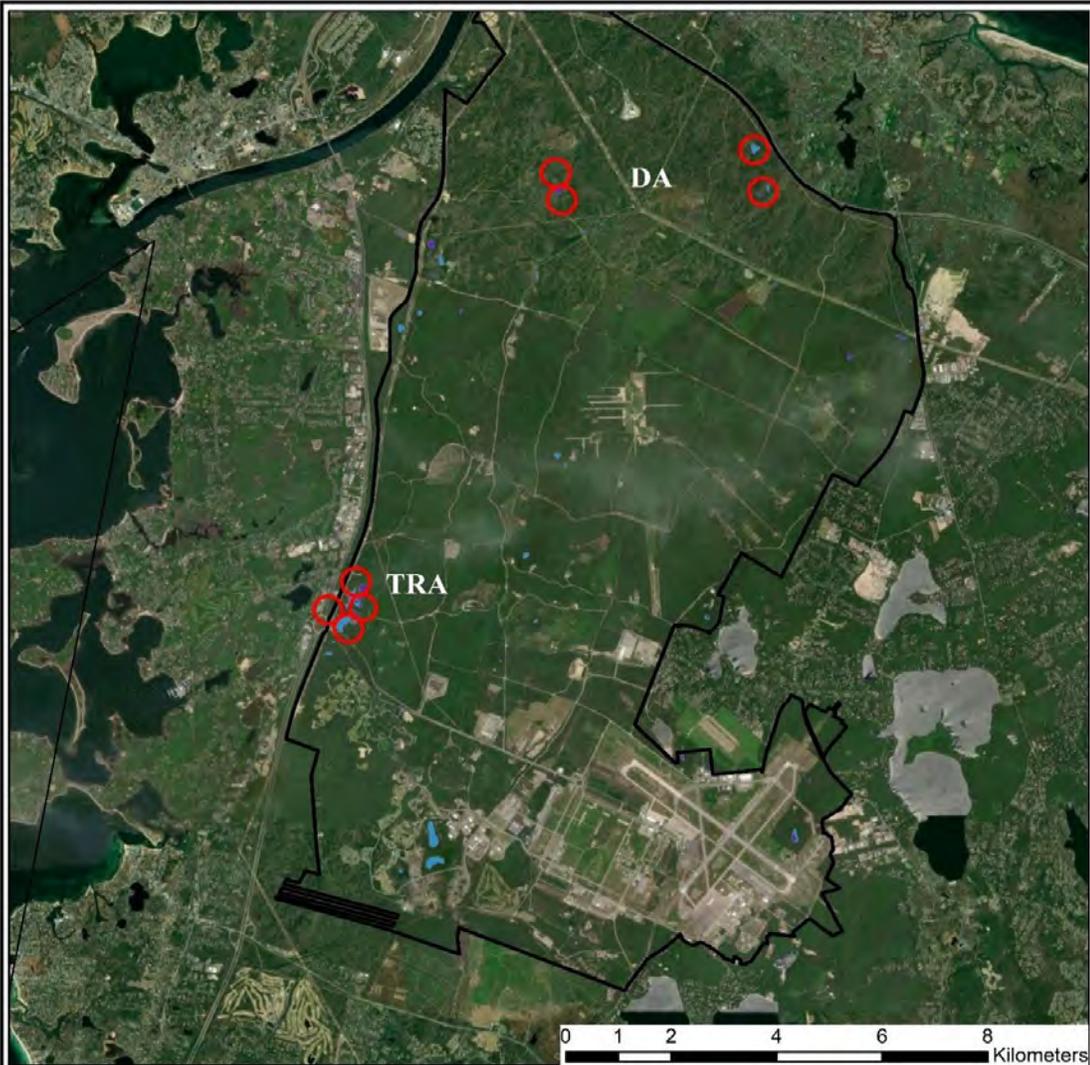
A Baited and Secured Promar Trap Set



Installation Sampling Configurations: Spring 2018-2019 and 2021

- U.S. Army National Guard Camp Edwards, Massachusetts
- Joint Base McGuire-Dix-Lakehurst, New Jersey
- Marine Corps Base Quantico, Virginia
- U.S. Army Fort A.P. Hill, Virginia
- Naval Support Activities Northwest Annex, Virginia
- U.S. Army Fort Stewart, Georgia





Legend

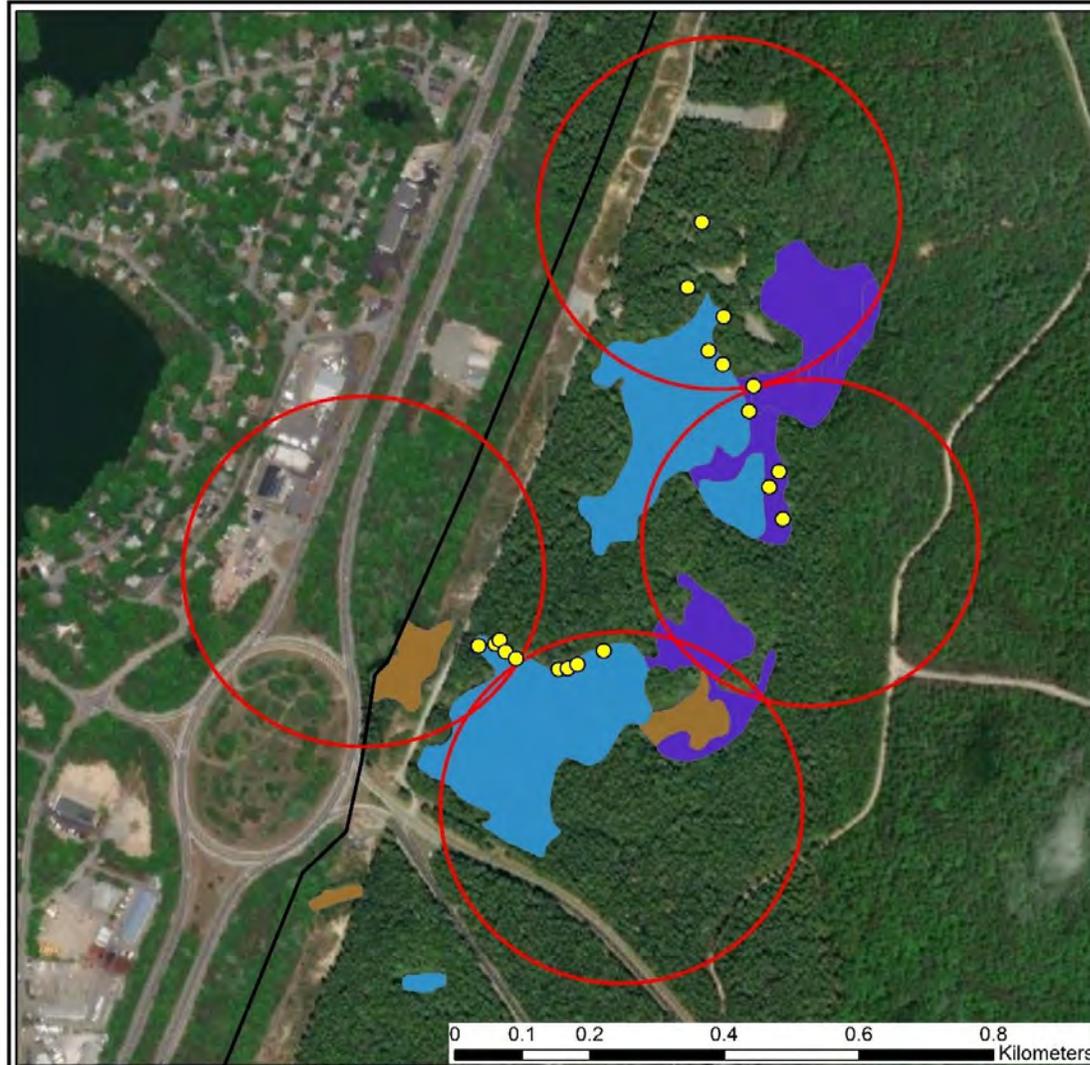
- Reference Plots
- Camp Edwards

Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond



Smithsonian Institution



Legend

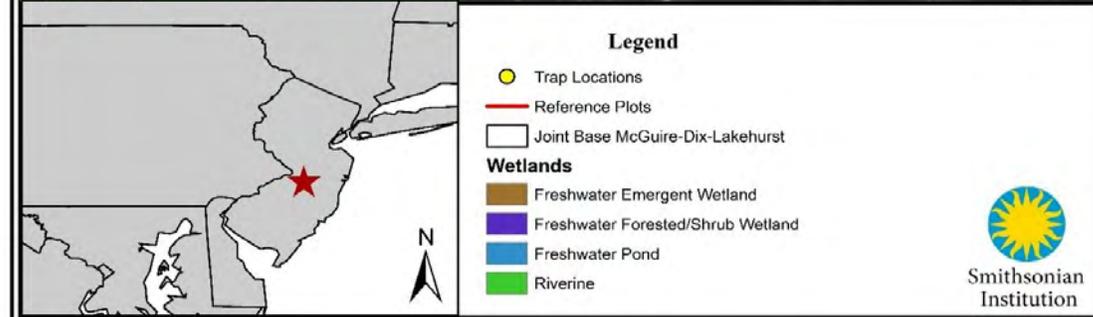
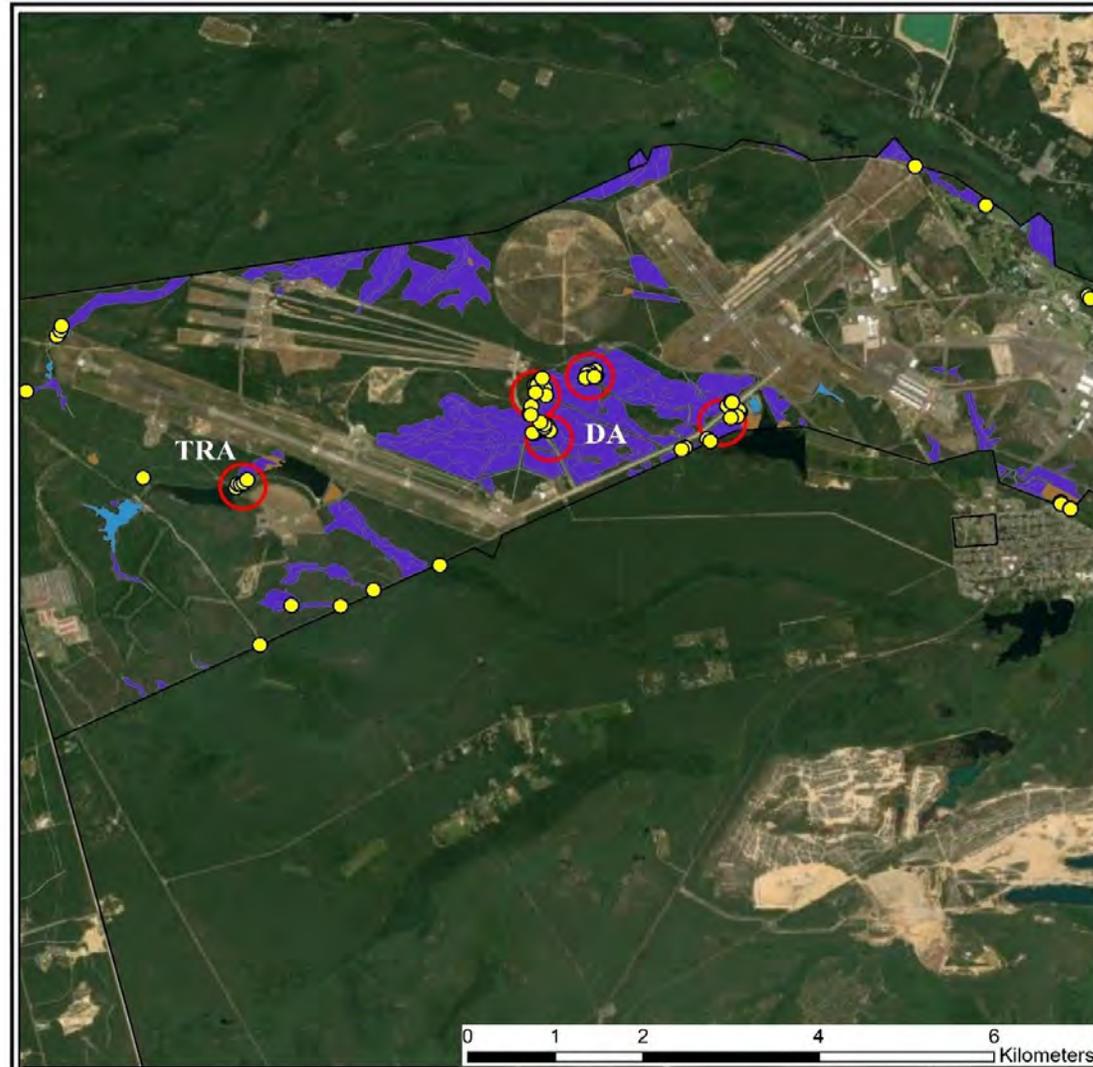
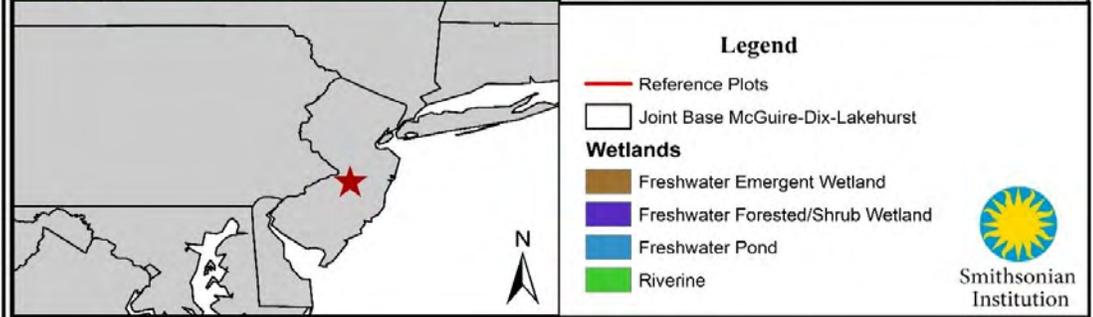
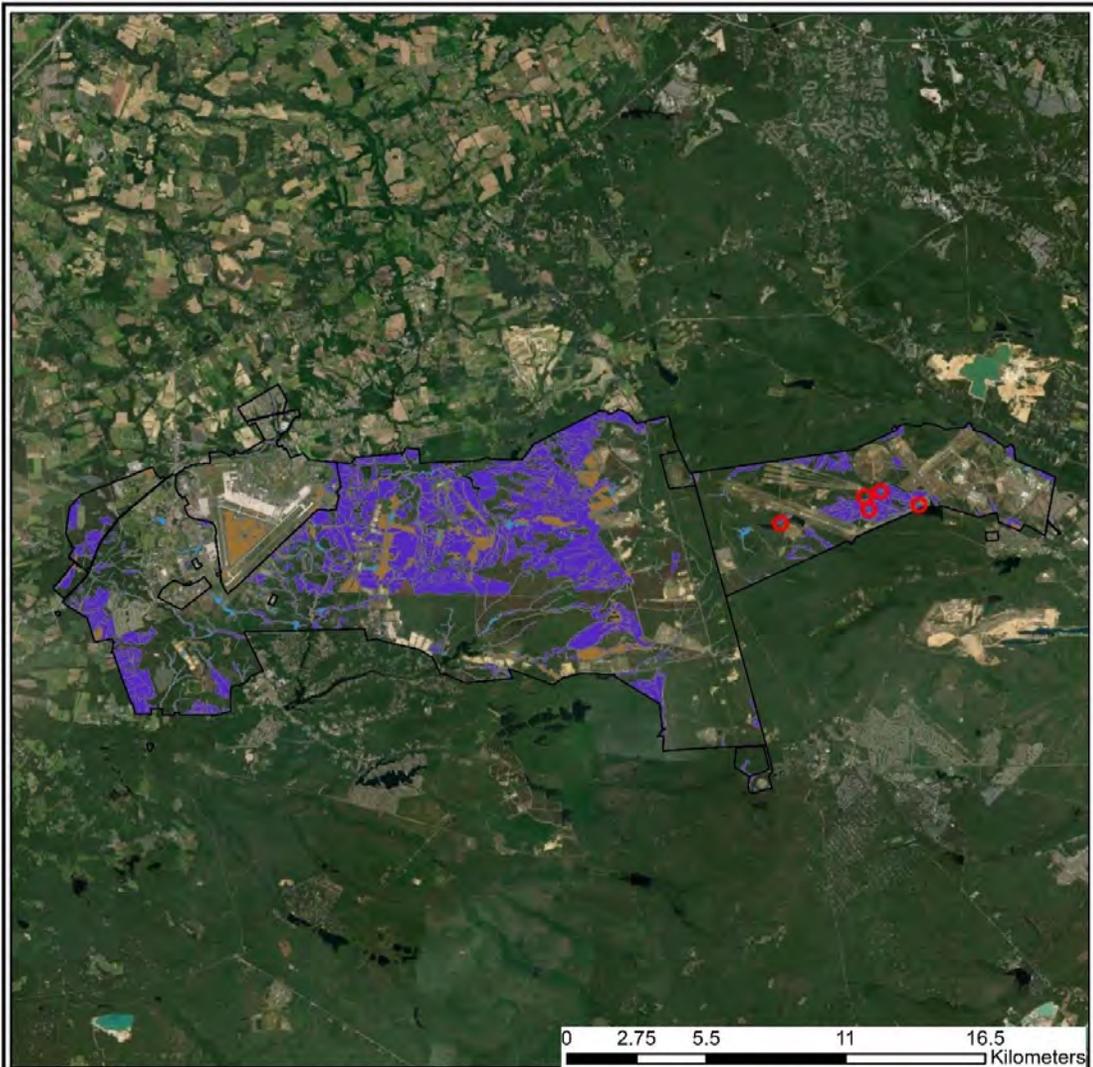
- Trap Locations
- Reference Plots
- Camp Edwards

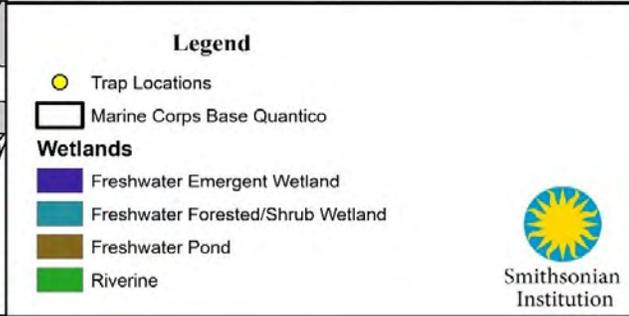
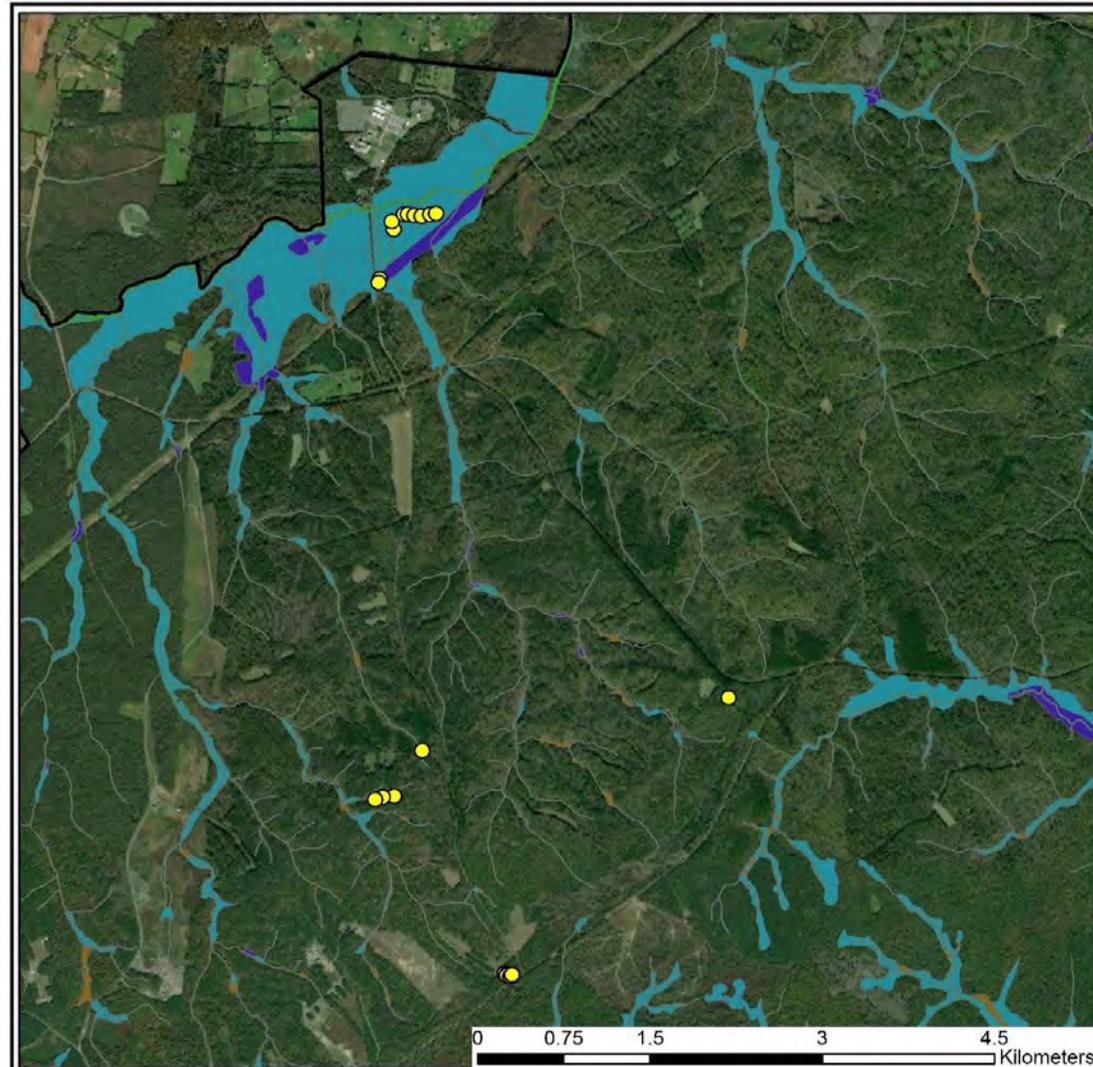
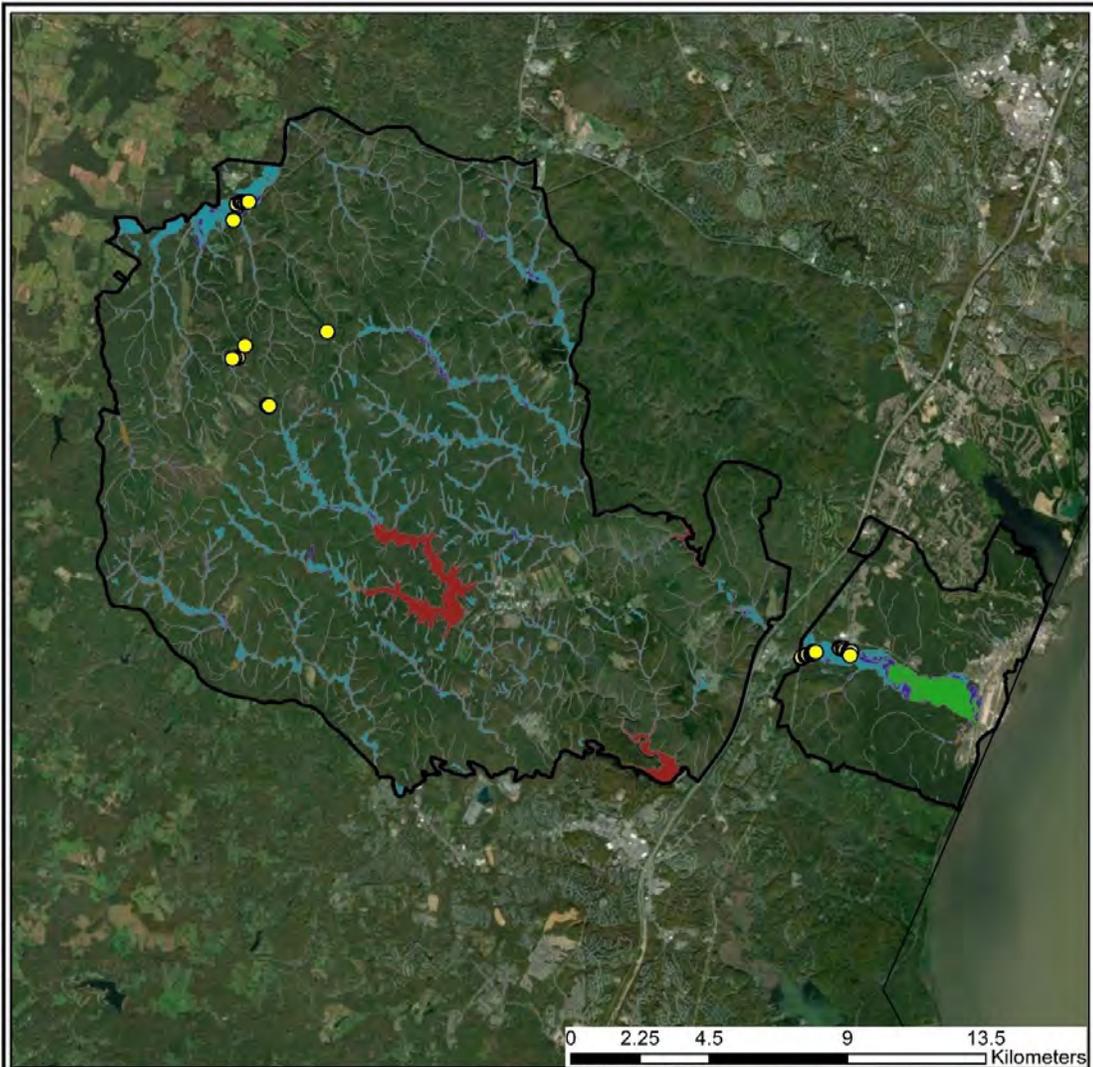
Wetlands

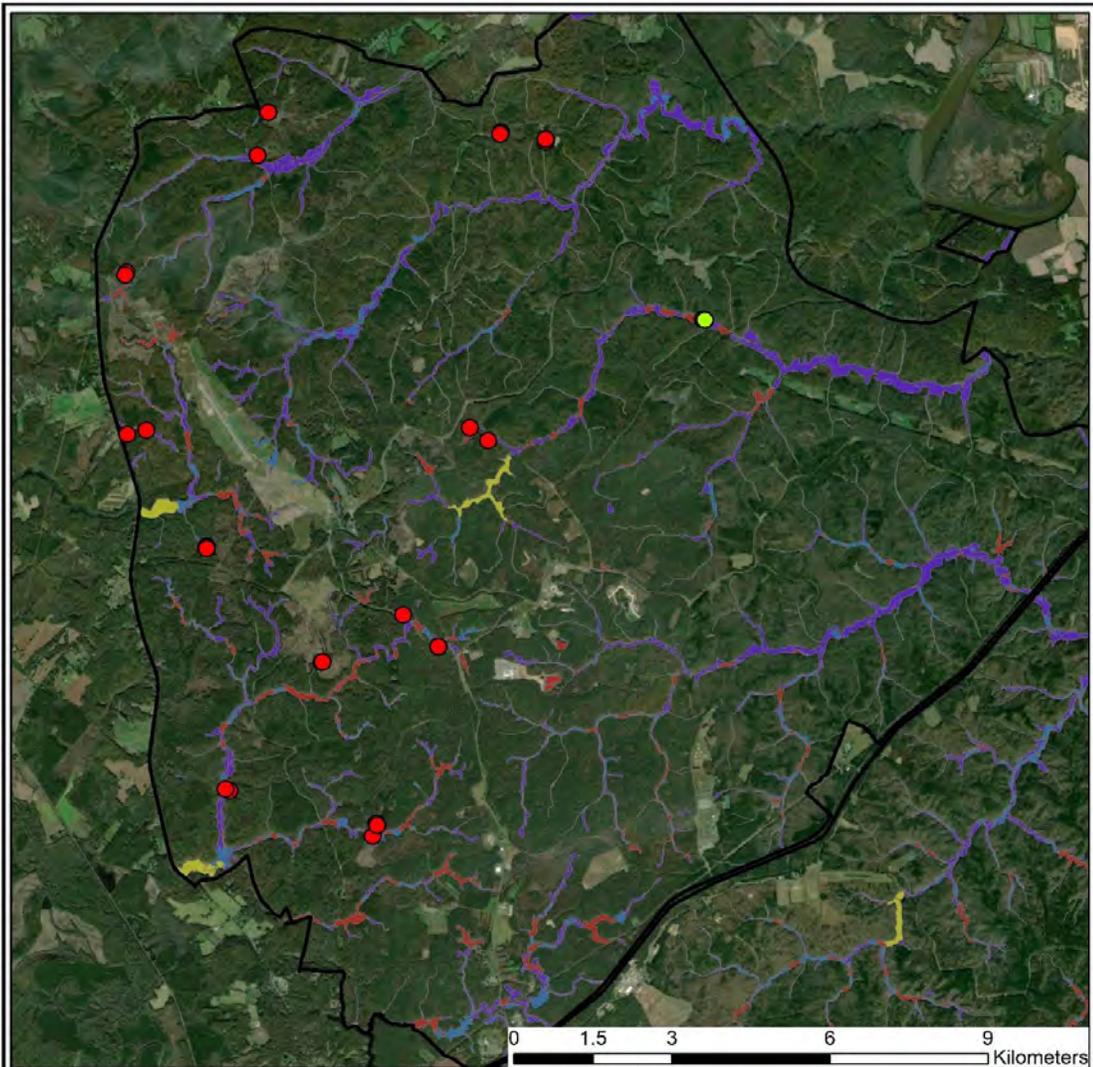
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond



Smithsonian Institution







Legend

Trap Captures 2021

- No
- Yes

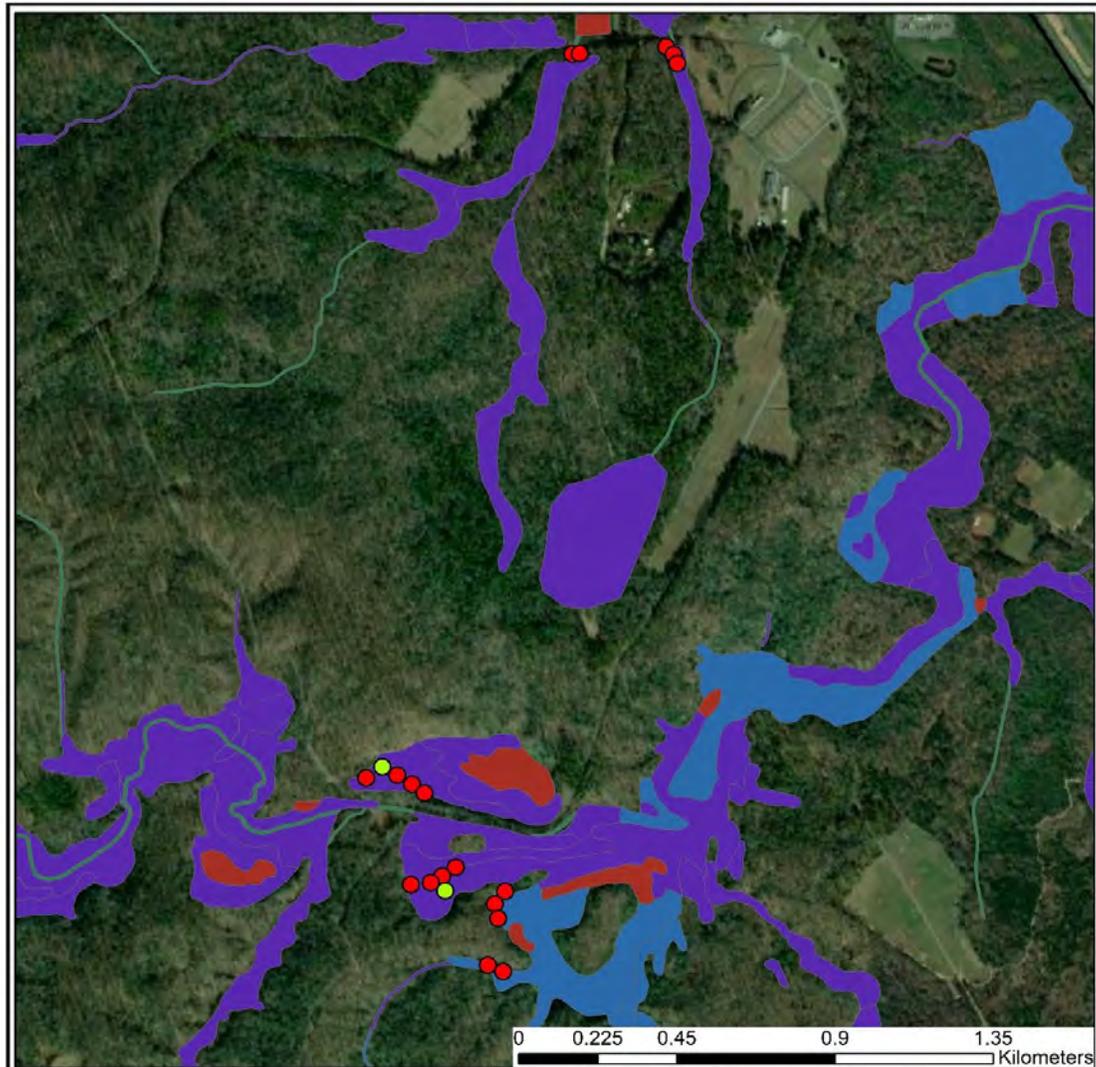
□ Fort A.P. Hill

Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine



Smithsonian Institution



Legend

Trap Captures 2019

- No
- Yes

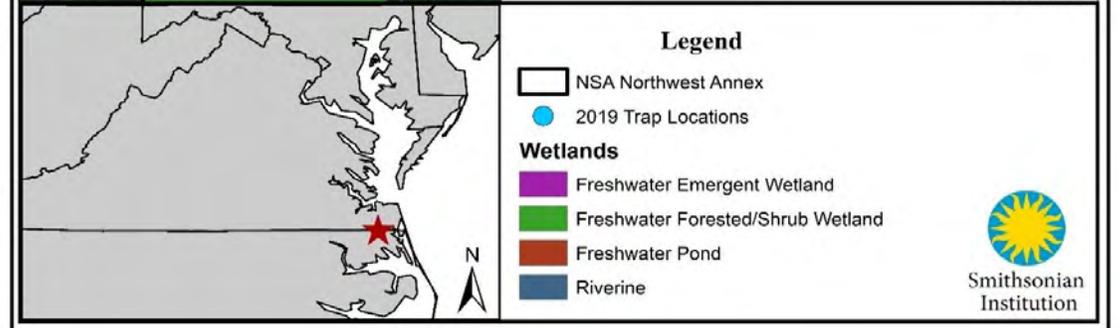
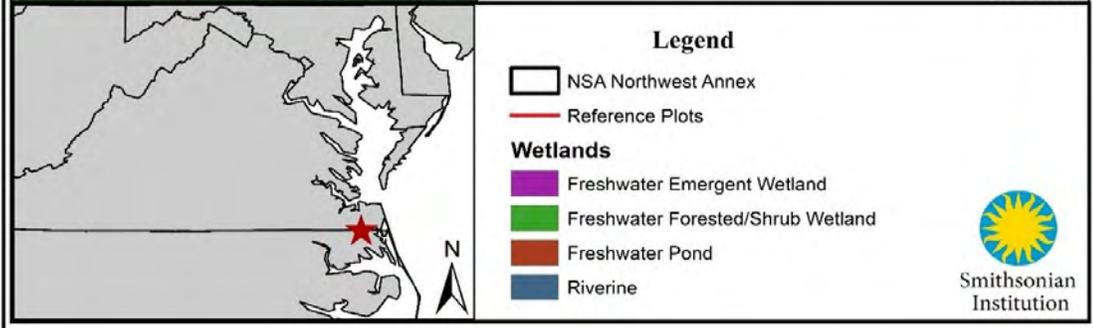
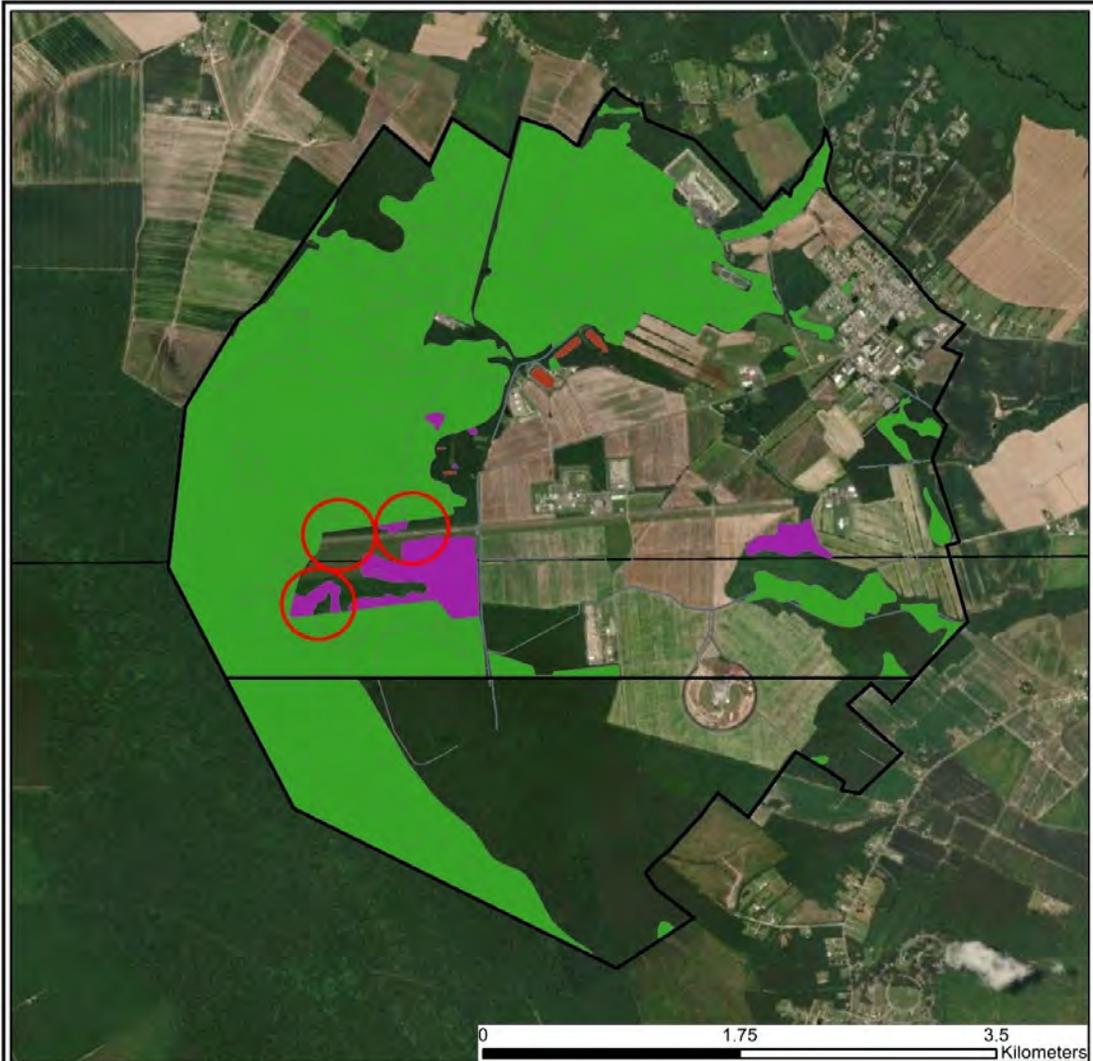
□ Fort A.P. Hill

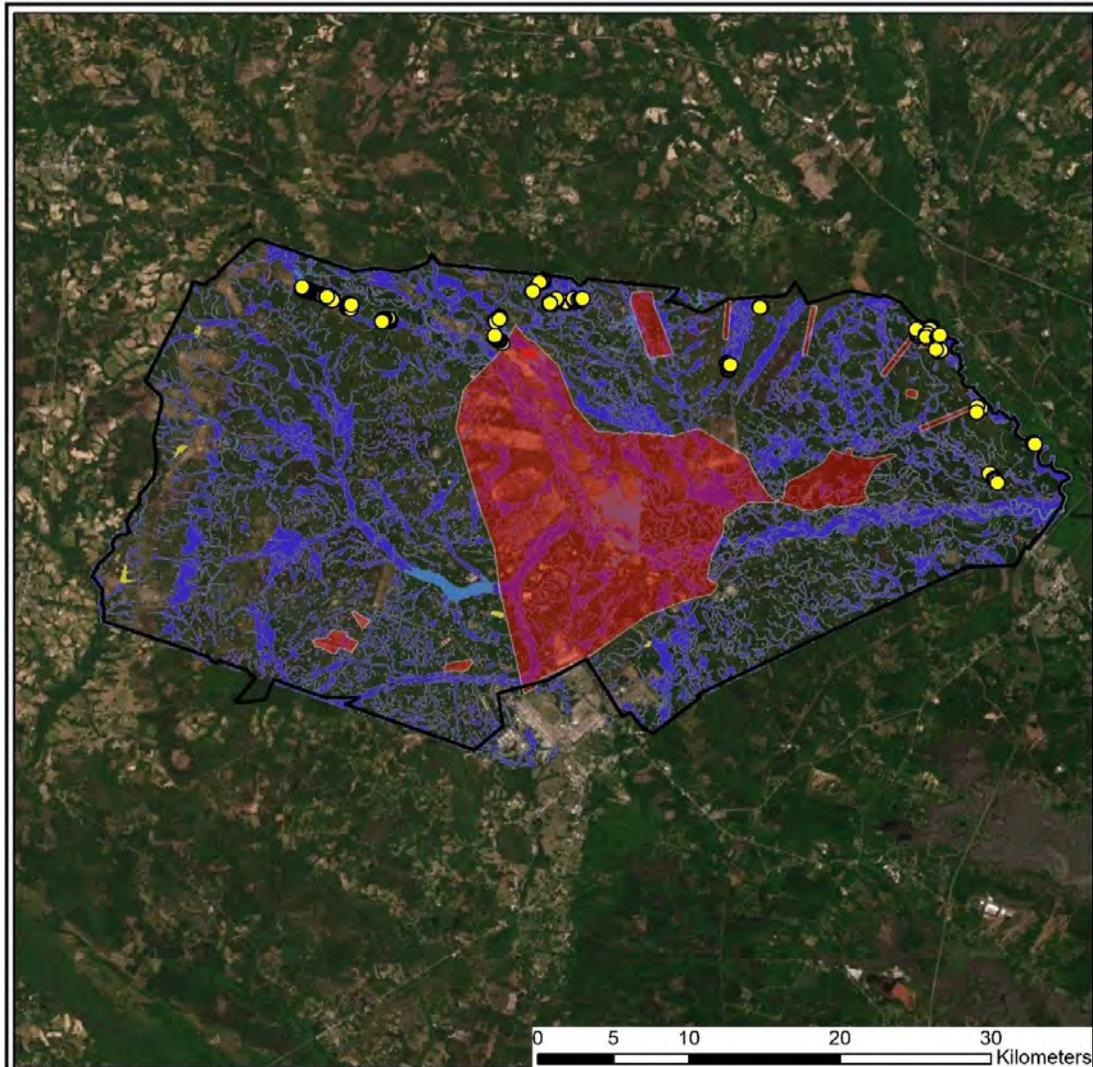
Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine



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0 5 10 20 30 Kilometers

Legend

- Trap Locations
- Fort Stewart
- No Access Areas**
-
- Wetlands**
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine



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A Promar trap with Spotted Turtles being inspected by SI Research Technician Emily Sikora (A). DoD Natural Resources Manager Taylor Austin, holding several Spotted Turtles after capture at NSA Northwest Annex, Virginia (B). Photographs taken by SI and DoD personnel, spring 2021.



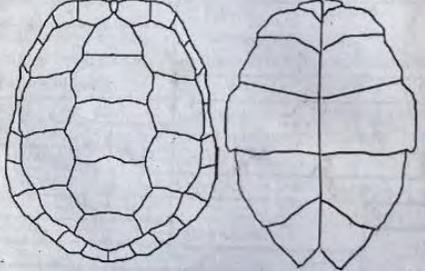
Trap-captured female (A) and male (B) Spotted Turtles from Camp Curtis Guild, Massachusetts. Note the domed carapace of the female and concave plastron and enlarged tail and posterior cloaca of the male. Photographs taken by ATO personnel, spring 2021.



A young juvenile Spotted Turtle from Camp Edwards, Massachusetts. Photograph taken by ATO personnel, spring 2021.

Turtle ID#: <u>7210</u>	Date: <u>4/21/21</u>	Time: <u>10:36</u>
Cap. Method: <input checked="" type="checkbox"/> Hand <input type="checkbox"/> Trap →	Ref. # (circle): 1 2 3 4	Trap #:
Sex: <u>F</u>	Coordinates (dd.dddd): <u>41.74215</u>	
<input checked="" type="checkbox"/> meas. <input checked="" type="checkbox"/> notched <input type="checkbox"/> tissue <input checked="" type="checkbox"/> photos <input type="checkbox"/> PIT ↓	PIT number: <u>-70.55122</u>	
SCLmin (mm): <u>107.02</u>	Wear class: <input type="checkbox"/> not worn	
SLPmin (mm): <u>82.3</u>	<input checked="" type="checkbox"/> ≤50% worn	
CW (optional): <u>77.19</u>	Photo file names:	<input type="checkbox"/> ≤50% worn
PW (optional): <u>36.18</u>	Visible annuli: <u>17</u>	<input type="checkbox"/> >50% worn
SH (optional): <u>37.72</u>	General health: <input type="checkbox"/> lethargy	<input type="checkbox"/> ≥ 90% worn
<input type="checkbox"/> URT distress <input type="checkbox"/> sores <input type="checkbox"/> other:		
<input type="checkbox"/> limb (specify)		

tail very short

Turtle ID#: <u>Other</u>	Date: <u>4/21/21</u>	Time: <u>11:54</u>
Cap. Method: <input checked="" type="checkbox"/> Hand <input type="checkbox"/> Trap →	Ref. # (circle): 1 2 3 4	Trap #:
Sex: <u>N/A</u>	Coordinates (dd.dddd): <u>41.74253</u>	
<input checked="" type="checkbox"/> meas. <input type="checkbox"/> notched <input type="checkbox"/> tissue <input checked="" type="checkbox"/> photos <input type="checkbox"/> PIT ↓	PIT number: <u>-70.55128</u>	
SCLmin (mm): <u>47.29</u>	Wear class: <input type="checkbox"/> not worn	
SLPmin (mm): <u>40.99</u>	<input type="checkbox"/> ≤50% worn	
CW (optional): <u>44.91</u>	Photo file names:	<input type="checkbox"/> >50% worn
PW (optional): <u>27.95</u>	Visible annuli: <u>4</u>	<input type="checkbox"/> ≥ 90% worn
SH (optional): <u>17.92</u>	General health: <input type="checkbox"/> lethargy	
Mass(g): <u>15</u>	<input type="checkbox"/> URT distress <input type="checkbox"/> sores <input type="checkbox"/> other:	
Scute morphology: <input type="checkbox"/> normal <input type="checkbox"/> irregular	Injuries: <input type="checkbox"/> tail <input type="checkbox"/> eye <input type="checkbox"/> limb (specify)	
(specify or mark below)	<input checked="" type="checkbox"/> initial capture (not marked before)	
	<input type="checkbox"/> previously marked	
	<input type="checkbox"/> gravid <input checked="" type="checkbox"/> not gravid	
Indicate notches and record marks or injuries:		
		
Comments: <u>too small to notch.</u>		

Effort and Results

- Total Trap Nights: **2085**
- Total Visual Surveys: **117**
- Total Captures: **213**
- Total Individuals: **179**



A general summary table of sampling effort and results from the 2021 field season of the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness CA.

Installation	Trap Nights	Captures	Trap Captures	Hand Captures	CPUE	Individuals
Camp Curtis Guild	240	31	23	8	0.129	22
Camp Edwards	316	50	32	18	0.158	47
Fort Indiantown Gap	232	31	30	1	0.134	24
Joint Base McGuire-Dix-Lakehurst	300	44	43	1	0.147	35
Fort Belvoir	23	11	11	0	0.478	10
Marine Corps Base Quantico	134	18	18	0	0.134	16
Fort A.P. Hill	130	2	2	0	0.015	2
NSA Northwest Annex	80	26	25	1	0.325	23
Fort Stewart	630	0	0	0	0.000	0
Total	2085	213	184	29		179
Mean (± STD)	231.7 (±179.2)	23.7 (±17.5)	20.4 (±14.2)	3.2 (±6.1)	0.169 (±0.149)	19.9 (±15.1)

A demographic summary table for captures and individuals from the 2021 field season of the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness CA.

Installation	Captures	Individuals	Females C : I*		Males C : I		Juveniles C : I		Captures (F:M:J)^	Individuals (F:M:J)
Camp Curtis Guild	31	22	14	9	7	6	10	7	2:1:1.4	1.5:1:1.2
Camp Edwards	50	47	17	15	19	18	14	14	1.2:1.4:1	1.1:1.3:1
Fort Indiantown Gap	31	24	9	8	13	9	9	7	1:1.4:1	1.1:1.3:1
Joint Base McGuire-Dix-Lakehurst	44	35	19	14	19	15	6	6	3.2:3.2:1	2.3:2.5:1
Fort Belvoir	11	10	3	3	1	1	7	6	3:1:7	3:1:6
Marine Corps Base Quantico	18	16	2	2	11	9	5	5	1:5.5:2.2	1:4.5:2.5
Fort A.P. Hill	2	2	1	1	1	1	0	0	1:1:0	1:1:0
NSA Northwest Annex	26	23	7	6	8	7	11	10	1:1.1:1.6	1:1.2:1.7
Fort Stewart	0	0	0	0	0	0	0	0	-	-
Total	213	179	72	58	79	66	62	55	1.2:1.3:1	1.1:1.2:1
Mean (±STD)	23.7 (±17.5)	19.9 (±15.1)	8.0 (±7.2)	6.4 (±5.5)	8.8 (±7.4)	7.3 (±6.3)	6.9 (±4.8)	6.1 (±4.4)	1.2:1.3:1	1.1:1.2:1

*C : I = number of Captures : number of Individuals.

^F:M:J is the ratio of females, males and juveniles.

Bycatch of SGCN and At-Risk Species



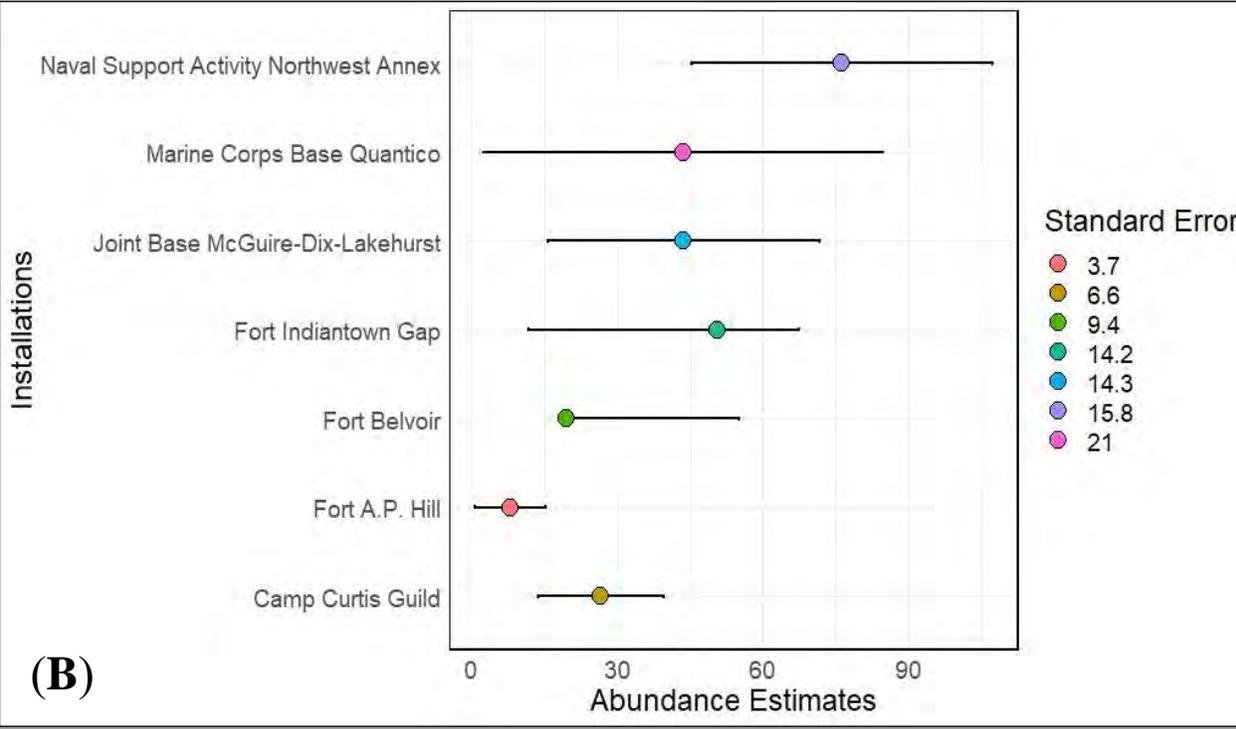
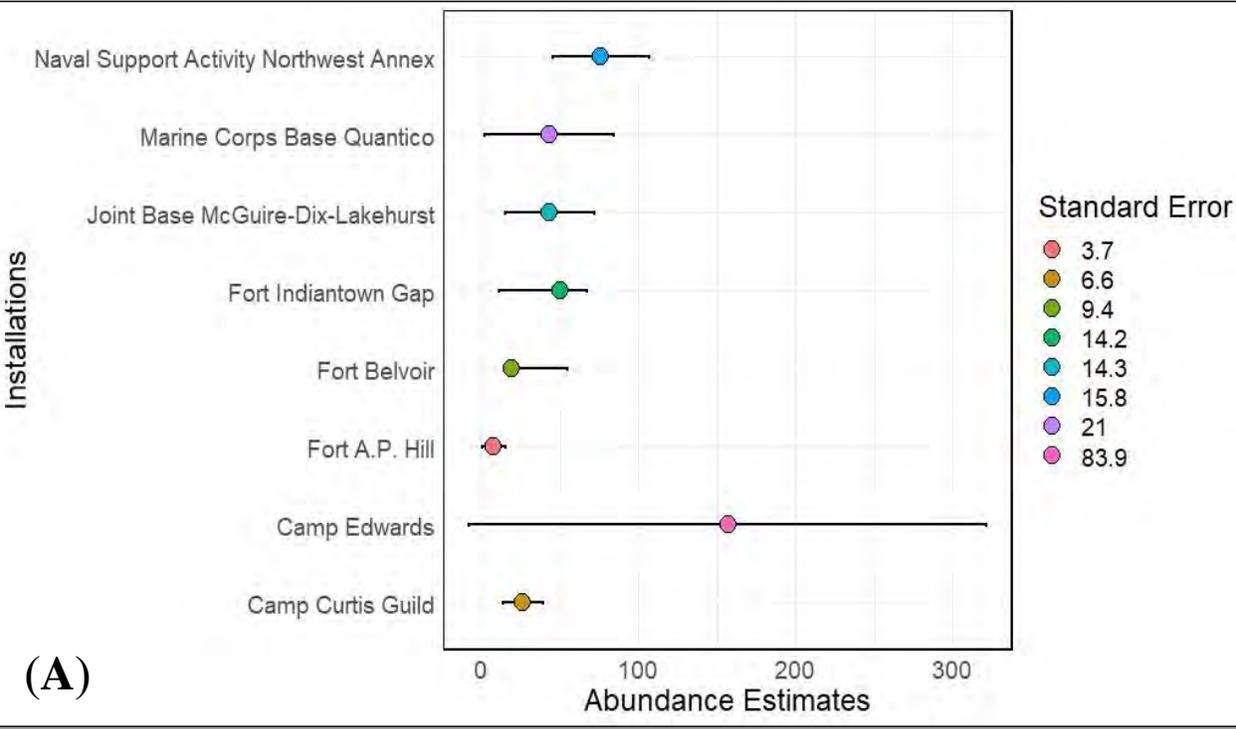
**Captured 90 individuals of 37
total taxa**

- Including SGCN species of insect, arthropod, and mollusc invertebrates, fishes, amphibians and reptiles

A sampling effort and abundance summary table for the 2021 field season of the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness CA.

Installation	Trap Nights	Trap Captures	CPUE	Individuals	Abundance	STE	Upper CI	Lower CI
Camp Curtis Guild	240	23	0.096	15	26.6	6.6	39.536	13.664
Camp Edwards	316	32	0.101	30	156.9	83.9	321.34	-7.544
Fort Indiantown Gap	232	30	0.129	23	50.5	14.2	67.392	11.728
Joint Base McGuire-Dix-Lakehurst	257	25	0.097	20	43.7	14.3	71.728	15.672
Fort Belvoir	23	11	0.478	10	19.4	9.4	55.249	18.401
Marine Corps Base Quantico	80	18	0.225	16	43.6	21	84.76	2.44
Fort A.P. Hill	80	6	0.075	5	8	3.7	15.252	0.748
NSA Northwest Annex	200	52	0.26	39	76.3	15.8	107.27	45.332
Fort Stewart	630	0	0.00	0	-	-	-	-
Total	2058	197	-	143	-	-	-	-
Mean (±STD)	229 (±179)	22 (±16)	0.162 (±0.142)	18 (±13)	53.1 (±46.9)	-	-	-

Population abundance and standard error estimates for eight participating DoD installations with sufficient capture data (A). Abundance estimates and standard error estimates with Camp Edwards excluded to enable better comparison among the remaining installations (B).



A sampling effort, demography and abundance summary table for 2021 field season of the Spotted Turtle (*Clemmys guttata*) Management for Mission Readiness CA.

Explanatory Variable [^]	Response Variable [#]	df	Slope	Intercept	R ²	P [*]	Reference
All Trap Nights	Trap Captures	6	0.089	6.88	0.54	0.04*	Table 5
All Trap Nights	Hand Captures	6	0.38	-3.2	0.39	0.1	Table 5
All Trap Nights	Individuals	6	0.104	3.55	0.61	0.02*	Table 5
All Trap Nights	CPUE	6	-0.001	0.34	0.36	0.12	Table 5
All Trap Nights	Female Captures	6	0.057	-1.32	0.74	0.01*	Table 6
All Trap Nights	Male Captures	6	0.055	-0.09	0.68	0.01*	Table 6
All Trap Nights	Juvenile Captures	6	0.015	5.09	0.13	0.38	Table 6
All Trap Nights	Female-Male Ratio	6	-0.003	1.76	0.13	0.38	Table 6
All Trap Nights	Adult-Juvenile Ratio	6	0.013	-0.03	0.48	0.06	Table 6
SA Trap Nights	SA Trap Captures	6	0.085	9.49	0.36	0.1	Table 8
SA Trap Nights	SA Individuals	6	0.067	7.82	0.41	0.09	Table 8
SA Trap Nights	SA CPUE	6	-0.001	0.33	0.41	0.09	Table 8
SA Trap Nights	Abundance	6	0.302	-0.79	0.45	0.07	Table 8
SA Trap Nights	STE-Abundance Ratio	6	-0.001	0.46	0.14	0.36	Table 8

[^]SA indicates Standardized Assessment (SA) trapping only.

[#]STE indicates the standard error of the abundance estimate.

^{*}Indicates the slope of the line is significantly different from 0 at $\alpha = 0.05$.

Conservation Application

Spotted Turtle CA Report and Status Assessment can be used as models for:

- Promoting cooperation and partnerships among state and federal agencies for imperiled species, particularly with the DoD
- Prioritizing conservation actions and resources
- Collecting baseline data for inclusion into INRMP for many other DoD sites
- The collection of field data on a variety of at-risk species for inclusion into Species Status Assessments



Best Management Practices and INRMPS

CLASSIFIED
For Group Publication
NO. 11-2019
DEPARTMENT OF DEFENSE
OFFICE OF TECHNOLOGY AND SECURITY POLICY



**Department of Defense
Legacy Resource Management Program**

**Recommended Best Management Practices
for the Spotted Turtle
on Department of Defense Installations**

Department of Defense Partners in Amphibian and Reptile Conservation



March, 2019



**Building Capacity for Managing At-risk Species to
Enable Mission Readiness on Military Installations:
Spotted Turtle Status Assessment and Surveys**

Project # NR-20-002

Background:
Spotted Turtle (*Clemmys guttata*) populations have declined across their range in the eastern United States, and this is particularly true in coastal areas where many Department of Defense (DoD) installations are located. The Spotted Turtle is confirmed present on 39 military sites, is a DoD Mission Sensitive Species, and is currently under review by the U.S. Fish and Wildlife Service (USFWS) for listing under the Endangered Species Act. However, little information is known about the distribution and population status of Spotted Turtles on military lands. Expanding the current knowledge of this species on military installations will enable natural resource personnel to improve Integrated Natural Resource Management Plans (INRMP), thereby promoting mission readiness through support of Spotted Turtle conservation and improved habitat management.



Benefit:
These data will improve the understanding of the habitat use and population status of Spotted Turtles on military sites. In addition, the resulting data can be used by installation natural resource managers to better inform INRMP priorities and implement best management practices that support mission readiness and conservation efforts for the Spotted Turtle. Lastly, the methods used in this survey can serve as a replicable model for the additional 30 installations with Spotted Turtle records, as well as the 60 sites with potential habitat and populations. This project enabled nearly 40 people, including those from the DoD, USFWS, state agencies, and non-governmental organizations, working in partnership to provide technical expertise and leadership to promote conservation science and management for the Spotted Turtle.

Accomplishments:
This project successfully accomplished field surveys and status assessments of Spotted Turtle populations on nine military sites. It provides a baseline for population trends and establishes best management practices that can be utilized and implemented at these nine military installations. These best management practices can also be duplicated on the remaining 30 military sites where this species has been confirmed present.

Contact Information:
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Program Scientist
Smithsonian Conservation Biology Institute
Front Royal, VA 22630
Phone: (540) 635-0466
Email: AkreT@si.edu

Objective:
The primary objective of this project was to investigate the status, distribution, and abundance of Spotted Turtles on nine military sites located from Massachusetts to Georgia through a standardized monitoring protocol developed for an ongoing conservation research effort supported by the USFWS and participating states. The project aim was to determine Spotted Turtle population distribution and abundance, and to evaluate habitat management opportunities on military sites.

Summary of Approach:
This project conducted a brief (November 2020 to November 2021) but thorough status assessment of Spotted Turtle populations on nine military sites using

a standardized monitoring protocol of high-density trap rapid assessments, demographic assessments, visual rapid assessments, and/or adaptive inventory-based trapping. Military site that participated in this study included Camps Curtis Guild, Camp Edwards, Fort Indiantown Gap, Joint Base McGuire-Dix Lakehurst, Forts Belvoir, Fort A.P. Hill, Marine Corps Base Quantico, Naval Support Activity Northwest Annex, and Fort Stewart. As traps were monitored for Spotted Turtle captures during deployment, select bycatch encountered during trap checks was also recorded.



**Enabling the Mission, Defending the Resources
Department of Defense Natural Resources Program**

REVISED 9/28/2022

<https://denix.osd.mil/dodparc/>

Next steps

- Geographically and demographically important Spotted Turtle populations occur on DoD lands on the eastern seaboard
- More work is needed to expand and refine an understanding of the Spotted Turtle on DoD lands
- While DoD lands may encompass Spotted Turtle populations that are essential to landscape-level conservation of a regional population complex, effective conservation of such a complex may not be possible through installation level INRMP-based maintenance alone
- There is a need for a complementary approach to landscape level conservation of Spotted Turtles and their wetland habitat that includes public-private partnerships among the DoD, state agencies, private companies, NGOs and small holders
- The CESU cooperative agreement approach to working with DoD representatives for conservation management of at-risk species has been very productive
- Continued support for this cooperative network approach is strongly recommended to leverage the mutual interests of the ESTWG and DoD LRMP and DoD PARC for Spotted Turtle conservation
- **LNRMP supported CA with SI for Western Pond Turtle on West Coast Installations**
- DoD SERDP Multi-Stressor Cumulative Risk Assessment for Spotted Turtle and Western Pond Turtle

Acknowledgments

Chris Petersen

Robert Lovich

Tom Akre

Houston Chandler

Lori Erb

Liz Willey

Molly Parren

John Garrison

Emily Sikora

Hunter VanDoren

JD Kleopfer

Ben Stegenga

Lawrence Carlile

Rachael Rourke

Andrea Colton

Taylor Austin

John Pilcicki

Dorothy Keough

Christa Nye

Kenneth Erwin

Jason Applegate

Kyle Crafts

Andrew Satterwhite

Jessica Soffee

Jake McCumber

Annie Curtis

Matthew Penella

Mark Stevenson

Michael Luna

Paul Mahone

Brandon Ruhe

James White

Sarah Cooke

Rebecca Picone

Jarrold Derr

Christopher Hauer

Jamie Shinskie

Emily Shertzer

Cassidy Titus

Nicole Madden

Sergeant Tammaro

Patrick Roberts

Mike Jones

Kat Lauer

Ellery Lassiter

Tomas Nocera

Taylor Siedel

Jeremy Vandenberg

Chris Polinski

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NAVFAC

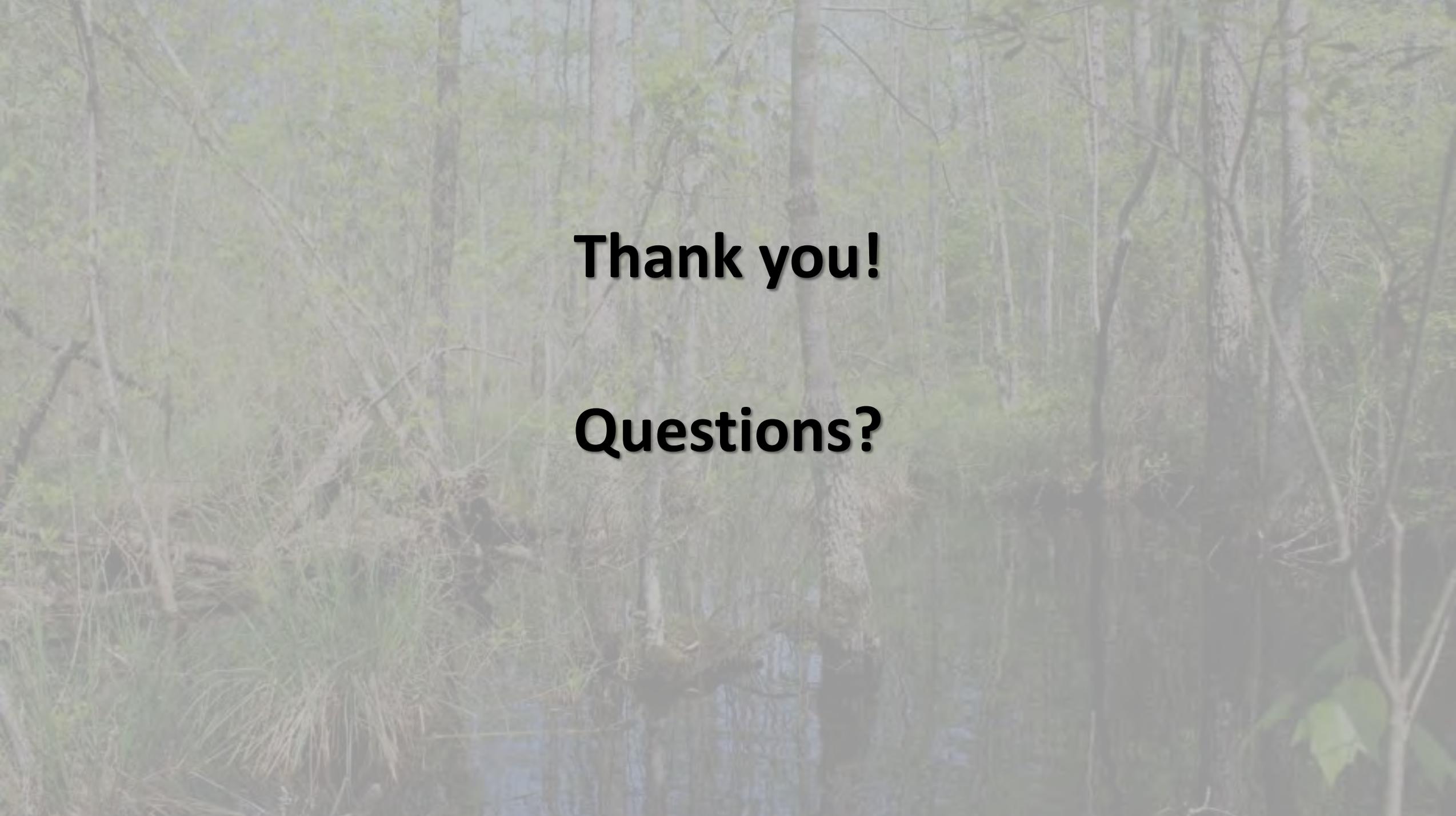
DoD PARC

USFWS

Virginia DWR

ATO

CSWG Partners



Thank you!

Questions?

Name	Affiliation	Location/Installation	Position	Cooperative Agreement Role
Chris Petersen	Naval Facilities Systems Engineering Command/DoD PARC	Norfolk, VA	Senior Natural Resources Specialist	DoD Cooperative Agreement Lead
Robert Lovich	Naval Facilities Systems Engineering Command/DoD PARC	San Diego, CA	Senior Natural Resources Specialist	DoD Cooperative Agreement Lead
Ryan Orndorff	DoD Natural Resource Program	Alexandria, VA	Director	Cooperative Agreement Sponsor
Elizabeth Galli-Noble	DoD Natural Resource Program	Alexandria, VA	Program Manager	DoD Legacy Resource Management Program Manager
Thomas Akre	Smithsonian Institution	Front Royal, VA	Research Ecologist	SI Cooperative Agreement Research Lead
Jessica Meck	Smithsonian Institution	Front Royal, VA	Research Coordinator	Cooperative Agreement Coordinator
Emily Sikora	Smithsonian Institution	Front Royal, VA	Research Technician	Research Technician
Jillian Newman*	Smithsonian Institution	Front Royal, VA	Research Technician	Research Technician
Lisabeth Willey	American Turtle Observatory	New Salem, MA	Research Ecologist	Organization Research Lead
Molly Parren	American Turtle Observatory	New Salem, MA	Research Associate	Research Technician
John Garrison	American Turtle Observatory	New Salem, MA	Research Associate	Research Technician
Brandon Ruhe	MidAtlantic Center for Herpetology & Conservation	Oley, PA	Principal	Organization Lead
Lori Erb	MidAtlantic Center for Herpetology & Conservation	Oley, PA	Turtle Specialist	Organization Research Lead
James White	MidAtlantic Center for Herpetology & Conservation	Oley, PA	Research Technician	Research Technician
Houston Chandler	The Orianne Society	Tiger, GA	Director of Science	Organization Research Lead
Ben Stegenga	The Orianne Society	Tiger, GA	Research Technician	Research Technician
Andrea Colton	The Orianne Society	Tiger, GA	Research Technician	Research Technician
Annie Curtis	Army National Guard	Camps Curtis Guild & Edwards	Biologist	Installation Representative
Matthew Penella	Army National Guard	Camps Curtis Guild & Edwards	Biologist	Project Technician

Name	Affiliation	Location/Installation	Position	Cooperative Agreement Role
Jacob McCumber	Army National Guard	Camps Curtis Guild & Edwards	National Resources Manager	Project Technician
Joseph Hovis	Army National Guard	Fort Indiantown Gap	Wildlife Biologist	Installation Representative
Annie Haines	Army National Guard	Fort Indiantown Gap	Natural Resources Manager	Installation Representative
Rebecca Piccone	Army National Guard	Fort Indiantown Gap	Wildlife Technician	Project Technician
Mark Stevenson	Air Force	Joint Base McGuire-Dix-Lakehurst	Natural Resources Biologist	Installation Representative
Paul Mahon	Air Force	Joint Base McGuire-Dix-Lakehurst	Biologist	Project Technician
Michael Luna	Air Force	Joint Base McGuire-Dix-Lakehurst	Biologist	Project Technician
Dorothy Keough	Army	Fort Belvoir	Conservation Branch Chief	Installation Representative
John Pilcicki	Army	Fort Belvoir	Wildlife Biologist	Project Technician
Christa Nye	Marine Corps	MCB Quantico	Natural Resources Manager	Installation Representative
Joseph Larose	Marine Corps	MCB Quantico	Natural Resources Manager	Installation Representative
Kenneth Erwin	Marine Corps	MCB Quantico	Biologist	Project Technician
Jason Applegate	Army	Fort A.P. Hill	Natural Resources Specialist	Installation Representative
Andrew Satterwhite*	Army	Fort A.P. Hill	Natural Resources Specialist	Project Technician
Kyle Crafts	Army	Fort A.P. Hill	Natural Resources Specialist	Project Technician
Taylor Austin	Navy	NSA Northwest Annex	Natural Resources Manager	Installation Representative
Lawrence Carlile	Army	Fort Stewart	Fish & Wildlife Branch Chief	Installation Representative
Rachel Rourke	Army	Fort Stewart	Wildlife Biologist	Project Technician
Personnel	Institutions	Installations	Positions	Roles
37	12	9	18	9