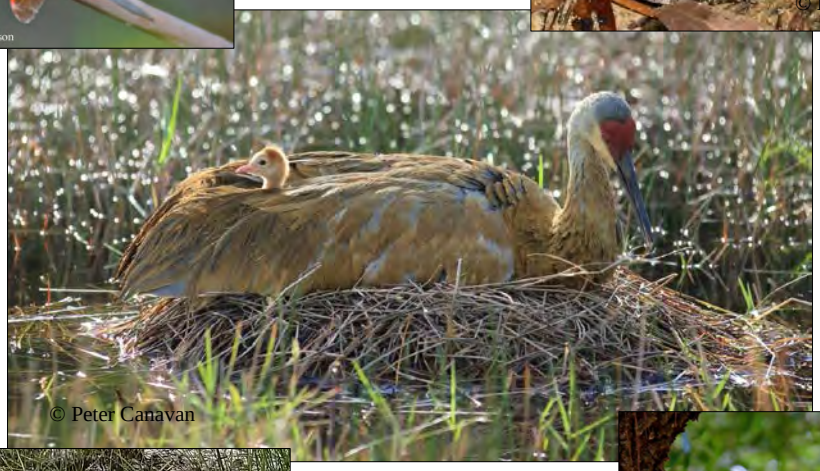
# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

Camp Blanding Joint Training Center
Clay County, FL
Appendices I, II, and III








Prepared by the U.S. Fish and Wildlife Service, Florida Armory Board, and the Florida Fish and Wildlife Conservation Commission in cooperation with the Army National Guard

November 14, 2016 (draft)

# APPENDIX I – FWC Gopher Tortoise Relocation Permit

# Categorical Exclusion Gopher Tortoise Relocation Permit

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
Species Conservation Planning Section
620 South Meridian Street, M.S. 2A
Tallahassee, FL 32399-1600

Permittee Name: Camp Blanding Joint Training Center
Permittee Address: 5629 SR 16W
Building 4540
Starke, FL 32091
Contact: Ms. Jennifer Perkins
Phone/Fax No.: 904-682-2441/682-3157

Permit #: GTM-13-00001
Effective Date: January 27, 2014
Expiration Date: January 27, 2019

Agent Name: Mr. Matt Stowe
Agent Address: Camp Blanding Joint Training Center
145 Moultrie Crossing Lane
Saint Augustine, FL 32086
Phone/Fax No.: 904-823-0249/823-0189

PERMITTEE IS AUTHORIZED TO:

Capture by using bucket traps, live traps, hand shovel and backhoe excavation of tortoise burrows, remove and relocate gopher tortoises (*Gopherus polyphemus*) by non-harmful means, and to molest, damage or destroy gopher tortoise burrows while conducting these activities, subject to the following conditions and provisions, in association with military training and other operational activities as described in the Gopher Tortoise Permitting Guidelines – April 2008 (revised April 2013) [hereafter, "Permitting Guidelines"].

AUTHORIZED LOCATION(S):

73,000-acre Camp Blanding Joint Training Center located south of State Road 16 and west of State Road 21 (T5S,R23E,S19-36; T5S,R24E,S19 & 30-31; T6S,R23E,S1-15,17-20 & 22-36; T6S,R24E,S6,16-21 & 28-33; T7S,R23E,S1-30 & 32-35; T7S,R24E,S4-9,16-20 & 30; T8S,R23E,S2-5 & 8-9; with Latitude 29° 56' 35" N and Longitude 81° 57' 50" W), in Clay County, relocated to and released at the 206.0-acre Griffis Loop Management Area-A unit recipient site (T7S,R23E,S33; T8S,R23E,S3 & 4; with Latitude 29° 49' 57" N and Longitude 82° 0' 10" W), or temporarily excluded to on-site adjacent recipient areas (see condition #4).

Permittee Signature _____ Date _____

Not valid unless signed. By signature, confirms that all information provided to issue the permit is accurate and complete, and indicates acceptance and understanding of the provisions and conditions listed below. **Any false statements or misrepresentations when applying for this permit may result in felony charges and will result in revocation of this permit.**

Authorized by: Nick Wiley, Executive Director

Authorizing Signature Bradley P. Gruver Date 01/27/14
Bradley Gruver, Ph.D., Leader
Species Conservation Planning Section

PERMIT CONDITIONS AND PROVISIONS (continued):

**Donor Site**

1. Authorizations to conduct the specified activities in association with the relocation of gopher tortoises in Florida are subject to Rules 68A-9.002 and 68A-27 Florida Administrative Code (F.A.C.), and the Florida Fish and Wildlife Conservation Commission's (hereafter, "FWC") Permitting Guidelines, and the following provisions/conditions.

2. Tortoises shall only be relocated when the low temperature at the recipient site is forecasted by the National Weather Service to be above 50° Fahrenheit for three consecutive days after release (including the day of relocation). This three-day window of milder overnight temperatures is required to allow the relocated tortoises to settle into the recipient site and to reduce the chance of cold-related stress or mortality. Authorization of the capture/relocation is otherwise predicated and conditioned on the information and assurances provided in Appendix N of the January 2014 draft of the Camp Blanding Joint Training Center Integrated Natural Resources Management Plan, [hereafter "INRMP"] scheduled to be approved by the National Guard Bureau in 2014, the assurances of which are herein incorporated by reference.

3. Captured gopher tortoises that show signs of disease (i.e., nasal and ocular discharge, emaciation, etc.) should not be relocated to the 206.0-acre Management Area-A unit of the 613-acre Griffis Loop recipient site. At the Permittee's discretion, symptomatic tortoises may be: relocated on-site; transported to and quarantined at a FWC licensed wildlife rehabilitation center (list available upon request) or licensed veterinary facility and observed for recovery and subsequent relocation along with others from the population; transported and donated to a FWC permitted disease research program; or humanely euthanized by a licensed veterinarian when disease is advanced.

4. Gopher tortoises captured from military installation projects that are of short duration, as described in the INRMP, may be released into temporary pens at densities of no more than 3 gopher tortoises per acre, in accordance with the Permitting Guidelines, and excluded from the donor site for no more than 10 days.

5. This permit does not authorize the Permittee access to any public or private properties. Any required permission must be secured from the appropriate landholders prior to undertaking any work on such properties.

6. Captures/relocations may be undertaken only subsequent to issuance of authorization for land clearing or grading, or construction activities, if required, by local, state and/or federal agencies. This permit is subject to revocation at any time pursuant to Chapter 120, Florida Statutes. It is nontransferable and must be readily available for inspection at all times while engaging in the permitted activities.

7. The activities authorized under this permit must be carried out by the Authorized Gopher Tortoise Agent ("Authorized Agent") designated on this permit, or under the direct supervision and responsibility of that Authorized Agent. The Permittee and Authorized Agent shall be as fully responsible for any such activities to the same extent as if they had themselves carried out those activities under this permit.

8. Either this original permit, or a complete copy, must be clearly posted at the affected site at all times while engaged in the permitted tortoise relocation activities.

9. The Permittee, by signing this permit, specifically agrees to allow authorized FWC personnel, upon presentation of credentials as may be required by law, access to the donor and recipient sites at

PERMIT CONDITIONS AND PROVISIONS (continued):

reasonable times, for the purpose of inspecting the capture/relocation activities authorized under this permit.

10. Any gopher tortoise mortality or injury that occurs while conducting activities authorized under this permit shall be reported to the Gopher Tortoise Permit Coordinator (phone number 850-921-1031) within 48 hours of the occurrence. An injured gopher tortoise shall be promptly taken to either a licensed wildlife rehabilitation facility or a licensed veterinarian for evaluation and treatment. Contact information for the facility or veterinarian shall be included with the information reported.

11. Non-native wildlife that are captured during gopher tortoise capture and relocation activities should either be humanely euthanized or placed with an individual, institution, or organization that is properly permitted to possess those species.

12. Gopher tortoise commensals listed in Rule 68A-27 as either State-designated threatened species or species of special concern (this does not include the eastern indigo snake [*Drymarchon couperi*] and other Federally-designated Endangered and Threatened species) and encountered in the gopher tortoise capture operation should either be released on-site or allowed to escape unharmed, or be donated to an educational or research facility that possesses the appropriate FWC scientific collecting/educational use permit and is authorized to receive additional specimens of the captured species. Non-listed native commensals should either be allowed to escape unharmed or released on-site. Refer to Appendix 9 of the Permitting Guidelines for additional information on gopher tortoise commensals. If you have questions regarding the proper method of addressing gopher tortoise commensals encountered during capture operations, contact the Gopher Tortoise Permit Coordinator (phone number 850-921-1031).

13. This permit does not authorize the take of Federally-designated Endangered and Threatened species. Only individuals who are in possession of a valid permit or authorization issued by the United States Fish and Wildlife Service (USFWS) to capture or possess an eastern indigo snake (*Drymarchon couperi*) or other Federally-designated Endangered and Threatened species may physically handle those species. If individuals without a USFWS permit or authorization encounter an eastern indigo snake during attempts to capture gopher tortoises or during subsequent land alteration or development activities within the property, all movement of heavy equipment and land alteration or development activities within the vicinity of the snake shall cease to allow the snake to vacate the area. No movement of heavy equipment, or land alteration or development activities within the vicinity of the snake shall resume until the snake has vacated the work area.

14. The Permittee shall submit a report detailing the capture/relocation of gopher tortoises for each military training or operational activity to the Gopher Tortoise Permit Coordinator either by email to gtpermits@myfwc.com or by mail delivery service to the address listed in the letterhead within 30 days of release of the captured/relocated tortoises involved. A report form is attached for use in that regard. Any request for permit amendment, including renewal, should be submitted at least 45 days prior to the expiration date of this permit.

**Recipient Site**

15. Up to 262 gopher tortoises may be received at and relocated into the estimated 206.0 acres of tortoise habitat contained within the Management Area-A unit of the 613-acre Griffis Loop recipient site identified above. Applications to amend this permit to authorize relocations of gopher tortoises to other units within this recipient site will be evaluated and acted upon by the FWC under the permitting guidelines and provisions/conditions in place at the time of application.

PERMIT CONDITIONS AND PROVISIONS (continued):

16. The permittee shall have the obligation to manage and maintain habitat for gopher tortoises in accordance with the INRMP.

17. Gopher tortoises released at the designated recipient site shall be released into an enclosure in conformance with the FWC enclosure requirements. The enclosure must be maintained for a minimum period of 6 months from the final release of gopher tortoises into the enclosure, but no longer than twelve months; however, the maximum 12-month time limit will not apply when the entire perimeter of the approved recipient site parcel is permanently fenced in conformance with the FWC enclosure requirements. Enclosure materials, construction methods and dimensions must conform to the requirements specified in the Permitting Guidelines. The enclosures must be regularly monitored and maintained and repaired immediately if damaged to maintain the integrity of the enclosure. Monitoring of the enclosure shall be conducted at least once a week for the first 4 weeks following release of tortoises, and at least once a month thereafter.

18. Gopher tortoises may be released into a temporary enclosure constructed within a portion of a recipient site. The stocking rate within the enclosure may be up to 1.5 times the gopher tortoise density that is approved by the FWC for that entire recipient site parcel. However, the maximum number of tortoises approved by the FWC for release into the entire recipient site parcel shall not be exceeded.

19. The Permittee shall keep written records of all the habitat management activities conducted within, and all tortoises relocated into the recipient site. A report of the habitat management activities, habitat monitoring and gopher tortoise population monitoring, as described in the INRMP, shall be provided to the Gopher Tortoise Permit Coordinator at the address listed in the letterhead in accordance with the phased recipient site monitoring and reporting requirements of the Permitting Guidelines, with the first report due on December 31, 2016. The subsequent reports shall be received by the Gopher Tortoise Permit Coordinator by December 31st every three years thereafter for the first 15 years this permit is in effect. If Camp Blanding has met monitoring and reporting requirements during the first 15 years, the monitoring and reporting requirement is reduced to every 5 years for the next 10 years. Following 25 years of successfully meeting all monitoring, habitat management and reporting requirements, reports are required every ten years as specified in the Permitting Guidelines. Reports shall be in the form specified by the FWC, and shall include the results of all monitoring and habitat management activities conducted through September 30th of the year the report is due.

**A person whose substantial interests are affected by FWC's action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. A person seeking a hearing on FWC's action shall file a petition for hearing with the agency within 21 days of receipt of written notice of the decision. The petition must contain the information and otherwise comply with section 120.569, Florida Statutes, and the uniform rules of the Florida Division of Administration, chapter 28-106, Florida Administrative Code. The Permittee shall cease all work authorized by this permit, upon receiving written notice that the FWC has received a petition. The cease work order shall remain in effect until the petition is resolved. The enclosed Explanation of Rights statement provides additional information as to the rights of parties whose substantial interests are or may be affected by this action.**

RDM/es
LIC 6-20
GTM-13-00001.per

Enclosure: Notice of Rights
Draft Camp Blanding INRMP (January 2014) – Appendix N
After Action Report form
cc w/o enc: Mr. Eric Seckinger, FWC, Tallahassee

The following text is an excerpt from Camp Blanding Joint Training Center's 2014 Integrated Natural Resources Management Plan:

**4.7.3 Federal Candidate Species**

***Gopher tortoise***: The gopher tortoise is a federal candidate species for listing as a threatened species and a state-listed threatened species that is typically found in dry upland habitats, such as sandhill, scrub, and pine flatwoods. Gopher tortoises excavate deep burrows for refuge from predators, weather, and fire (Hipes et al. 2000). The gopher tortoise is considered a keystone species because their burrows provide refuge for more than 300 animal species that neither harm nor benefit the gopher tortoise, including listed species such as the eastern indigo snake, Florida pine snake, Florida mouse, and gopher frog (FDMA 2011). The gopher tortoise population is thriving at CBJTC; the installation has been used in the past for the relocation of gopher tortoises displaced by development in northeastern Florida.

Through appropriate habitat management (See Sections 4.4.3, 4.4.4, and 4.4.6), CBJTC will manage existing high quality habitat as well as improve and restore degraded habitat in xeric uplands and natural communities that support the gopher tortoise. Frequent prescribed fire will be the primary tool, but other treatments, such as mechanical and chemical removal of hardwoods, replanting longleaf pine or native grasses and other ground cover in appropriate areas, and plantation thinning will be used when necessary. Maintaining these communities in a manner that replicates their natural form and function helps ensure they meet the needs of the gopher tortoise and the other species dependent on these communities.

Management Guidelines: Gopher tortoises are vulnerable to several threats within their range, including habitat degradation and loss (FFWCC 2007). The following management actions are recommended:

- Maintain a 25-foot boundary around all gopher tortoise burrows within the vicinity of projects and military training activities that have the potential to collapse burrows. Identify these burrows with high visibility signs indicating the 25-foot boundary where gopher tortoises will not be relocated during a project or military training.
- Manage fuel loads by implementing dormant season burns in units with high fuel loads and conduct maintenance burns during the growing season on a 1-3 year rotation.
- Natural stands will be maintained with their uneven-age or several-age structure. At cutting cycles of approximately 25 years, stand density will be reduced to basal areas between 60 and 80 square feet (sq-ft) per acre.
- Underplant turkey oak stands with containerized longleaf pine seedlings if natural regeneration is less than 200 longleaf pine seedlings per acre. Where practical and necessary, treatments such as mechanical thinning and herbicide treatment may be used to reduce the hardwood midstory.
- Harvest and remove on a large scale existing sand pine stands while retaining any volunteer or original longleaf pines. After 2-3 years the stands will then be burned and/or chopped, and replanted with containerized longleaf pine.
- Control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species.

**Permitting**

CBJTC has worked closely with FFWCC in developing the following permitting parameters. Most on-installation activities do not adversely affect the available habitat for gopher tortoises. Projects that are not expected to have a negative impact to gopher tortoise habitat or activities where the area will return to gopher tortoise habitat upon completion will not require a permit. Examples of these projects include military training or readiness events (Picture 1), the placement of conex storage containers (Picture 2), or construction in a management unit that does not adversely impact the quality of the habitat – such as a new tower (Picture 3) on a firing range or a temporary structure in a training area. This is not an exhaustive list. In addition, projects where gopher tortoise habitat will be created or improved, such as the creation of new ranges or renovations of existing ranges (Pictures 7 and 8) will also be covered under the categorical exclusion. The construction of permanent structures and parking lots and the laying of pavement or gravel shall still be permitted through the normal permitting process. For projects that will impact and require the relocation of gopher tortoises, all tortoises shall be captured, marked, and relocated using the methods outlined in FFWCC's Gopher Tortoise Permitting Guidelines, and as conducted by an Authorized Gopher Tortoise Agent.

Gopher tortoises will be temporarily relocated or excluded from areas where projects of short duration, such as range maintenance and berm improvement behind ranges, will occur. These short duration projects typically require some level of ground disturbance. Tortoises will be penned for no longer than 10 days for temporary relocations. For construction activities, training events, and other projects that exceed the 10-day threshold, gopher tortoises will be permanently relocated to an approved recipient site. The number of permanently relocated tortoises is anticipated to be low (e.g. only 20 adult tortoises and 3 juveniles – excavated from 59 burrows – have been permanently relocated from 9 project sites between 2009 and 2012.

To the extent possible, FFWCC will receive notification of any tortoise relocation activity (gtpermits@myfwc.com) at least 72 hours prior to relocation, not including weekends or holidays. At that time, FFWCC will receive a copy of the 100% gopher tortoise burrow survey of the project area. After Action Reports, in the format provided by FFWCC, will be submitted within 30 days of gopher tortoises being relocated.

**Recipient Site**

The area known as Griffis Loop is bounded by Griffis Loop and Greble Road (Figure 1). Only light maneuvers, such as light infantry (foot traffic) and rubber-wheeled vehicles, have occurred in the area and it is expected that only these activities will continue. Training only occurs occasionally in this area and vehicles rarely leave the road. The area will be managed with fire, on approximately a 1-3 year interval, to maintain canopy cover at ≤ 60% and herbaceous groundcover at ≥ 30%. Management guidelines that are recommended above for the entire installation will be implemented at the recipient site. Future management units selected to house recipient sites, including those located on buffer lands, shall have comparable uses and similar burn intervals and vegetative cover percentages.

Griffis Loop is broken up into 3 management units (Figure 1). Management Area A shall be the recipient site used for the next 5 years. Enclosure material will meet the requirements listed in the Gopher Tortoise Permitting Guidelines (revised April 2013). Enclosures within the recipient site will remain in place for 6-12+ months after the last gopher tortoise is relocated into the enclosure. It is anticipated that fencing will be in place longer than 12 months to accommodate multiple projects over a long time-

span. For the long term, when Management Area C is used, fencing will remain in place for at least 12 months because of the proximity of State Road 21. When possible, the enclosure will have a rounded perimeter to prevent tortoises from congregating in corners. Fencing shall be monitored every week for the first month to ensure that it remains intact. Thereafter, fence monitoring will occur according to the Gopher Tortoise Permitting Guidelines. Gopher tortoise population and habitat/vegetation monitoring shall occur at least as often as the intervals described in the Gopher Tortoise Permitting Guidelines. The results of these surveys will also be included in the annual report submitted to FFWCC.

A 15% survey of Management Area A was conducted using the burrow survey methods found in Appendix 4 of the Gopher Tortoise Permitting Guidelines, although Line Transect Distance Surveys are also an appropriate survey method and may be used. Because the entire site provides potential gopher tortoise habitat, 31 acres of the 206-acre recipient site was surveyed to ascertain the current density of tortoises. Management Area A is composed entirely of sandhill habitat (Figure 2), with Kershaw and Penney soils (Figure 3 and Table 2). The survey assessed both soil types. The Land Cover Types map (Figure 2) shows the potential tortoise habitat, transects, and burrow locations (Table 1 contains information pertaining to the gopher tortoise burrows; Table 3 contains information pertaining to the transects). The current estimated baseline density is 0.73 tortoises per acre. The maximum allowable gopher tortoise density is 2 tortoises/acre, resulting in a final stocking rate of 1.27 tortoises/acre that can be relocated to this recipient site is (i.e., approximately 262 tortoises). Burrows less than 5 inches in width were not included in the calculation of the baseline density estimation. In addition, juveniles with a total carapace length of less than 130 mm (i.e., 5 inches) that are relocated into the recipient site do not count towards the carrying capacity.

$$\frac{\text{(45 potentially occupied burrows >129mm in width)}}{\text{(31 acres within survey area)}} \times (0.50) = 0.73 \text{ tortoises/acre}$$

(2 tortoises/acre allowed – 0.73 tortoises/acre baseline density) X 206 acres ≈ 262 tortoises

A vegetation survey was also conducted using the methods found in Appendix 7 of the Gopher Tortoise Permitting Guidelines. The majority of the site consists of longleaf pine and turkey oak, with a moderate layer of debris on the ground, in addition to wiregrass and forbs. Vegetation height is low and some bare ground is present. A very small amount of habitat is dominated by live oak and turkey oak with a groundcover of debris and sparse woody vegetation. The remaining area – approximately one-third of the site – is dominated by longleaf pine only, with little debris, little bare ground, and more herbaceous vegetation. Canopy cover overall averaged 54% and ranged from 36-68%. Average shrub cover was 3% and ranged from 1-9%. Only 36% of stations had any shrub cover.

Herbaceous vegetation height was wide-ranging at 0-83cm. Eight of the nine transects contained no broadleaf grasses. Only two vegetation stations along one transect had broadleaf grasses ranging from 1-5% and 6-29% cover. While 25% of vegetation stations contained no other species of grass, 39% of stations contained 6-29% cover of other species of grass and 22% had 30-59% cover. Fifteen vegetation stations contained forbs ranging from <1-29% cover. Six vegetation stations contained sedges, five of which ranged from <1-5% cover. Many of the stations had a fair amount of bare ground and debris (19 and 20 stations, respectively, both with 30-95% cover); however, there was no palmetto and virtually no vines present (3 of 6 stations with <1% cover). Half of the woody species component (9 of 19 stations)

contained <5% cover. There was no visible geographical trend in any of the fields across the landscape for shrub or canopy cover, or any of the percent cover classes.

The following is the location information for the Recipient Site Management Area A, which is located entirely within Camp Blanding Joint Training Center in Clay County, Florida:

| Section | Township | Township Directional | Range | Range Directional |
|---|---|---|---|---|
| 3 | 8 | S | 23 | E |
| 4 | 8 | S | 23 | E |
| 33 | 7 | S | 23 | E |

| Latitude Degrees | Latitude Minutes | Latitude Seconds | | Longitude Degrees | Longitude Minutes | Longitude Seconds | |
|---|---|---|---|---|---|---|---|
| 29 | 49 | 57 | N | 82 | 0 | 10 | W |

| Parcel Numbers |
|---|
| 03-08-23-000760-000-00 |
| 04-08-23-000825-000-00 |
| 33-07-23-000744-000-00 |

Picture 1

Picture2

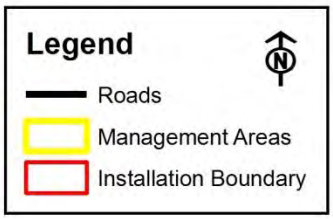
Picture 3


Picture 7

Picture 8

Figure 1


**Camp Blanding Joint Training Center**
**Gopher Tortoise Management Areas**
**Aerial Map**



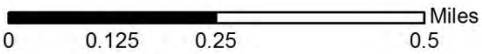
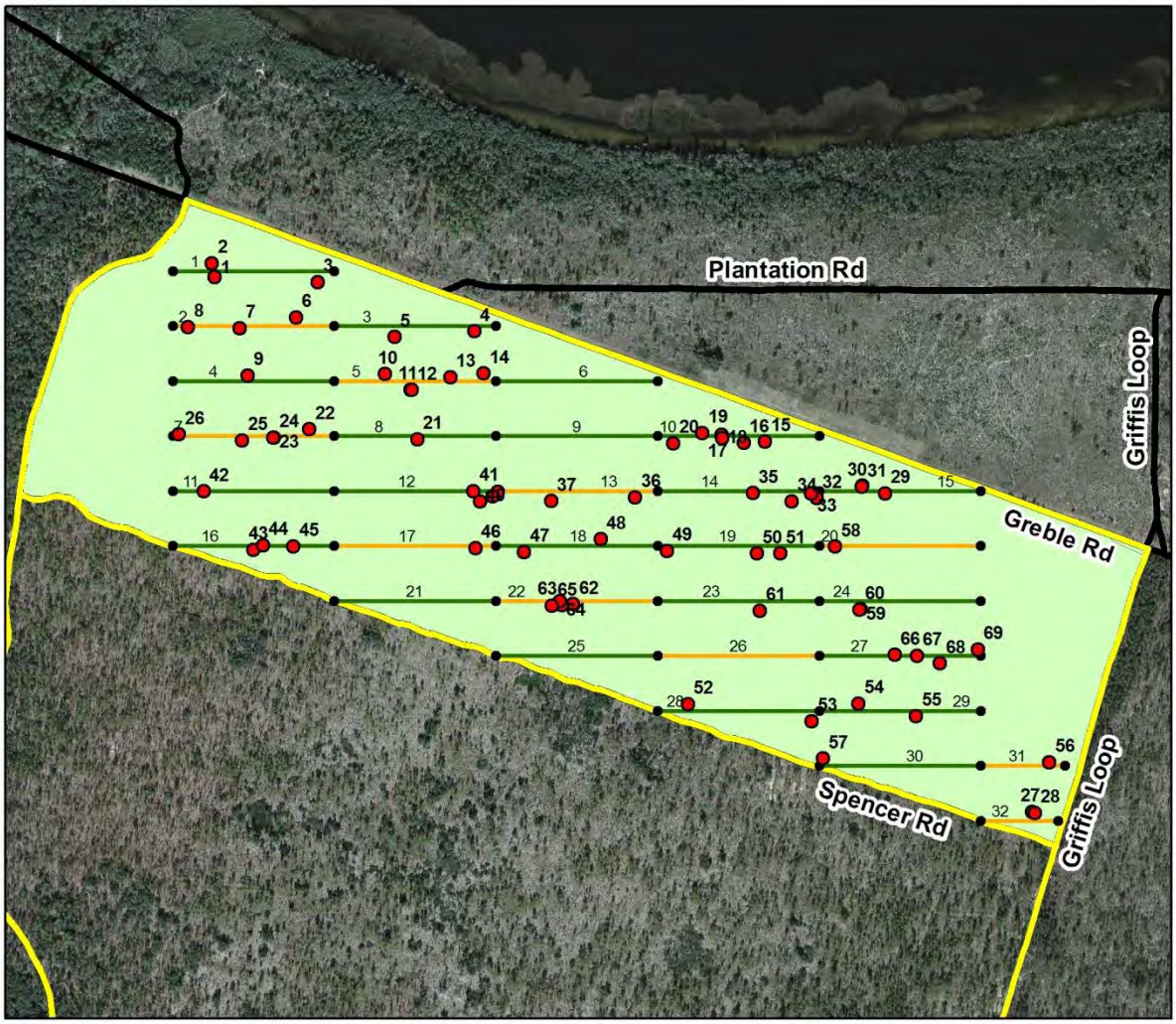
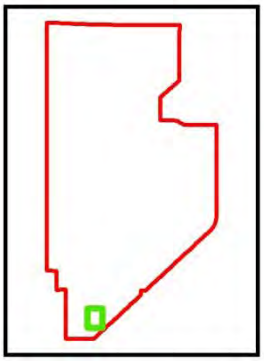




Figure 2




**Camp Blanding Joint Training Center**
**Gopher Tortoise Management Area A**
**Vegetation Community Type Map**
**and Burrow Location Map**



**Legend**

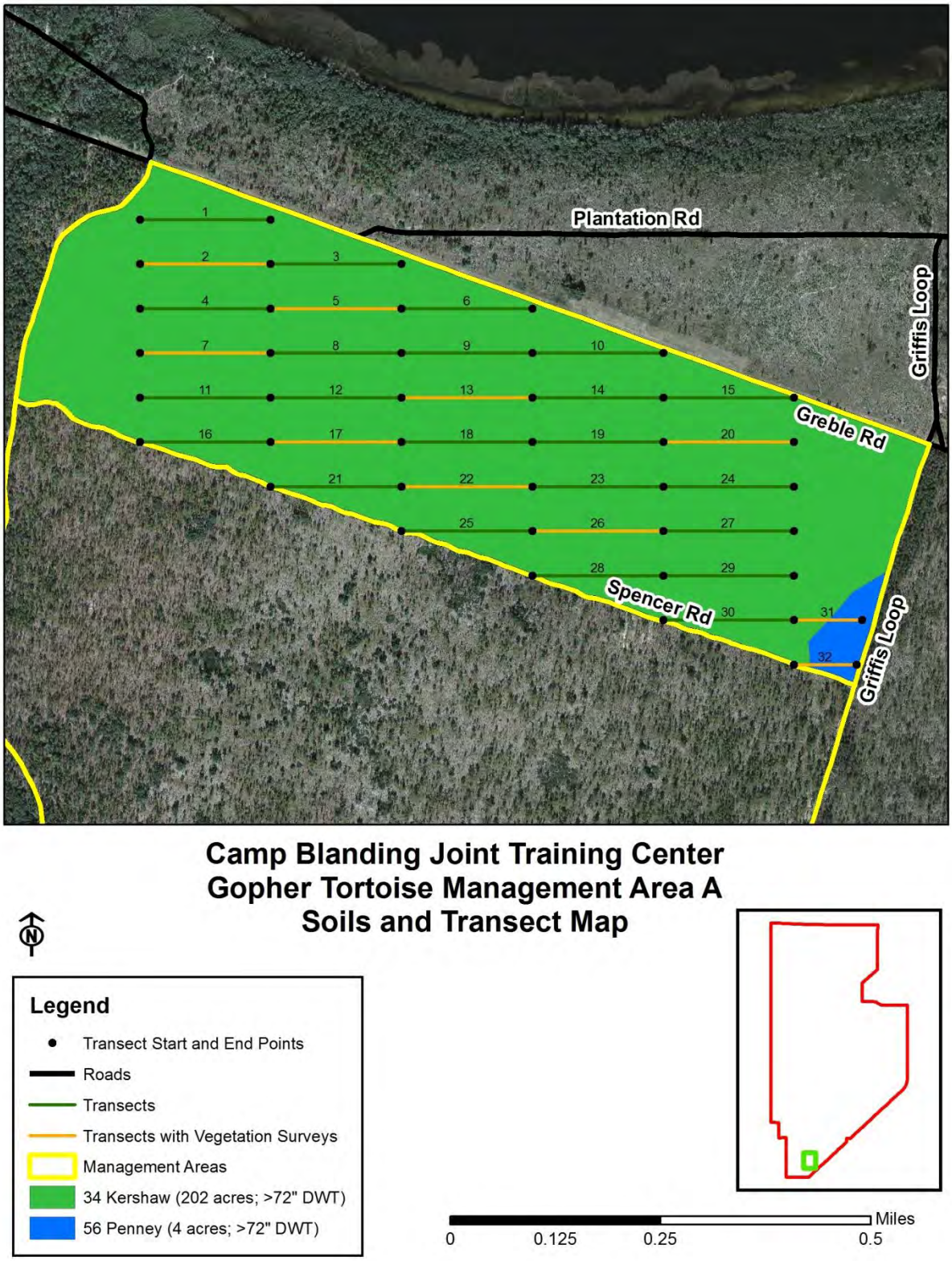
- Gopher Tortoise Burrows
- Transect Start and End Points
- Roads
- Transects
- Transects with Vegetation Surveys
- Management Areas
- Sandhill (206 acres, FLUCCS code 412)

0 0.125 0.25 0.5 Miles

Table 1. Gopher tortoise burrow information.

| Burrow ID | Size (mm) | Activity Status | Degrees Minutes Seconds | Burrow ID | Size (mm) | Activity Status | Degrees Minutes Seconds |
|---|---|---|---|---|---|---|---|
| 1 | 200 | potential | 29 50 08 N 82 00 28 W | 36 | 320 | potential | 29 49 57 N 82 00 04 W |
| 2 | 300 | potential | 29 50 09 N 82 00 28 W | 37 | 290 | potential | 29 49 57 N 82 00 09 W |
| 3 | 90 | potential | 29 50 08 N 82 00 22 W | 38 | 220 | potential | 29 49 57 N 82 00 12 W |
| 4 | 80 | potential | 29 50 05 N 82 00 13 W | 39 | 180 | potential | 29 49 57 N 82 00 12 W |
| 5 | 304 | potential | 29 50 05 N 82 00 18 W | 40 | 120 | potential | 29 49 57 N 82 00 13 W |
| 6 | 70 | potential | 29 50 06 N 82 00 24 W | 41 | 150 | potential | 29 49 57 N 82 00 13 W |
| 7 | 75 | abandoned | 29 50 05 N 82 00 27 W | 42 | 360 | potential | 29 49 57 N 82 00 29 W |
| 8 | 305 | potential | 29 50 05 N 82 00 30 W | 43 | 190 | abandoned | 29 49 54 N 82 00 26 W |
| 9 | 303 | potential | 29 50 03 N 82 00 26 W | 44 | 370 | potential | 29 49 54 N 82 00 25 W |
| 10 | 120 | potential | 29 50 03 N 82 00 18 W | 45 | 330 | potential | 29 49 54 N 82 00 24 W |
| 11 | 120 | potential | 29 50 02 N 82 00 17 W | 46 | 120 | abandoned | 29 49 54 N 82 00 13 W |
| 12 | 180 | abandoned | 29 50 02 N 82 00 17 W | 47 | 270 | potential | 29 49 54 N 82 00 10 W |
| 13 | 200 | abandoned | 29 50 03 N 82 00 15 W | 48 | 280 | potential | 29 49 55 N 82 00 06 W |
| 14 | 170 | potential | 29 50 03 N 82 00 13 W | 49 | 240 | potential | 29 49 54 N 82 00 02 W |
| 15 | 140 | potential | 29 49 60 N 81 59 56 W | 50 | 470 | potential | 29 49 54 N 81 59 57 W |
| 16 | 310 | potential | 29 49 60 N 81 59 58 W | 51 | 210 | abandoned | 29 49 54 N 81 59 56 W |
| 17 | 350 | potential | 29 50 00 N 81 59 59 W | 52 | 330 | abandoned | 29 49 47 N 82 00 01 W |
| 18 | 250 | abandoned | 29 50 00 N 81 59 59 W | 53 | 400 | potential | 29 49 46 N 81 59 54 W |
| 19 | 360 | potential | 29 50 00 N 82 00 00 W | 54 | 320 | potential | 29 49 47 N 81 59 51 W |
| 20 | 420 | abandoned | 29 49 60 N 82 00 02 W | 55 | 380 | potential | 29 49 46 N 81 59 48 W |
| 21 | 230 | potential | 29 49 60 N 82 00 16 W | 56 | 190 | potential | 29 49 44 N 81 59 40 W |
| 22 | 250 | potential | 29 50 00 N 82 00 23 W | 57 | 240 | abandoned | 29 49 44 N 81 59 53 W |
| 23 | 210 | abandoned | 29 49 60 N 82 00 25 W | 58 | 180 | potential | 29 49 55 N 81 59 52 W |
| 24 | 150 | potential | 29 49 60 N 82 00 25 W | 59 | 300 | potential | 29 49 52 N 81 59 51 W |
| 25 | 400 | potential | 29 49 60 N 82 00 27 W | 60 | 370 | potential | 29 49 51 N 81 59 51 W |
| 26 | 170 | potential | 29 49 60 N 82 00 30 W | 61 | 270 | potential | 29 49 51 N 81 59 57 W |
| 27 | 80 | potential | 29 49 41 N 81 59 41 W | 62 | 250 | abandoned | 29 49 52 N 82 00 07 W |
| 28 | 290 | potential | 29 49 41 N 81 59 41 W | 63 | 280 | potential | 29 49 52 N 82 00 08 W |
| 29 | 280 | potential | 29 49 57 N 81 59 49 W | 64 | 250 | abandoned | 29 49 52 N 82 00 08 W |
| 30 | 240 | potential | 29 49 58 N 81 59 51 W | 65 | 150 | potential | 29 49 52 N 82 00 09 W |
| 31 | 260 | potential | 29 49 58 N 81 59 51 W | 66 | 60 | potential | 29 49 49 N 81 59 49 W |
| 32 | 190 | potential | 29 49 57 N 81 59 53 W | 67 | 250 | abandoned | 29 49 49 N 81 59 48 W |
| 33 | 330 | potential | 29 49 57 N 81 59 54 W | 68 | 260 | potential | 29 49 49 N 81 59 46 W |
| 34 | 210 | abandoned | 29 49 57 N 81 59 55 W | 69 | 260 | potential | 29 49 50 N 81 59 44 W |
| 35 | 340 | abandoned | 29 49 57 N 81 59 57 W | | | | |

Figure 3




*DWT = depth to water table*

Table 2. Soil types.

| Soil Type | Soil Code | Acres | DWT* |
|---|---|---|---|
| Kershaw | 34 | 202 | >72” |
| Penney | 56 | 4 | >72” |

** Depth to water table*

Table 3. Gopher tortoise survey transect information.

| Transect ID | Length (m) | Width (m) | Vegetation Survey* | # Potentially Occupied Burrows | # Abandoned Burrows | # Juvenile Burrows | # Adult Burrows | Density (per acre) |
|---|---|---|---|---|---|---|---|---|
| 1 | 250 | 16 | No | 3 | 0 | 1 | 2 | 1.5 |
| 2 | 250 | 16 | Yes | 2 | 1 | 2 | 1 | 1 |
| 3 | 250 | 16 | No | 2 | 0 | 1 | 1 | 1 |
| 4 | 250 | 16 | No | 1 | 0 | 0 | 1 | 0.5 |
| 5 | 250 | 16 | Yes | 3 | 2 | 2 | 3 | 1.5 |
| 6 | 250 | 16 | No | 0 | 0 | 0 | 0 | 0 |
| 7 | 250 | 16 | Yes | 4 | 1 | 0 | 5 | 2 |
| 8 | 250 | 16 | No | 1 | 0 | 0 | 1 | 0.5 |
| 9 | 250 | 16 | No | 0 | 0 | 0 | 0 | 0 |
| 10 | 250 | 16 | No | 4 | 2 | 0 | 6 | 2 |
| 11 | 250 | 16 | No | 1 | 0 | 0 | 1 | 0.5 |
| 12 | 250 | 16 | No | 3 | 0 | 1 | 2 | 1.5 |
| 13 | 250 | 16 | Yes | 3 | 0 | 0 | 3 | 1.5 |
| 14 | 250 | 16 | No | 2 | 2 | 0 | 4 | 1 |
| 15 | 250 | 16 | No | 3 | 0 | 0 | 3 | 1.5 |
| 16 | 250 | 16 | No | 2 | 1 | 0 | 3 | 1 |
| 17 | 250 | 16 | Yes | 0 | 1 | 1 | 0 | 0 |
| 18 | 250 | 16 | No | 2 | 0 | 0 | 2 | 1 |
| 19 | 250 | 16 | No | 2 | 1 | 0 | 3 | 1 |
| 20 | 250 | 16 | Yes | 1 | 0 | 0 | 1 | 0.5 |
| 21 | 250 | 16 | No | 0 | 0 | 0 | 0 | 0 |
| 22 | 250 | 16 | Yes | 2 | 2 | 0 | 4 | 2 |
| 23 | 250 | 16 | No | 1 | 0 | 0 | 1 | 0.5 |
| 24 | 250 | 16 | No | 2 | 0 | 0 | 2 | 1 |
| 25 | 250 | 16 | No | 0 | 0 | 0 | 0 | 0 |
| 26 | 250 | 16 | Yes | 0 | 0 | 0 | 0 | 0 |
| 27 | 250 | 16 | No | 3 | 1 | 1 | 3 | 1.5 |
| 28 | 250 | 16 | No | 1 | 1 | 0 | 2 | 0.5 |
| 29 | 250 | 16 | No | 2 | 0 | 0 | 2 | 1 |
| 30 | 250 | 16 | No | 0 | 1 | 0 | 1 | 0 |
| 31 | 130 | 16 | Yes | 1 | 0 | 0 | 1 | 0.25 |
| 32 | 120 | 16 | Yes | 2 | 0 | 1 | 1 | 0.5 |
| **TOTAL** | | | | **53** | **16** | **10** | **59** | |

** "Yes" refers to those transects that were also used as vegetation survey transect*

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# APPENDIX II – Species Accounts

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## AMERICAN EEL

*Anguilla rostrata*


Figure 1. The American eel has a very large range, from Greenland south to Brazil.

### Description

The American eel is an elongate, slender, snakelike fish with a yellowish to brown body with a white to pale yellowish ventral surface (Figure 1). It has a small pointed head, with the lower jaw protruding beyond the upper jaw; a long dorsal fin that is continuous with the tail fin and anal fin; and a small single gill slit on each side in front of the pectoral fin. Its slippery skin appears to be devoid of scales. Total length is up to 152 cm (60 inches).

### Geographic Range and Distribution

The American eel has a very large range in the Atlantic Ocean and estuaries and rivers of the Atlantic and Gulf coasts of the United States and southeastern Canada, as well as much of the Mississippi River basin and the West Indies and Caribbean regions. The American eel is known from the St. Johns River and hence may be present on the Camp Blanding Joint Training Center.

### Life History

Spawning has never been directly observed, but apparently occurs in the Sargasso Sea during winter and early spring (McCleave et al. 1987). Each female produces about 0.4-21.9 million eggs. Adults presumably die after spawning. Larvae are transported by currents to areas near the continental margin of North America, but the mechanism by which they arrive in estuarine areas is not known, nor is it known precisely how they arrive in the Gulf of Mexico or the coast of South America.

Larvae metamorphose during the pelagic stage (8-12 months after hatching, or perhaps more than a year later), and unpigmented "glass eels" actively move toward land. Glass eels develop external pigmentation as they enter coastal areas and are then referred to as "elvers." Young eels begin moving upstream in river systems before pigmentation is complete, generally in spring in the northeastern United States. Eels develop into the "yellow eel" stage, which resembles the adult stage, usually by age two. Some yellow eels move far into stream headwaters whereas others remain in estuaries. After the lengthy "yellow eel" stage, eels may undergo a physical and physiological transformation into a distinct, sexually mature "silver eel" stage, and move downstream and into the ocean to spawn. Morphologically altered silver eels have not been observed in all parts of the range.

In general, eel populations in freshwater tend to be female dominated (Facey and LaBar 1981, Helfman et al. 1987). Size and age of maturity are greater in the north than in the south (Helfman et al. 1987). For example, maturation occurs in 8 to 24 years in the Chesapeake Bay Region, but may occur earlier in southern regions and later in northern regions.

Yellow eels feed opportunistically on various bottom- and near bottom-dwelling animals, mostly invertebrates and slower fishes (Denoncourt and Stauffer 1993). In freshwater, they feed on insects (especially Ephemeroptera, Plecoptera, and Trichoptera), worms, crayfish and other crustaceans, and small frogs and fishes; the diet varies geographically, seasonally, and among size classes. Larvae feed on plankton.

### Habitat Requirements

Soft, undisturbed bottom sediments may be important to migrating elvers for shelter (Facey and Van Den Avyle 1987). Post larval eels tend to be bottom dwellers and hide in burrows, tubes, snags, plant masses, other types of shelter, or in the substrate; they are inactive in bottom mud in winter in the north (Van Den Avyle 1984). Mature adults migrate back downstream to return to the Sargasso Sea. In the ocean, American eels have been observed at depths greater than 6,000 meters.

### Threats

Possible factors contributing to the decline along the Atlantic coast of Canada and the United States include barriers to migration, habitat loss and alteration, hydroturbine mortality, oceanic conditions, overfishing, parasitism, predation, and pollution (Haro et al. 2000, Richkus and Whalen 2000).

Dams are frequently mentioned as a factor in the apparent declines in American eel abundance. Dams that reduce or restrict upstream movements limit the amount of habitat available to eels. Many surveys indicate that density and population size of American eels tend to decrease with increasing distance inland and with increasing severity of obstructions to movement. Given the dominance of large females in many riverine habitats, such habitat reduction could conceivably lead to reduced eel productivity and abundance. However, the importance of freshwater in eel productivity is still an open question (e.g., Morrison and Secure 2003).

Passage through turbines at hydropower dams during downstream migration may represent a major source of eel mortality (Ritter et al 1997). Turbine-induced mortality ranges from 5 to 60%, depending on turbine type, flow rate, and the length of the fish (Hadderingh 1990). Mortality of eels passing downstream through turbines may contribute to reduced eel abundance in eastern Canada (Jessop 2000). The amount of nonlethal injury to eels that pass through turbines is not well documented.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## AMERICAN EEL

*Anguilla rostrata*

Substantial long-term and short-term changes in ocean temperature, salinity, and upper-ocean transport conditions (Stebbing et al. 2002, Colbourne 2004, Drinkwater and Gilbert 2004, Curry and Mauritzen 2005, Rossby et al. 2005, Sutton and Hodson 2005) have been documented recently. Attrill and Power (2002) showed that during a recent 16-year period (1977-1992), climatic forcing, by means of the North Atlantic Oscillation, was consistently the most important parameter explaining variation in assemblage composition and abundance and growth of juvenile marine fishes during their estuarine residence in the Thames Estuary, United Kingdom. This information suggests that an investigation of the relationship between oceanic conditions and patterns of abundance and recruitment of the American eel might be fruitful in understanding recent population fluctuations.

The bulk of the commercial eel catch in the United States (80%) occurs in central coastal (mid-Atlantic) states, with less from northern (19%) and southern (1%) states (Casselman 2001). For example, both Massachusetts and Florida have been granted de minimis status by the Atlantic States Marine Fisheries Commission for their commercial American eel fisheries in recent years. This indicates that their landings comprise an insignificant portion of the overall harvest.

The small commercial fishery for American eels in Florida operates almost exclusively in the St. Johns River system (Florida Fish and Wildlife Conservation Commission, 2014). The documented annual American eel harvest in Florida is small; commercial landings in 2000 totaled only 6,054 lb (2,752 kg), the lowest harvest year since 1994 (Bonvechio et al. 2004). In 2001, landings more than doubled to 14,218 lb (6,463 kg), but they declined to 7,587 lb (3,441 kg) in 2002 and 8,486 lb (3,849 kg) in 2003. A consistent decline in eel harvest has been observed since the early 1990s, but harvest reported in 2003 was similar to that reported in recent years (Bonvechio et al. 2004). From 1980 to 2003, American eel landings in Florida exhibited a substantial decline; the highest reported harvest during this time period was in 1980-81 and totaled 460,000 lbs (208,652 kg) (Bonvechio et al. 2004). Commercial landings in Florida are of large eels; in recent years, no commercial harvest of the glass eel stage, silver (mature) eel stage, or of bait-sized juvenile eels was reported for Florida (Bonvechio et al. 2004). Currently there is no known recreational fishery for the American eels in Florida; incidentally caught eels generally are released alive (Bonvechio et al. 2004).

### Listing Status

The American eel is not listed by the Florida Fish and Wildlife Conservation Commission nor under the federal Endangered Species Act (ESA). However, the Council for Endangered Species Act Reliability petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CESAR 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## AMERICAN EEL

*Anguilla rostrata*

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Note: Information in this species account was used directly from the NatureServe Explorer *Anguilla rostrata* webpage (http://natureserve.org/explorer).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## BLACK CREEK CRAYFISH

*Procambarus pictus*


Figure 1. Black Creek crayfish are also known as the spotted royal crayfish.

### Description

The Black Creek crayfish is medium-sized (about 3 inches), with dark claws and a dark carapace that has a white or yellowish middorsal stripe, white spots or streaks on its sides, and a rust-colored abdomen (Franz et al. 2008; Figure 1). Due to this distinctive pattern, this crayfish is also known as the "spotted royal crayfish." The color pattern may help it hide during the day amidst the stream bottom detritus, tree roots, and vegetation (Franz 1994).

### Geographic Range and Distribution

The great majority of occurrence records for Black Creek crayfish are in streams and tributaries that are part of the extensive Black Creek drainage (Figure 2). The handful of other streams outside of the Black Creek drainage where Black Creek crayfish have been found include the Etoniah Creek drainage in Putnam County, Trout Creek in St. Johns County, and Corklan Branch, Big Davis Creek, and Holly Creek in Duval County. These outlying streams (and any others that may yet be discovered) could have important conservation value to the Black Creek crayfish by expanding its known extent of occurrence and spreading the vulnerability to threats among a greater number of separate drainages.

The range of the Black Creek crayfish includes public lands managed by the Florida Army National Guard (Camp Blanding Joint Training Center) and the Florida Forest Service (Jennings State Forest, Etoniah Creek State Forest). These lands are wildlife management areas wherein wildlife is managed by the Florida Fish and Wildlife Conservation Commission (FWC), and have hosted recent surveys for Black Creek crayfish (Franz et al. 2008, Nelson and Floyd 2011). Additional conservation lands with occurrence records for Black Creek crayfish include parcels managed by the St. Johns River Water Management District (SJRWMD; Florida Natural Areas Inventory [FNAI] 2013).

### Habitat Requirements

The Black Creek crayfish is endemic to northeast Florida, where it inhabits small, relatively cool and swift, sand-bottomed, and tannic-colored headwater and tributary streams (Franz and Franz 1979, Franz 1994). These streams typically emanate from sandhills and occasionally flow through or from swampy terrain (Franz and Franz 1979, Brody 1990, Franz 1994, FNAI 2001, Nelson and Floyd 2011).

Streams occupied by Black Creek crayfish are often referred to as "high quality" streams due to their cool, unpolluted water, constant flow, and high oxygen content. The small gill chamber of the Black Creek crayfish is an adaptation requiring highly-oxygenated cool waters (Franz et al. 2008). Habitat attributes include a sandy bottom with aquatic vegetation and woody debris to serve as daytime retreats, plus a forested overstory (with sunny openings) that gives shade, cools the air and water temperatures, and provides a consistent influx of leafy and woody debris to serve as food sources (Franz et al. 2008, FWC 2010).

### Life History

As is true of other crayfish species, male Black Creek crayfish periodically alternate between a reproductively ready form (Form I) and a form that is not reproductive (Form II). Reproductive males occur from January to September (Franz 1994). A female crayfish carries her eggs on the underside of her abdomen, attached to leg-like appendages called swimmerets, and they are protected there in a sort of "brood chamber." The clutch of eggs can number from 47 to 146, and the newly hatched young hold onto the swimmerets and each other. They may remain with the mother, protected by her, for 2 to 3 weeks. Black Creek crayfish young that hatch in late summer are mature by the following spring (Franz 1994). Black Creek crayfish can live up to 16 months (Franz 1994), so a female apparently produces just one clutch of eggs in her lifetime.

Black Creek crayfish have a similar diet as other stream-dwelling crayfish. They eat aquatic plants, dead plant and animal material, and detritus. Potential predators of Black Creek crayfish include fish, softshell and snapping turtles, and birds. In general, though, crayfish populations should be resilient to natural predators (FWC 2010).

### Threats

Potential threats to the Black Creek crayfish are those that would impact the high quality streams where it dwells. These threats include pollution, change in water temperature, siltation, damming, and other changes in water and habitat quality (Franz and Franz 1979, Brody 1990, FNAI 2001). For example, damming immediately changes the character of a stream and its suitability for Black Creek crayfish, resulting in reduced oxygen, increased siltation, and higher water temperature. Improperly controlled effluent from mining sites may degrade water quality and negatively impact Black Creek crayfish populations. Brody (1990) reported the lack of crayfish and other stream fauna from a stream (Boggy Creek) that receives effluent from mine tailing ponds of a titanium extraction operation. This stream is a tributary to the North Fork of Black Creek just north (and downstream) of Camp Blanding Joint Training Center.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## BLACK CREEK CRAYFISH

*Procambarus pictus*

Populations on public lands (Camp Blanding and Jennings State Forest) may receive some protection, but those sites on private lands may be threatened with expanding urbanization, mining, and silviculture (Franz and Franz 1979, Brody 1990, FNAI 2001). Roadwork associated with bridges being newly constructed, repaired, or retrofitted is a potential source of impact to water quality, primarily siltation and other construction-related pollution. Plans for the construction of Jacksonville's First Coast Outer Beltway are being finalized; this project will pass through a portion of the Black Creek crayfish range (Florida Department of Transportation 2013) and would be expected to impact stream crossings.

Little is known about the potential impact of disease and parasites on Black Creek crayfish. Specimens with an apparent fungal disease have been reported by Franz et al. (2008) and Nelson and Floyd (2011). Infected specimens had chalky white muscle tissues visible through the exoskeleton on the underside of the abdomen. Franz stated this condition is believed to be highly contagious and often fatal, but the impact on crayfish populations is unknown (Franz et al. 2008, FWC 2010). Further research on this condition is warranted.

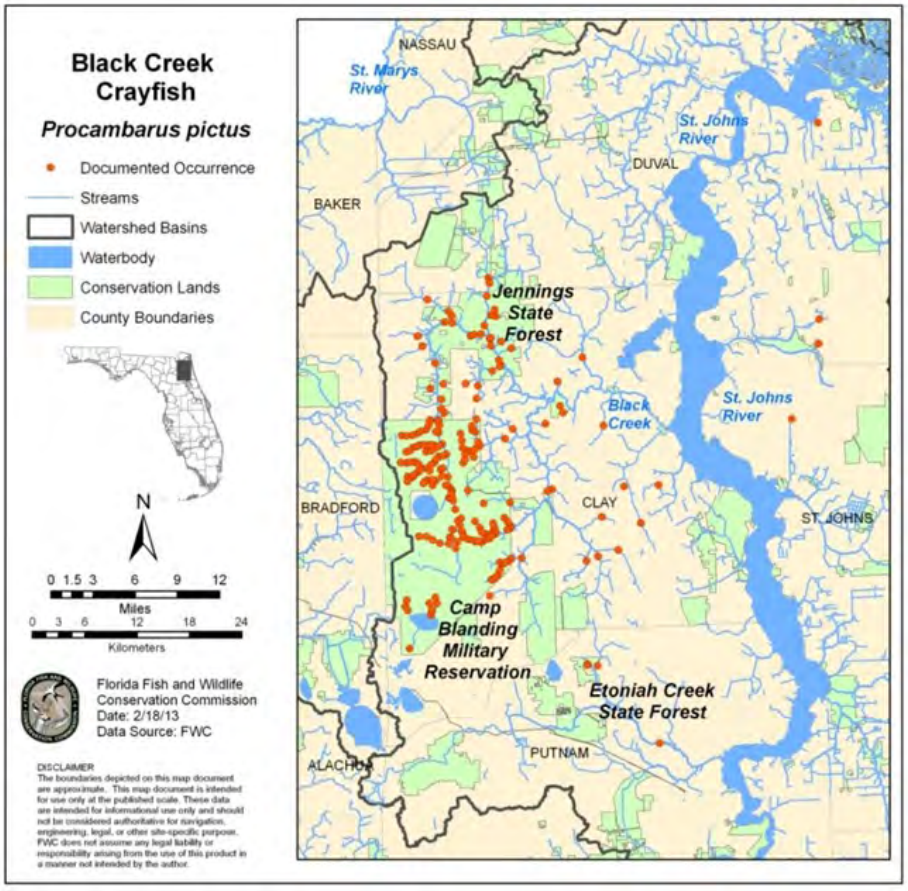


Figure 2. Map showing occurrence records for the Black Creek crayfish.

### Listing Status

The Black Creek crayfish was listed by the State of Florida as a Species of Special Concern in 1989 (Florida Game and Fresh Water Fish Commission 1989, Wood 1991). This status makes it illegal to take, possess, transport, or sell Black Creek crayfish except as authorized by a permit from the FWC. In 2010, the FWC directed staff to evaluate the status of all species listed as Threatened or Species of Special Concern that had not undergone a status review in the past decade. After assessing the biological status of the species using criteria specified in Rule 68A-27.001, F.A.C., the Biological Review Group concluded that the Black Creek crayfish met criteria necessary to warrant listing it as a State Threatened species.

The Black Creek crayfish is not listed by the U.S. Fish and Wildlife Service (Service). However, the Center for Biological Diversity recently petitioned the Service to list the crayfish under the federal Endangered Species Act (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## BLACK CREEK CRAYFISH

*Procambarus pictus*

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Note: All information in this species account was used directly from the Draft Species Action Plan for the Black Creek Crayfish, *Procambarus pictus*; prepared by the Florida Fish and Wildlife Conservation Commission; dated May 9, 2013. 35 pages.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## DUKES' SKIPPER

*Euphyes dukesi calhouni*


Figure 1. The *E. dukesi calhouni* subspecies of Duke's skippers is endemic to Florida.

### Description

Dukes' skippers range in size from 1¼-1½ inches (32-38 mm) and have short, rounded wings. Females are slightly larger than males. The upper surfaces of the wings in both sexes are deep brown (Figure 1). The females have a band on the hindwings that has two to three pale yellow spots. Males have a black stigma on the forewing. The undersides of the hindwings are light brown with pale yellow rays (Opler and Krizek 1984, Pyle 1995, Scott 1986).

The caterpillars of this species have a black head and light green body. The pupae nest in sedge leaves; they tie themselves into the upper portion of plants with silk (Nielsen 1999).

### Geographic Range and Distribution

There are three populations of Dukes' skippers (*Euphyes dukesi*) in eastern North America. The subspecies *E. dukesi calhouni* inhabits the southern United States coastal plain and is endemic to Florida. The endemic nature of *E. dukesi calhouni* was recognized in the mid-1990's. Calhoun (1995) speculates that their isolation from populations on the North American mainland may be attributed to Pleistocene glacial events.

### Habitat Requirements

This species prefers shaded wetlands dominated by the larval food plant *Carex lacustris*, including coastal swamps and ditches. In Florida, *E. dukesi calhouni* is limited to swamp habitats that support large stands of the sedge host plants and various *Rhynchospora* and *Carex* species (Shuey 1996).

### Life History

In the southern part of their range, Dukes' skippers have three flights from mid-May through October. Males are often seen patrolling over the tops of sedges and will perch in search of females (Scott 1986, Iftner et al. 1992). After mating, females lay their eggs under the leaves of their host plants, sedges in the genus *Carex*. After hatching, the larvae undergo several molts and hibernate in the fourth instar stage (Glassberg 1999, Iftner et al. 1992, Nielsen 1999, Opler and Krizek 1984, Pyle 1995).

From hatching through the death of the adult stage, a Dukes' skipper probably lives about a year or less. Several months of that time may be spent dormant in the winter. The estimated lifespan of an adult Dukes' skipper in the wild is approximately three weeks.

Dukes' skippers have a weak flight pattern and are most often seen flying within sedges or visiting nectar plants. *E. dukesi calhouni* frequent sunlit patches of their host plants and can be seen nectaring on a variety of plants (Iftner et al. 1992, Nielsen 1999, Calhoun 1995).

Dukes' skipper larvae feed on *Carex laucustris* in the north and *Carex hyalinolepis* in the south. They are also reported to utilize *Carex walteriana*, and *Rhynchospora*. In Florida, the primary hostplant of *E. dukesi calhouni* has been identified as *Rhynchospora inundata*, but they are also known to utilize *Rhynchospora miliacea* and species of *Carex* (Glassberg 1999, Opler and Krizek 1984, Scott 1986, Calhoun 1995).

Adults nectar on buttonbush *(Cephalanthus occidentalis)*, common milkweed *(Asclepias syriaca)*, swamp milkweed *(Asclepias incarnata)*, joe-pye weed *(Eupatorium maculatum)*, blue mistflower *(E. coelestinum)*, pickerelweed *(Pontederia cordata)*, hibiscus species *(Hibiscus sp.)*, sneezeweed *(Helenium autumnale)*, alfalfa *(Medicago sativa)*, and red clover *(Trifolium pratense)* (Iftner et al. 1992, Nielsen 1999, Opler and Krizek 1984, Scott 1986).

### Threats

Dukes' skippers are primarily threatened by conversion of their wetland habitat to development and other uses. They also face predation from a variety of insects. Praying mantids, lacewings, ladybird beetles, assassin bugs, ground beetles, spiders, ants, and wasps prey upon the larvae. Adult butterflies are eaten by robber flies, ambush bugs, spiders, dragonflies, ants, wasps, and tiger beetles. There are also many vertebrate predators including lizards, frogs, toads, birds, mice, and other rodents (Scott 1986). Dukes' skippers may also be threatened by chemicals sprayed to control mosquitoes.

### Listing Status

Dukes' skippers are not listed by the Florida Fish and Wildlife Conservation Commission or the U.S. Fish and Wildlife Service (Service). However, the Center for Biological Diversity recently petitioned the Service to list the skipper under the federal Endangered Species Act (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## DUKES' SKIPPER

*Euphyes dukesi calhouni*

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Note: All information in this species account was used directly from the "*Euphyes dukesi*" website, sponsored by Animal Diversity Web, at: http://animaldiversity.ummz.umich.edu/accounts/Euphyes_dukesi/

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## EASTERN DIAMONDBACK RATTLESNAKE

*Crotalus adamanteus*


Figure 1. The eastern diamondback rattlesnake (*Crotalus adamanteus)* occurs in all Florida counties.

### Description

The eastern diamondback rattlesnake (*Crotalus adamanteus*) is the largest venomous snake in North America (Timmerman and Martin 2003) and the largest rattlesnake in the world (Timmerman and Martin 2003). This snake can be distinguished by its large size (maximum length, 244 cm [96 in]; although most are between 100-150 cm [39-59 in]) and its bulk (Ernst 1992). It is brown with a dorsal pattern of dark, yellow-bordered, diamond shaped markings; light stripes that border a dark band which extends downward and backward through the eye; and a brown and white ringed tail tipped with a rattle (Ernst 1992; Figure 1). The ventral surface is yellow to cream with brown mottling (Ernst 1992).

Two other species of rattlesnakes in Florida are sympatric with the distribution of the eastern diamondback rattlesnake. These species, the pigmy rattlesnake (*Sistrurus miliarius*) and the canebrake rattlesnake (*Crotalus horridus*), are generally smaller and have different colorations and patterns (Timmerman and Martin 2003). No other rattlesnake in Florida has the combination of the dorsal diamond pattern, light facial stripes, and ringed tail (Ernst 1992).

### Geographic Range and Distribution

The eastern diamondback rattlesnake historically ranged on the Coastal Plain from North Carolina south throughout Florida and westward to the easternmost parishes of Louisiana (Dundee and Rossman 1989; Ernst 1992; Ernst and Ernst 2003). The eastern diamondback rattlesnake occurs in all Florida counties and has been documented on Camp Blanding Joint Training Center (Gregory et al. 2006).

### Habitat Requirements

The eastern diamondback rattlesnake is primarily a specialist of longleaf pine habitats (Guyer and Bailey 1993), including sandhill, flatwoods, and upland pine forest; other habitats utilized include oldfields, floodplains, hardwood hammocks, dry prairie, scrub, and coastal strand (Hipes et al. 2000). The pre-settlement range was essentially statewide in appropriate habitats including the barrier islands and keys (Martin and Means 2000). Conversion of native habitats and fire suppression have greatly reduced the amount of suitable habitat, and the eastern diamondback is rare or absent from significant portions of its former range. Eastern diamondback rattlesnakes require large tracts of open-canopy habitats (Means 2006; Steen et al. 2007; Means, unpublished data). Open-canopy conditions with diverse, herbaceous groundcover provide structure and a food base for the rattlesnake's primary prey species, rodents and rabbits (Means, unpublished data).

In addition to stump holes and other underground sheltering sites, eastern diamondback rattlesnakes utilize gopher tortoise burrows (*Gopherus polyphemus*) as microhabitat and seasonal refugia (Ernst 1992; Martin and Means 2000; Timmerman and Martin 2003).

### Life History

In Florida, eastern diamondback rattlesnakes are active throughout the year (Ernst 1992). To escape cold and hot extremes, eastern diamondbacks seek refuge in mammal burrows, stump holes, hollow logs, and particularly in gopher tortoise burrows (Ernst 1992). Ashton and Ashton (1981) report mating to occur in the spring and fall. Females give birth to between 8 and 15 young in the late fall (Mount 1975; Ashton and Ashton 1981; Ernst 1992). After the neonates are born, they utilize the same refugia as the adults (Ernst 1992).

Eastern diamondback rattlesnakes are ambush predators, but may actively seek out prey using scent trails or thermal trails detected using their facial pits (Ernst 1992). Prey items consist mainly of rodents and rabbits, but they are also known to eat birds (Mount 1975; Ernst 1992; and Means, pers. comm.).

Although humans are the main source of mortality, eastern diamondbacks are eaten by feral hogs (*Sus scrofa*), carnivorous mammals (*Procyon, Ursus, Mephitis, Lutra, Canis, Felis*), birds of prey (*Bubo, Buteo*, etc.), wood storks (*Mycteria*), and other snakes (*Lampropeltis, Drymarchon, Coluber*) (Ernst 1994).

### Threats

The decline of the eastern diamondback rattlesnake is associated with the loss, alteration, and degradation of native habitats due to commercial and residential development, agriculture, and mining (Timmerman and Martin 2003). The loss of suitable habitat is further exacerbated by alterations to the natural fire return interval of upland pine habitats. Additional threats may include road mortality and general persecution of snakes by humans. Localized commercial collection for regional rattlesnake roundups has been a conservation issue in the past, and continues to be so in several Alabama and Georgia towns (Means 2009).

### Listing Status

The eastern diamondback rattlesnake is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, in 2011, a group of four organizations petitioned the U.S. Fish and Wildlife Service (Service) to list the species under the ESA

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## EASTERN DIAMONDBACK RATTLESNAKE

*Crotalus adamanteus*

(CBD 2011). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA MOUSE

*Podomys floridana*


Figure 1. Florida mice typically build their burrows inside the burrows of other species.

### Description

The Florida mouse has relatively large ears, eyes, and hind feet. The Florida mouse is also characterized by the presence of only 5 (sometimes 4, and rarely 6) plantar tubercles on the soles of the hind feet, instead of the 6 plantar tubercles typical of the genus *Peromyscus*. The adult's pelage is brown or tawny on top, with white undersides and orange-buff colored fur on the cheeks, shoulders, and lower sides (Figure 1). Adults also have a relatively large body size, weighing between 20 and 49 g (0.7 to 1.7 oz) (Whitaker and Hamilton 1998, Layne 1990, Layne 1992, Jones and Layne 1993). The Florida mouse often exhibits a skunk-like odor (Layne 1990).

### Geographic Range and Distribution

Florida mice occur throughout central Florida, where they are largely restricted to fire-maintained, xeric, upland communities with deep, well-drained, sandy soils (Figure 2). The Florida mouse is known from Camp Blanding Joint Training Center (Hipes and Jackson 1994, Gunter 2003).

### Habitat Requirements

The primary natural communities occupied by the Florida mouse are scrub (includes scrubby flatwoods, oak scrub, sand pine scrub, and rosemary scrub) and sandhill, though the species can often be found in drier mesic flatwoods and has been recorded in a number of other natural communities such as flatwoods, hammocks, and wetland edges during dispersal (Layne 1990). Groundcover may be sparse, especially in scrub, but the number of Florida mice in a sandhill may be correlated with ground cover diversity (T. Doonan, Florida Fish and Wildlife Conservation Commission, personal communication).

### Life History

Reproduction occurs throughout the year but peaks in fall and winter. Litters typically consist of 2 to 4 young. Offspring wean at 3 to 4 weeks. Mean survival time for adults (as recorded during trapping studies) was reported as being longer in sandhill (4.2 months) than in scrub (2 months) (Layne 1990). However, survivorship of more than 360 days was reported in 8.6% of one local population (Jones 1990).

Florida mice consume a wide range of food items including acorns, insects, seeds, nuts, fungi, and other plant material. Given the range of food they consume, Florida mice are probably opportunistic feeders (Jones 1993); however, they are dependent upon the presence of acorns as a major component of their diet (Jones 1990, 1993; Layne 1990, 1992). Food resources are important in determining habitat quality.

Florida mouse populations may be isolated and scattered because the distribution of their primary habitats are often discontinuous (Layne 1990). Habitat loss and degradation exacerbate this problem as the already discontinuous habitat becomes increasingly fragmented. This creates problems with demographic connectivity.

Florida mice excavate burrows that they use as daytime refuges and as nesting sites, with expanded nesting chambers usually present (Layne and Jackson 1994). They typically build their burrows inside the burrows of other species, often in gopher tortoise (*Gopherus polyphemus*) burrows. Florida mice burrows are typically found as small U-shaped tunnels off the sides of the main gopher tortoise burrow. Florida mice use gopher tortoise burrows for shelter and protection and as cover from fire and adverse weather conditions (Layne 1990). The Florida mouse can be sensitive to cold temperatures and begins to show signs of cold stress at 10° C (50° F) (Jones 1990). For these reasons, the ecology of the Florida mouse is considered to be tightly linked to the gopher tortoise (Jones and Layne 1993). This association leaves the Florida mouse vulnerable to gopher tortoise population decline. However, Florida mice will use burrows of other species such as the nine-banded armadillo (*Dasypus novemcinctus*) and old-field mouse (*Peromyscus polionotus*). They also opportunistically use stump holes or other holes, especially in scrub (Layne and Jackson 1994; Jones 1990; Layne 1990, 1992; Lips 1991; and Jones and Layne 1993).

Home ranges of the Florida mouse tend to be smaller in scrub than in sandhill, which may be a function of greater resource abundance in scrub (Layne 1990). Scrub habitat generally supports higher numbers of Florida mice than sandhill. Reported density estimates have ranged from 1.6 ha to 28 ha (0.64 to 11.2 ac) and average around 5 to 10 ha (2 to 4 ac) depending on the location and community type (Layne 1992). Jones (1990) reported that in sandhill, females had a home range size of 2,601 $m^2$ (0.64 ac), while males had an average home range of 4,042 $m^2$ (1.0 ac).

### Threats

The Florida mouse depends on fire-maintained, xeric uplands occurring on deep, well-drained soils, especially scrub and sandhill (Jones and Layne 1993). Because of this habitat specificity, the major threat to the Florida mouse is loss and degradation of habitat caused by conversion to other uses (e.g., development and agricultural use) and insufficient management (e.g., fire suppression) (Layne 1990, 1992). For example, in Highlands County, 64% of the species' habitat was destroyed between 1940 and 1980,

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA MOUSE

*Podomys floridana*

with an additional 10% considered disturbed or degraded (Layne 1992).

Historically, the distribution of sandhill and scrub communities in Florida was naturally fragmented and discontinuous (Myers 1990). Unfortunately, these communities are becoming increasingly fragmented (Layne 1992). The result is that Florida mouse populations are becoming more isolated, with reduced movement of individuals among populations a predicted consequence (Layne 1992). Effects of such increased isolation can be more frequent loss of local populations and reduced gene flow within or among populations (Hilty et al. 2006).

Dependence of Florida mice on gopher tortoise burrows as sites for their own burrows (Jones and Layne 1993) leaves Florida mice vulnerable to the decline of gopher tortoises in some habitats. Some research has estimated that the gopher tortoise populations in Florida have declined 50% to 60% over the past 60 to 93 years (Enge et al. 2006). The International Union for Conservation of Nature (IUCN) stated, "*Podomys floridanus* is moderately dependent on gopher tortoise burrows (Pergams et al. 2008), and gopher tortoises in Florida are well documented to be in decline, as much as 80% by some estimates due to habitat destruction as well as Upper Respiratory Tract Disease (URTD)." However, most of the estimated gopher tortoise declines associated with habitat loss occurred prior to the last 10 years (Cox and Kautz 2000, Enge et al. 2006, Endries et al. 2009). Further, Berish et al. (2010) reported that while URTD may be chronic in many gopher tortoise populations, mortality is typically low and rarely results in local extinctions that would have a negative effect on Florida mouse populations.

There are some concerns that relocation of Florida mice, which currently is allowed in limited circumstances under permitting provisions in FWC's Gopher Tortoise Permitting Guidelines (FWC 2013), may have unintended consequences on local populations of Florida mice. Previous versions of the gopher tortoise permitting guidelines provided little guidance on relocations, and the current limitations are a result of concern over the potential impacts. Both the Gopher Tortoise Management Plan (FWC 2012) and the current permitting guidelines recognize that additional data are needed to evaluate the potential benefits of relocations relative to the potential negative impacts to Florida mouse populations.

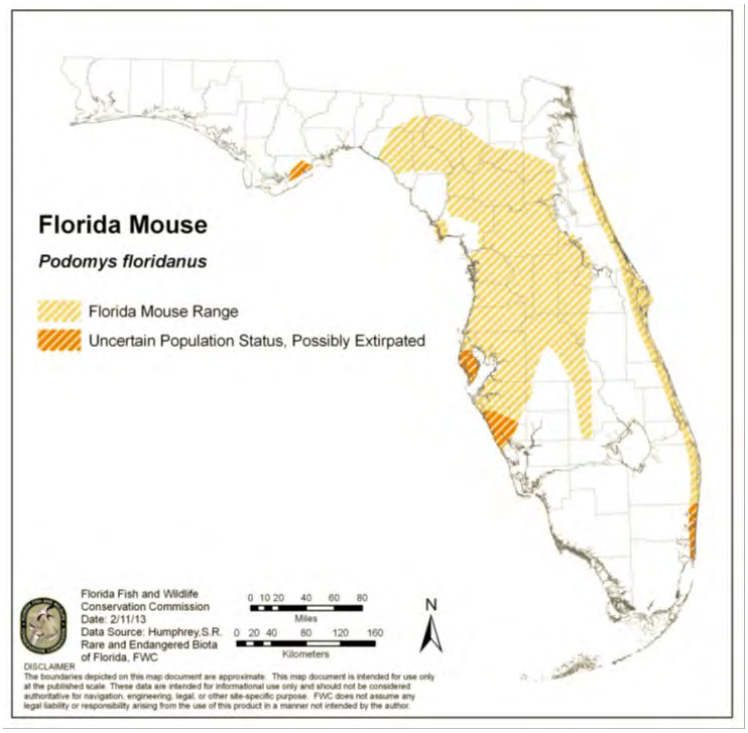


Figure 2. The historical extent of occurrence of the Florida mouse, adapted from Layne (1992).

Insufficient or inappropriate habitat management can also threaten the Florida mouse. This species shows a preference for early successional habitats maintained or created by fire. The availability of these habitats declines as natural and prescribed fires are suppressed (Hafner et al. 1998). This could be problematic on private lands, where prescribed fire return intervals may be longer than is required to maintain the habitat quality necessary for robust Florida mouse populations. However, for managed conservation lands across regions of the state occupied by the Florida mouse, Debra Childs Woithe, Inc. and PBS&J (2010) recently estimated that only 37% to 61% of sandhill and 15% to 50% of scrub currently meet management targets for fire return intervals. The manner in which this criterion is used may be of further concern because fire return intervals are at best indices of habitat quality and target intervals are not consistent among agencies.

A number of species prey upon Florida mice, including several snakes, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), raccoons (*Procyon lotor*), and bobcats (*Lynx rufus floridanus*) (Layne 1992, Jones and Layne 1993). Some of these predators benefit from close association with people, which may increase the threat of predation to Florida mice as habitats become fragmented and natural areas are increasingly interspersed with developed areas. Red imported fire ants (*Solenopsis invicta*) may be a potential predatory threat to the Florida mouse (Wetterer and Moore 2005), as well as free-ranging domestic cats (Loss et al. 2013).

### Listing Status

The Florida mouse is currently listed as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission (FWC). FWC's Florida mouse Biological Review Group (BRG) concluded from their

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA MOUSE

*Podomys floridana*

biological assessment that the Florida mouse did not meet listing criteria. As a result, the FWC recommended that the Florida mouse be removed from the state's list of Species of Special Concern under Rule 68A-27, F.A.C. The Florida mouse is not listed, nor has it been petitioned to be listed, under the federal Endangered Species Act.

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## FLORIDA MOUSE

*Podomys floridana*

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA PINE SNAKE

*Pituophis melanoleucus mugitus*


Figure 1. Florida pine snakes prefer dry upland habitats with well-drained sandy soils.

### Description

The Florida pine snake is a large, non-venomous snake with dark brown to reddish markings on a gray to sandy-colored background (Figure 1). The scales on the upper part of the body are strongly keeled, and the anal scale is undivided. The head and snout are distinctly cone-shaped and adapted for burrowing (Franz 1992). Florida pine snakes range in length from 38 to 61 cm (15–24 inches) at hatching and 122–168 cm (48–66 inches) for adults, with a maximum recorded length of 228.6 cm (90 inches) (Conant and Collins 1998, Hipes et al. 2000). Newly hatched Florida pine snakes resemble adults, but their patterns are often brighter and bolder (Tuberville and Mason 2008, Miller et al. 2009). These snakes are well known for their impressive defensive displays, which include hissing loudly, inflating the body, vibrating the tail noisily against leaf litter, raising the front of the body, and even striking with the mouth closed or partially open (Tuberville and Mason 2008).

### Geographic Range and Distribution

The Florida pine snake occurs throughout the Atlantic and Gulf coastal plains, from southeastern South Carolina to south Florida, and west to Mobile Bay, Alabama (Jordan 1998). In Florida, this species historically occurred throughout the state except for the Everglades and the Florida Keys. Museum records indicate the distribution of this snake in South Florida is patchy (Franz 1992). In 1998, a Florida pine snake was identified at Camp Blanding Joint Training Center (Jordan 1998) and more recent sightings have been documented onsite by staff biologists.

### Habitat Requirements

Florida pine snakes prefer dry upland habitats with a moderate to open canopy cover and well-drained sandy soils (Franz 1992, Hipes et al. 2000, Ernst and Ernst 2003). In Florida, the Florida pine snake is most commonly found in sandhills, but may also occupy other habitat types including scrub, xeric hammock, scrubby flatwoods, mesic pine flatwoods, dry prairie, old fields, and pastures (Allen and Neill 1952, Enge 1997, Ernst and Ernst 2003, Franz 2005). Altered fire regimes in sandhill habitat and resulting hardwood encroachment presumably create less favorable habitat conditions for Florida pine snake (FWC 2011). Florida pine snakes can tolerate some degree of degraded habitats, but may not use habitats where succession has led to closed-canopy forests (Hipes et al. 2000).

### Life History

Florida pine snakes are active from March through October but show the greatest activity in May, June, July, and October when they move more frequently and travel farther distances (Franz 1992). Miller (2008) estimated average home range size to be 70.1 ha (173 acres) for males and 37.5 ha (93 acres) for females in southern Georgia. These home range estimates were similar to home range estimates found by Franz (1986) in northern Florida. Eggs are usually laid from June to August, and hatching occurs in September and October (Franz 1992, Hipes et al. 2000). Although Florida pine snake nesting has not been observed in the wild, females are believed to nest inside the burrows of other animals (Lee 1967, Franz 2005).

Florida pine snakes can spend up to 70–80% of their time in underground refuges (Franz 1992, Miller 2008). Pine snakes use refuges to forage, nest, and escape adverse weather conditions or fire. In Florida, Georgia, and South Carolina, Florida pine snakes primarily use pocket gopher (*Geomys pinetus*) burrows as refuges. However, in the absence of pocket gopher burrows, Florida pine snakes will also use stump holes, gopher tortoise (*Gopherus polyphemus*) burrows, and the burrows of nine-banded armadillos (*Dasypus novemcinctus*) and mice (Franz 1992, Hipes et al. 2000, Franz 2005, Miller 2008).

### Threats

The major threat to the Florida pine snake is loss and degradation of habitat caused by conversion to other uses (e.g., development, agricultural use, and mining) and insufficient management (e.g., fire suppression) (Hipes et al. 2000, FWC 2011).

Because the Florida pine snake is dependent on underground refugia, it is vulnerable to the loss or decline of burrowing species. It has been estimated that gopher tortoise populations in Florida have declined 50-60% over the past 60-93 years (Enge et al. 2006). Pocket gopher populations are also suspected to be declining throughout Alabama, Georgia, and Florida (Georgia Department of Natural Resources 2008, Miller et al. 2008). These declines could be significant as Florida pine snakes both forage and seek refuge in pocket gopher burrows (Ashton and Ashton 1981, Franz 1992, Franz 2005). Forestry-related practices (e.g., stump removal, root raking, and soil compaction from heavy equipment operating on site) could be eliminating Florida pine snakes habitat as this species and many others utilize stump holes, rotting root canals, and other animal burrows as underground refuges (Means 2005).

### Listing Status

The pine snake (*Pituophis melanoleucus*) is classified as a species of "Least Concern" on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (Hammerson 2007).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA PINE SNAKE

*Pituophis melanoleucus mugitus*

Currently, the Florida pine snake subspecies is considered uncommon to rare and possibly in decline over most of its range (Franz 1992, Miller et al. 2009). In 1985, the Florida Game and Fresh Water Fish Commission (predecessor to the FWC) listed the Florida pine snake as a Species of Special Concern.

The Florida pine snake is not listed by under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity recently petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2012). The Service is in the process of developing the 90-day finding for the petition and will subsequently solicit information for use in the 12-month finding, if applicable.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA SANDHILL CRANE

*Grus canadensis pratensis*


Figure 1. Adult Florida sandhill cranes stand about 1.2 meters (almost 4 feet) tall.

### Description

Florida sandhill cranes are omnivorous, heavy-bodied, gray birds with long necks and legs (Figure 1) that inhabit open grasslands and marshes (Tacha et al. 1992). The cranes stand nearly 1.2 meters (4 feet) tall and fly with their necks outstretched. The sexes appear identical except the male is slightly larger. Their distinctive rattling calls can be heard from far away.

### Geographic Range and Distribution

Florida sandhill cranes occur from southern Georgia, primarily in the Okefenokee Swamp, to the Everglades (Stys 1997). However, most of the population is in peninsular Florida from Alachua County in the north to the northern edge of the Everglades in the south (Figure 2).

Florida sandhill cranes are non-migratory and exhibit year-round home range fidelity. Territorial adult home ranges are influenced by several factors including habitat quality, status, and season (Nesbitt and Williams 1990). A pair's average home range is about 450 ha (1,100 ac). Although home ranges can overlap, core nesting areas are defended from other cranes and vary from 120 to 250 ha (300-635 ac).

### Habitat Requirements

Sandhill cranes rely on shallow marshes for roosting and nesting and open upland habitats for foraging (Wood and Nesbitt 2001). Preferred crane habitat occurs where most vegetation is less than 50 cm, or 20 in, tall (Stys 1997). The crane avoids forests and deep marshes, and may preferentially use open upland habitats such as pastures and transitional pastures (Nesbitt and Williams 1990). Sandhill cranes in north Florida spent 86% of their time in 4 habitat types: pasture, freshwater marsh, pasture-marsh transition, and pasture-forest transition (Nesbitt and Williams 1990).

### Life History

Florida sandhill cranes are perennially monogamous and long-lived, with a low annual reproductive potential (Wood and Nesbitt 2001). They begin breeding at 3 years of age but are rarely successful until age 5 (Nesbitt 1992). Although Florida sandhill cranes can begin breeding as early as December and extend nesting through August, they nest primarily from February through April. Nesting typically takes place in marshes, or shallow lakes and ponds with dense emergent vegetation (Johnsgard 1983). Nests are composed of plant stems in shallow water or on the ground in marshy areas. Water depth at nests averages 13-33 cm (5-13 in). Although each pair's eggs are laid in a single nest, accessory nests or platforms are also built. Nesting success relies on relatively predictable water levels and absence of predators. Nest disturbance can lead to abandonment (Stys 1997), but pairs can re-nest after a nest failure.

A clutch consists of 1-3 (usually 2) eggs (mean=1.72, Nesbitt 1988) which are incubated by both parents for an average of 30 days. Brood size averages 1.32 and both parents also share in raising the young. The downy young are cinnamon brown and achieve flight at 65-70 days of age. Young Florida sandhill cranes stay with their parents about 10 months before becoming independent and gaining their featherless red crowns.

### Threats

The most common threat to Florida sandhill cranes is habitat loss and degradation due to human development and lack of appropriate land management. Like many declining species in Florida, Florida sandhill cranes depend on open habitats such as prairies, improved pastures, and freshwater marshes. Because much of their habitat is privately owned, it is vulnerable to development and overgrowth of wetland and upland vegetation. Potential Florida sandhill crane habitat in Florida declined by an average 16.6% per decade between 1974 and 2003; total available habitat was estimated to have declined 42% in these 3 decades (Nesbitt and Hatchitt 2008).

Florida sandhill cranes avoid overgrown habitats and dense forest canopies that result from ecological succession unchecked by disturbances, such as fire. Loss of natural fire regimes in both upland and wetland plant communities across the Florida landscape hamper Florida sandhill crane success. As habitat conditions degrade, Florida sandhill cranes will leave their home range and travel up to 15 km (9.3 miles) to find resources, making them more vulnerable to mortality. Thus, proximity of wetlands to upland foraging areas for roosting and nesting is important.

Dense vegetation contributes to increased Florida sandhill crane mortality through predation. Florida sandhill cranes have become more restricted to overgrown areas where predators like bobcats (*Lynx rufus*) are more successful at killing them. Florida sandhill crane predation is also exacerbated by an abundance of predators, like raccoons (*Procyon lotor*), that thrive near humans. Predation by other species such as coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), domestic dogs (*Canis lupus familiaris*), feral hogs (*Sus scrofa*), and fire ants (*Solenopsis invicta*) is also a threat. Climate-induced changes, such as altered hydroperiod and fire regime, may

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## FLORIDA SANDHILL CRANE

*Grus canadensis pratensis*

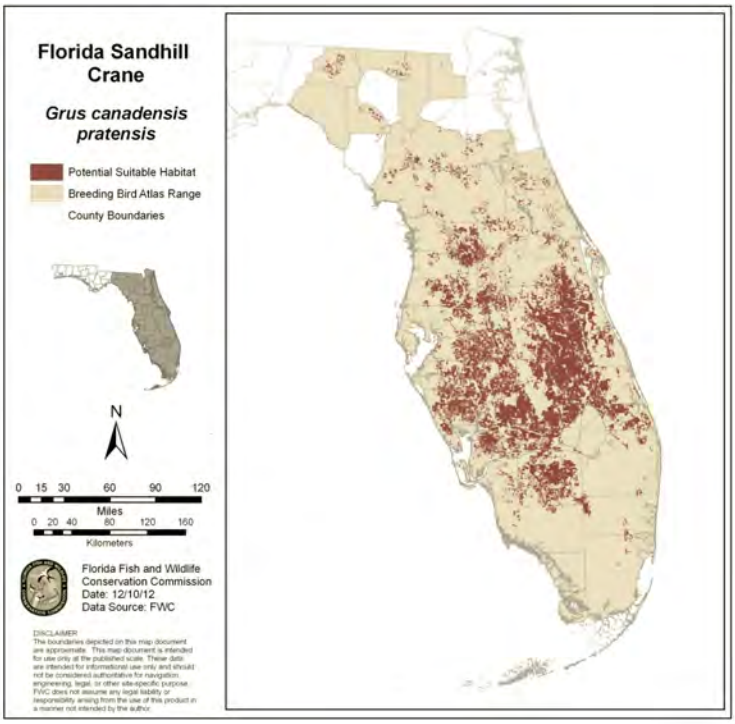


Figure 2. Range and potential habitat of the Florida sandhill crane.

lead to increased crane mortality by both native and exotic predators.

Due to their reliance on wetlands for roosting and nesting, Florida sandhill cranes are particularly vulnerable to flooding, drought, ground water withdrawals by humans, storms, and climate change. Droughts threaten Florida sandhill crane nesting success and extended droughts can lead to low annual reproduction. Florida sandhill cranes usually forgo nesting when wetlands are dry. Low water levels leave nests and young vulnerable to predation. Increased duration and intensity of droughts due to climate change threaten historic hydrological levels, leading to loss of nesting habitat. Longer dry periods can also cause changes in fire regimes that would affect the vegetation structure of upland Florda sandhill crane habitat. Other human impacts, such as ditching and diverting water to drain wetlands, are far-reaching and detrimental.

Conversely, rapid rises in water levels can also cause Florida sandhill crane nests to fail. Wetlands near impermeable surfaces such as roads and parking lots are subject to more rapid flooding. Climate change predictions for Florida also include increased heavy rainfall events, which will likely lead to localized flooding, another source of nest failure. Additionally, the timing of precipitation events may shift, contracting the breeding season and resulting in lower nesting success.

### Listing Status

Florida sandhill cranes are listed as Threatened by the Florida Fish and Wildlife Conservation Commission. They are protected under the federal Migratory Bird Treaty Act, but are not listed under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity recently petitioned the U.S. Fish and Wildlife Service (Service) to list the Florida sandhill crane under the ESA (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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Note: All information in this species account was used directly from the Draft Species Action Plan for the Florida Sandhill Crane, *Grus canadensis pratensis*; prepared by the Florida Fish and Wildlife Conservation Commission; dated April 10, 2013. 31 pages.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## GOPHER FROG

*Lithobates capito*


Figure 1. Gopher frogs typically inhabit xeric uplands that are close to breeding wetlands.

### Description

The gopher frog is a relatively large frog, with adults measuring between 64 and 112 mm (2.5 and 4.4 inches) from snout to vent (Cash et al. 2008). Gopher frogs range in color from light tan to gray or dark brown with irregular black or dark brown blotches on the back, sides, and legs (Figure 1). A raised ridge runs from behind the eye to the hind leg on both sides. During the breeding season, males can be distinguished from females by the presence of dark thumb pads called nuptial pads. Gopher frog tadpoles are greenish gold with irregular, scattered dark spots over the body and tail.

### Geographic Range and Distribution

The historical range of the gopher frog extended eastward from the Mobile River delta in Alabama across the southeastern Coastal Plain into North Carolina (Jensen and Richter 2005). In Florida, the gopher frog historically occurred throughout the state except for the Everglades and extreme South Florida (FWC 2011, Krysko et al. 2011, Figure 2). Gopher frogs – adults, larval stage, and egg masses – have been documented on Camp Blanding (Gregory et al. 2006).

### Habitat Requirements

Gopher frogs typically inhabit xeric (well-drained) upland habitats that are in close proximity (< 5 km [3.1 mi]) to suitable breeding wetlands. In Florida, gopher frogs have been found in a wide variety of upland habitats including: sandhills, upland pine forests, scrub, xeric hammock, mesic and scrubby flatwoods, dry prairie, mixed hardwood-pine communities, pastures, and various other disturbed habitats that still harbor gopher tortoises (Enge 1997; K. Enge, FWC, unpublished data). Suitable breeding wetlands include a variety of shallow, fishless, temporary and semi-permanent wetland habitats that have an open canopy and emergent vegetation (Jensen and Richter 2005). Breeding has been observed in depression marshes, basin marshes, wet prairies, dome swamps, upland sandhill lakes, sinkhole ponds, ditches, and borrow pits (FWC 2011).

Gopher frogs spend the majority of the non-breeding season in the uplands where they shelter in gopher tortoise burrows. However, they will use other refugia such as pocket gopher and small mammal burrows, crayfish burrows, stump holes, leaf litter, hollow logs, and clumps of grass (Wright 1932, Carr 1940, Blihovde 2006, Roznik 2007, FWC 2011).

### Life History

Detailed information on gopher frog life history and habitat requirements has been summarized by Jensen and Richter (2005). Although the longevity of gopher frogs in the wild is not known, individuals have lived as long as 7 years in captivity (Jensen and Richter 2005). During the breeding season, gopher frogs migrate up to 5 km (3.1 mi) to breeding wetlands to mate and lay eggs (Humphries and Sisson 2012). The breeding season can occur during any time of year in association with heavy rains (Jensen and Richter 2005), but is generally September – April in northern Florida (Palis 1998, FWC 2011), and often occurs in the summer in central and south Florida (Godley 1992).

Studies suggest that gopher frogs reach sexual maturity between 1.5 and 2 years of age (Phillips 1995, Palis 1998, Jensen and Richter 2005). Males attract females for mating at breeding ponds by calling. Once paired with a male, females will deposit a single globular, fist-sized egg mass of 500-5,000 eggs in the wetland attached to submerged or emergent vegetation (Palis 1998, Jensen and Richter 2005). As the egg mass is laid, it is externally fertilized by the male. Eggs hatch within 4–5 days and continue development as larvae (tadpoles), which take 3–7 months to develop and metamorphose into froglets (Wright 1932, Phillips 1995, Palis 1998). Newly metamorphosed frogs leave the wetlands shortly after transforming and migrate into the uplands, where they shelter in burrows (Roznik and Johnson 2009). Adults return to the uplands after breeding and may migrate to and from breeding ponds using the same routes (Franz 1986, Palis 1998).

### Threats

The most common threats to gopher frogs in Florida and range-wide are habitat loss and alteration of xeric upland habitats. Other threats include fire suppression and altered fire regimes in both upland and wetland habitats, wetland destruction and degradation, off-road vehicle use in pond basins, groundwater withdrawals, climate change impacts on wetland and upland habitat, fish introductions to breeding wetlands, and disease impacts on populations.

Gopher frogs require both suitable upland and wetland habitats to complete their life cycle and are therefore threatened by habitat loss and degradation in both. In Florida and across its range, the gopher frog has experienced significant losses in both its upland and wetland habitats (Jensen and Richter 2005, FWC 2011). Although gopher frogs can tolerate some degree of habitat fragmentation and can be found in pastures and other disturbed habitats (FWC 2011), they are not commonly found in areas converted to intensive agriculture, silviculture, or urban areas (Franz and Smith 1999; Wigley et al. 1999; Means and Means 2005; L. Smith, Jones

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## GOPHER FROG

*Lithobates capito*

Ecological Research Center, unpublished data). Gopher frogs also appear to avoid fire-suppressed uplands that have become overgrown with hardwoods (Roznik et al. 2009).

### Listing Status

The gopher frog is currently listed as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission (FWC). However, in 2010, the FWC convened a biological review group (BRG) of experts on the gopher frog to assess the biological status of the species using criteria specified in Rule 68A-27.001, Florida Administrative Code The gopher frog BRG concluded from the biological assessment that the gopher frog did not meet any listing criteria, and the gopher frog will be removed from the Species of Special Concern list.

The gopher frog is not listed under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity recently petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2012). The Service is in the process of developing the 90-day finding for the petition and will subsequently solicit information for use in the 12-month finding, if applicable.

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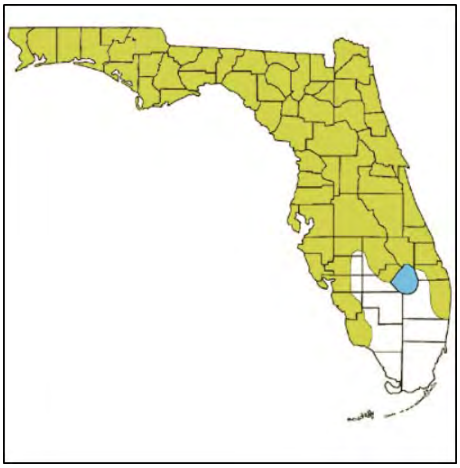

Figure 2. Historical range of the gopher frog in Florida based on historical records and the location of suitable habitat. Map credit: Monica McGarrity, University of Florida.


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## GOPHER FROG

*Lithobates capito*

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Note: Information in this species account was used directly from the Florida Fish and Wildlife Conservation Commission's Florida Gopher Frog Species Action Plan; dated November 1, 2013. 38 pages.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## GOPHER TORTOISE

*Gopherus polyphemus*


Figure 1. Gopher tortoises typically inhabit well-drained sandy soils.

### Description

The gopher tortoise is a moderate-sized, terrestrial turtle, with an average carapace length of 23–28 cm (9–11 in). The species is identified by its stumpy, elephantine hind feet and flattened, shovel-like forelimbs adapted for digging (Figure 1). The shell is oblong and generally tan, brown, or gray in coloration.

### Geographic Range and Distribution

The gopher tortoise occurs in the southeastern Coastal Plain from southeastern South Carolina westward to extreme southeastern Louisiana (Auffenberg and Franz 1982, Figure 2). The gopher tortoise is endemic to the United States, and Florida represents the largest portion of the total range of the species. Gopher tortoises remain widely distributed in Florida, occurring in parts of all 67 counties; however, their current range in South Florida is limited because of unsuitable habitat and increased urbanization (Mushinsky et al. 2006). Tortoise populations occur as far south as Cape Sable and on islands off the east and west coasts (Auffenberg and Franz 1982, Kushlan and Mazzotti 1984). The gopher tortoise is documented at Camp Blanding as well as other areas of Clay and surrounding counties (Hipes et al. 2000).

### Habitat Requirements

The gopher tortoise typically inhabits relatively well-drained, sandy soils. The gopher tortoise is generally associated with longleaf pine (*Pinus palustris*) –xeric oak (*Quercus* spp.) sandhills, but also occurs in scrub, xeric hammock, pine flatwoods, dry prairie, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of man-made environments such as pastures, old fields, and grassy roadsides (Auffenberg and Franz 1982; Kushlan and Mazzotti 1984; Diemer 1986, 1987, 1992; Breininger et al. 1994).

Gopher tortoises excavate burrows that average 4.5 m (14.8 ft) in length and 2 m (6.6 ft) in depth (Hansen 1963). These burrows, which provide protection from temperature extremes, desiccation, fire, and predators, serve as refuges for approximately 360 other species, including listed species such as the gopher frog (*Lithobates capito*), eastern indigo snake (*Drymarchon couperi*), Florida pine snake (*Pituophis melanoleucus mugitus*), and Florida mouse (*Podomys floridanus*) (Cox et al. 1987, Jackson and Milstrey 1989, Witz et al. 1991, Kent et al. 1997).

### Life History

The gopher tortoise is slow to reach sexual maturity, has low fecundity, and has a long life span (Landers 1980). Females reach sexual maturity at 9–21 years of age, depending on local resource abundance and latitude; males mature at a slightly younger age (Landers et al. 1980, Diemer and Moore 1994, Mushinsky et al. 1994, Aresco and Guyer 1999). The breeding season is generally April–November. Nests are constructed (often in burrow aprons) from mid-May to mid-June, and only one clutch is produced annually (Landers et al. 1980). Clutch size is usually five to nine eggs, with an average of six (Diemer and Moore 1994, Butler and Hull 1996). Predation on nests and hatchlings by mammals, birds, and snakes is heavy (Alford 1980, Landers et al. 1980, Butler and Sowell 1996, Smith 1997).

Gopher tortoises feed primarily on broadleaf grasses, wiregrass, grass-like asters, legumes, and fruits (Garner and Landers 1981, Macdonald and Mushinsky 1988), but they are known to eat >300 species of plants (Ashton and Ashton 2004). Tortoise densities and movements are affected by the amount of herbaceous ground cover (Auffenberg and Iverson 1979). Generally, feeding activity is confined to within 50 m (164 ft) of the burrow (Auffenberg and Franz 1982), but a tortoise may travel >100 m from its burrow for specific forage requirements (Ashton and Ashton 2008). Home range size varies with habitat type, season, and sex of the tortoise; moreover, considerable individual variation has been found (Diemer 1992). Reported annual average home ranges for males have varied from 0.5 to 1.9 ha (1.2 to 4.7 ac). Females generally have smaller home ranges, with reported averages ranging from 0.1 to 0.6 ha (0.2 to 1.6 ac) (McRae et al. 1981, Diemer 1992, Smith et al. 1997). Multiple burrows are typically used (McRae et al. 1981, Auffenberg and Franz 1982, Diemer 1992), which complicates estimates of population density (McCoy and Mushinsky 1992b).

### Threats

The primary threat to gopher tortoises in Florida is habitat destruction, fragmentation, and degradation, particularly from urbanization and development, agriculture, and phosphate/heavy metals mining (Diemer 1986, 1987; Berish [Diemer] 1991; McCoy and Mushinsky 1995; Berish 2001). Populations in the Florida Panhandle have been severely depleted by human predation and from habitat degradation resulting from fire suppression and planting dense stands of sand pine (*Pinus clausa*) in sandhill habitat (Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Formerly large tortoise populations in the northern peninsula have been depleted by agriculture, overharvest, and increasing development (Taylor 1982, Diemer 1987). In Central Florida, urban growth and development, phosphate mining, and citrus production are the primary threats (Auffenberg and Franz 1982; Diemer 1986, 1987). In

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## GOPHER TORTOISE

*Gopherus polyphemus*

South Florida, tortoise habitat has been destroyed or degraded by urbanization, intensive agriculture, and invasive exotic plant species (Berish [Diemer] 1991, Berish 2001). Habitat fragmentation of rural areas by roads and increased vehicular traffic due to development result in increased road mortality of gopher tortoises, which are often drawn to roadsides because of available forage (Franz and Auffenberg 1978; Landers and Buckner 1981; Landers and Garner 1981; Lohoefener 1982; Diemer 1986, 1987; Berish 2001; Mushinsky et al. 2006).

Degradation of tortoise habitat on silvicultural lands occurs when the canopy of pine plantations becomes closed and little or no understory forage is available to tortoises (Landers and Buckner 1981; Landers and Garner 1981; Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Intensive site preparation often associated with pine silviculture reduces native ground cover, and the sparse cover of legume and non-legume forbs provide poor forage, resulting in slower tortoise growth rates and delayed sexual maturity (Aresco and Guyer 1999). Lack of prescribed fire or suppression of natural fires also results in canopy closure and reduced tortoise forage plants (Landers and Speake 1980; Landers and Garner 1981; Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Local isolated populations of gopher tortoises may persist for decades in overgrown habitat, but recruitment of young into these populations declines as the canopy increases and habitat quality decreases (McCoy and Mushinsky 1992a, Mushinsky and McCoy 1994).

The spread of exotic invasive plant species, such as cogongrass (*Imperata cylindrica*) and hairy indigo (*Indigofera hirsute*), also degrades tortoise habitat (Berish [Diemer] 1991, Hicklin 1994, Berish 2001, Basiotis et al. 2005). Cogongrass can quickly form a tall, dense ground cover that is unsuitable for the gopher tortoise, particularly on rangelands, pastures, roadsides, and reclaimed phosphate mines (Shilling et al. 1997, Mushinsky et al. 2006). Gopher tortoise eggs and hatchlings are preyed upon by mammals, birds, and snakes (Douglass and Winegarner 1977, Fitzpatrick and Woolfenden 1978, Landers et al. 1980, Butler and Sowell 1996, Smith 1997). Approximately 80–90% of nests are typically depredated, primarily by mammalian predators such as the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), and opossum (*Didelphis virginianus*) (Hallinan 1923, Ernst and Barbour 1972, Douglass and Winegarner 1977, Landers et al. 1980). More than 90% of hatchlings may not survive their first year (Witz et al. 1992, Butler and Sowell 1996, Epperson and Heise 2003). Adults are nearly immune to predation, but some may be killed by dogs (*Canis familiaris*) and coyotes (*C. latrans*) (Douglass and Winegarner 1977, Causey and Cude 1978, Hawkins and Burke 1989; Mushinsky et al. 2006). Gopher tortoise populations can typically sustain natural predation pressure, with only one to three of every 100 eggs probably producing a breeding adult (Landers 1980). However, predator populations, such as raccoons and crows (*Corvus* spp.), can be artificially high in some habitats because of anthropogenic factors (Smith and Engeman 2002). Also, potential new tortoise predators have invaded Florida via human transport or habitat alteration: nine-banded armadillo (*Dasypus novemcinctus*), coyote, monitor lizards (*Varanus* spp.), and imported red fire ant (*Solenopsis invicta*) (Douglas and Winegarner 1977, Auffenberg and Iverson 1979, Main et al. 2000, Epperson and Heise 2003; Enge et al. 2004; Owens et al. 2005).

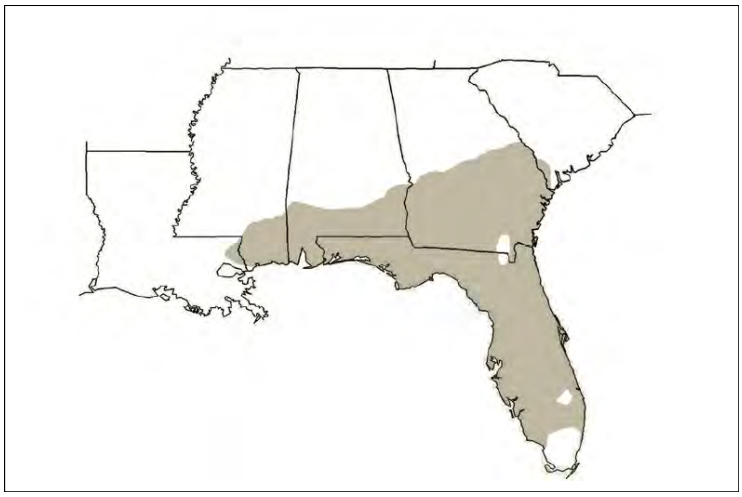

Figure 2. Distribution of the gopher tortoise in the southeastern United States.

Heavy human predation on the gopher tortoise occurred in the past in Florida, especially in the Panhandle and northern peninsula (Harcourt 1889, Fisher 1917, Anderson 1949, Alberson 1953, Hutt 1967, Matthews 1979, Auffenberg and Franz 1982, Taylor 1982, Diemer 1986, Mickler 1986, Diemer 1987, Berish 2001). Prior to the closure of tortoise harvest in the late 1980s, one community in Okaloosa County held an annual tortoise cookout. Although tortoise protection and decreased tortoise populations have reduced human consumption rates, some tortoise populations may still be depleted by sustained human predation (Mushinsky et al. 2006). Road development facilitates human access into remote areas and may lead to exploitation of additional gopher tortoise populations.

Beginning in the 1990s, upper respiratory tract disease (URTD) was identified as a potential threat to the gopher tortoise (Brown et al. 2002), and relatively large die-offs (100–300+ shells) that might be linked to URTD were documented on several public lands in Florida (McLaughlin 1997, Smith et al. 1998, Brown et al. 1999, Berish 2001, Gates et al. 2002, Rabatsky and Blihovde 2002). Besides at least two *Mycoplasma* species responsible for URTD, gopher tortoises also may have herpesvirus and iridovirus.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## GOPHER TORTOISE

*Gopherus polyphemus*

Pathogens may be partially responsible for recent declines in some gopher tortoise populations, but URTD may have a long evolutionary history as a gopher tortoise disease. McCoy et al. (2005) speculate that *Mycoplasma agassizii* may be detected in virtually every population, if enough tortoises are sampled. There are several possibilities why URTD has only been discovered recently: 1) increased research on the species, 2) increased stress on gopher tortoise populations from habitat fragmentation and degradation has lowered their resistance to pathogens, 3) a more virulent form of the pathogen has evolved, or (4) URTD was introduced by humans via exposure to infected captive tortoises (Mushinsky et al. 2006). On Sanibel Island, 87% of tortoises tested were seropositive for exposure to the pathogen, and at least one population here appears to have experienced a 25–50% reduction in breeding age adults (McLaughlin 1997, McLaughlin et al. 2000). However, McCoy et al. (2005) found that observed declines in the demographic well-being of gopher tortoise populations did not appear to be related to the presence of *Mycoplasma agassizii*.

### Listing Status

The gopher tortoise is listed as a Threatened species by the United States Fish and Wildlife Service under the federal Endangered Species Act (ESA) for populations occurring west of the Mobile and Tombigbee Rivers in Alabama, Mississippi, and Louisiana (50 CFR §17.11). The status of the gopher tortoise in its eastern range was evaluated by the USFWS in 2010-2011. The 12-month status review was published in the Federal Register in July 2011 (76(144):45130-45162) and included the finding that the species is warranted for federal listing under the ESA as Threatened, but precluded from listing due to higher priority listing activities (U.S. Fish and Wildlife Service 2011). As such, it is currently considered as a Candidate species under the ESA. Candidate species are not subjected to federal regulations under the ESA, and current conservation actions can potentially help preclude the need for future federal listing in the eastern portion of the species' range. The gopher tortoise is also listed as Threatened by the Florida Fish and Wildlife Conservation Commission.

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## GOPHER TORTOISE

*Gopherus polyphemus*

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## GOPHER TORTOISE

*Gopherus polyphemus*

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## GOPHER TORTOISE

*Gopherus polyphemus*

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Note: Information in this species account was used directly from the Florida Fish and Wildlife Conservation Commission's Gopher Tortoise Management Plan, dated September 2012. 243 pages.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## LITTLE BLUE HERON

*Egretta caerulea*


Figure 1. Little blue herons have slate blue plumage that blends in well with dark marsh plants.

### Description

On average, little blue herons measure 24 inches in length with a 40-inch wingspan, and weigh about 12 ounces – one-sixth the mass of a great blue heron (*Ardea herodias*). Little blues appear dark overall, with a relatively stout neck, moderately long, yellow-green legs, and a dagger-shaped, slightly drooped blue bill with a black tip (Figure 1). The entire body below the upper neck is slate blue. A purplish maroon color, boldest in summer, adorns the head and neck. Sexes are alike. First-year birds begin their lives completely white and are difficult to distinguish from juvenile snowy egrets (*Egretta thula*). After about nine months, grayish feathers begin to molt into the white plumage, creating a remarkable splotched appearance.

### Geographic Range and Distribution

Little blue herons breed along the Atlantic coast from southern Maine to Florida, with concentrations from South Carolina southward. Breeding across the Florida peninsula, this is distributed unevenly around the Gulf Coast and coastal plain, with the greatest densities in Louisiana. Little blue herons also breed up the Mississippi River valley into Illinois and through eastern Texas into Kansas. Wintering territory shrinks back to the warmer coasts. Little blue herons also occur throughout the Caribbean, Central America, and South America as far south as Uruguay (Figure 2). The little blue heron is known from Camp Blanding Joint Training Center (Florida Fish and Wildlife Conservation Commission 1997).

### Habitat Requirements

Little blue herons nest in small trees, shrubs, and mangrove stands near or over water. Estuaries, saltwater and freshwater marshes, and river bottoms are used for feeding and breeding. This heron forages in marshes, lagoons, canals and ditches, impoundments, ponds, streams, and flooded fields, usually where vegetation is emerging or mature. Young little blue herons prefer more open, shallow water. Wintering habitat is similar.

### Life History

In colonies with other herons, ibises, and anhingas, little blue herons usually nest in short trees and tall shrubs. Males form small territories, three to six feet wide, and begin to build nest platforms. The most common display is the "neck stretch", in which the male elongates his body upward, then collapses down with bill still up but neck folded, wings opened, and legs bent. A soft "unh!" punctuates the display. Pair bonds last for the season. The male gathers twigs and passes them to the female, who constructs the loose nest, with few or no leaves. Both sexes incubate up to six blue-green eggs for about 22 days, then brood, feed, and defend the white hatchlings together.

Little blue heron hatchlings can barely raise their heads and must pick regurgitated food from the nest floor for a few days before they can take food directly from the adults. Young birds leave the nest in about five weeks, but return to roost at night after foraging with other fledglings. They disperse from their natal area before migrating in mid-fall.


Figure 2. Range map for the little blue heron; used directly from from the "All About Birds" website, sponsored by the Cornell Lab of Ornithology, at: http://www.allaboutbirds.org/guide/little_blue_heron/id.

After breeding, little blue herons disperse in all directions, but favor the north. Pushed southward by cooler temperatures, usually in late September, this bird migrates via traditional routes along rivers and coasts, with frequent stops to forage and roost. Southern U.S. populations move as far south as Central America, and immature birds often remain there through the next year (Figure 2). Spring migrants appear along the mid-Atlantic coast in late March.

This dark, deliberate stalker walks, pauses, crouches, and stares to find prey. Its diet includes small amphibians; small fish such as anchovies, drum, and killifish; crustaceans such as crayfish and crabs; and insects such as bees, dragonflies, flies, and grasshoppers. This heron often forages alone, but juveniles often join snowy egrets to forage in open waters.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## LITTLE BLUE HERON

*Egretta caerulea*

### Threats

Lacking the breeding plumes most coveted by feather hunters in the 1800s, little blue herons avoided the extensive slaughter of other egrets. Today, the loss of feeding habitat seems to be the greatest limiting factor for this dark heron. Between 1780 and 1980, key breeding and wintering states like Mississippi, Arkansas, and Florida lost over 50% of their wetlands. Despite the recent preservation of key breeding sites like Florida's Pelican Island and Ding Darling National Wildlife Refuge, the little blue heron has not shown significant population increases. As a result of farmland expansion, residential development, and recreation, changes in water levels and flow have degraded coastal and riparian wetlands for breeding and wintering herons. Refuge managers now work to maintain open wetland habitats, which first year little blues use. A few states limit human proximity to sensitive breeding and foraging areas, but additional public education and buffer zones are needed.

### Listing Status

Little blue herons currently are a Species of Special Concern for the Florida Fish and Wildlife Conservation Commission (FWC). However, the FWC's Little Blue Heron Biological Review Group concluded from their biological assessment that the little blue heron meets the criteria for being listed as Threatened under Rule 68A-27, F.A.C. The listing status is expected to change to Threatened when the Commission approves the Imperiled Species Management Plan in 2015. Little blue herons are also protected under the federal Migratory Bird Treaty Act, but are not listed under the federal Endangered Species Act.

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Note: Unless noted, all information in this species account was used directly from the

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## LITTLE OECETIS LONGHORN CADDISFLY

*Oecetis parva*


Figure 1. *Oecetis parva* are only 3-5 mm in length.

### Description

Little *Oecetis* longhorn caddisflies are only 3-5 mm in length (Figure 1). Illustrations of both the male and female terminalia (i.e., reproductive organs) can be found in Burington et al. (2012), and larval and case illustrations can be found in Floyd (1995).

### Geographic Range and Distribution

This southeastern endemic was historically collected only from Alabama (one male from Wright's Creek near the Florida border) and Florida (throughout most areas of central and northern Florida where natural ponds and lakes occur) (Floyd, 1995; Rasmussen et al., 2008), but the species was recently found at one site in Georgia (Banks Lake National Wildlife Refuge) and several sites in the sandhills region of South Carolina (Burington et al., 2012) (Figure 2). It is possibly extirpated from Alabama.

### Habitat Requirements

The little *Oecetis* longhorn caddisfly prefers natural lakes, ponds, springs, and spring runs (Rasmussen et al., 2008). Rasmussen et al. (2008) indicated that *O. parva* was only located in Florida's healthiest lakes and considered the species to be an excellent bioindicator.

### Life History

Prior to adult emergence, caddisflies enter a stage of inactivity called the pupal stage that can last for several weeks or months depending on the species. Adult emergence is then triggered by various environmental factors, effectively synchronizing the adult activity to make mate-finding easier. For *O. parva*, adults are captured typically in the spring and summer (M. Floyd, pers. comm., 2014). There can be more than one cohort at a site, so multiple, synchronous emergences may be observed throughout the summer.

Caddisfly pupation occurs much like pupation of Lepidoptera (moths and butterflies). That is, caddisflies pupate in a cocoon spun from silk (Wiggins, 1977). Caddisflies that build portable cases attach their case to some underwater object, seal the front and back apertures against predation while still allowing water flow, and pupate within it. Once fully developed, most pupal caddisflies cut through their cases with a specially modified pair of mandibles, swim to the water surface, cast off the pupal skin and now-obsolete gills and mandibles, and emerge as fully formed adults. In a minority of species, the pupae swim to shore (either below the water or across the surface) and crawl out of the water to emerge. Many of them are able to fly immediately after breaking from their pupal skin.

The adult stage of caddisflies, in most cases, is very short-lived, usually only 1–2 weeks, but can sometimes last for two months. Most adults are non-feeding and are equipped mainly to mate. Once mating has occurred, the female caddisfly will often lay eggs (enclosed in a gelatinous mass) by attaching them above or below the water surface. Eggs hatch in as little as three weeks.
Caddisflies in most temperate areas complete their life cycle in a single year (Wiggins, 1977). The general temperate-zone lifecycle pattern is one of larval feeding and growth in autumn, winter, and spring, with adult emergence between late spring and early fall, although the adult activity of a few species peaks in the winter. Larvae can be active in very cold water and can frequently be observed feeding under ice. In common with many aquatic insect species, many caddisfly adults emerge synchronously *en masse*. Such emergence patterns ensure that most caddisflies will encounter a member of the opposite sex in a timely fashion. Mass emergences of this nature are called 'hatches' by salmon and trout anglers, and salmonid fish species will frequently 'switch' to whatever species is emerging on a particular day.[1]

Regardless of habitat, caddisfly adults tend to remain somewhat near the emergence site (LaFontaine, 1981; Collier and Smith, 1998) where oviposition occurs. Dispersal away from emergence sites tends to be negatively correlated with density of vegetation along the dispersal corridor; caddisflies tend to disperse shorter distances in dense forest compared with more open vegetation (Collier and Smith, 1998). Although dispersal flights are common especially from temporary habitats, such flights are relatively short and only occur immediately following emergence (Merritt and Cummins, 1996).[2]

### Threats

Rasmussen et al. (2008) believe *O. parva* is an excellent bioindicator of lake health in Florida, as it is abundant in the healthiest lakes. This indicates that this species is threatened by any factor which negatively affects water quality.

The Florida Fish and Wildlife Conservation Commission (2005) reports that this species' freshwater marsh and wet prairie habitat is highly threatened by altered hydrologic regime, altered water quality, and altered

[1] All information in this species account paragraph was used directly from the "Caddisfly" website, sponsored by Wikipedia, at: http://en.wikipedia.org/wiki/Caddisfly#cite_ref-Wiggins-22_5-1.

[2] All information in this species account paragraph was used directly from the "Oecetis parva" website, sponsored by NatureServe Explorer, at: http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Oecetis+parva.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## LITTLE OECETIS LONGHORN CADDISFLY

*Oecetis parva*

species dominance, and that this species' seepage habitat is highly threatened by altered hydrologic regime. Marsh, seepage, and lake habitats are all threatened by agriculture, urban development, forestry, recreation, water withdrawals, and nutrient loading (FWC 2005).

### Listing Status

The little *Oecetis* longhorn caddisfly is not listed by the Florida Fish and Wildlife Conservation Commission or the U.S. Fish and Wildlife Service (Service). However, the Center for Biological Diversity recently petitioned the Service to list the species under the federal Endangered Species Act (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

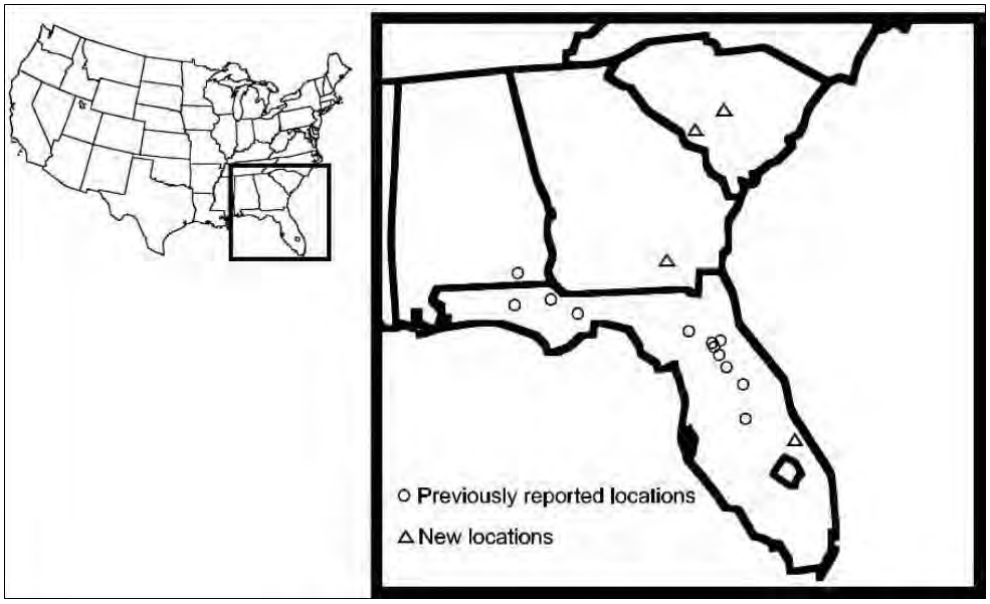


Figure 2. Range of *Oecetis parva* in the southeastern United States. Includes previously reported "O" locations from Rasmussen et al. (2008) and Harris et al. (1991), and new locations "Δ" reported in Burington et al. (2012). Map reproduced from Burington et al. (2012) publication.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## PURPLE SKIMMER

*Libellula jesseana*


Figure 1. Male purple skimmers have orange wings with a blue body.

### Description

The purple skimmer reaches an average body length of about two inches (5 centimeters), with individuals varying in color depending upon the age and sex. Adult males are pale blue to dark blue in color with orange wings (Figure 1), while females are yellow in color, making them hard to distinguish from the golden-winged skimmer (*Libellula auripennis*). Although its name suggests it is purple in color, only a few individuals typically hold this color.

### Geographic Range and Distribution

This species is endemic to Florida and limited to ten counties in the panhandle and northern peninsula of Florida: Bay, Washington, Clay, Putnam, Marion, Lake, Orange, Volusia, Seminole, and Palm Beach (Dunkle 1992, Richardson 2003, Abbott 2012). However, Paulson (2009) stated that the 1937 record from Palm Beach County is quite anomalous and should be confirmed or discredited (Keppner 2012), and Paulson (2011) excluded Palm Beach County from the range map for *L. jesseana*. Figure 2 shows the range for purple skimmers as noted in Keppner (2012). There is a protected population at Gold Head Branch State Park and Camp Blanding Joint Training Center in Clay County (Daigle 2007). However, most other populations receive no protection.

### Habitat Requirements

This species is found in clear, sandy lakes and ponds with little aquatic vegetation but with a shoreline belt of tall maidencane (*Panicum hemitomon*) and/or sedges and St. John's wort (*Hypericum spp.*). According to Dunkle (2000), this species requires the most infertile lakes with sparsest grass.

### Life History

Purple skimmers have a flight season from April through October (Dunkle 2000, Paulson 2011, Keppner pers. comm., 2013).

### Threats

Eutrophication and other types of water pollution from human settlement at and near lakes, ongoing in much of the purple skimmer's range in Florida, continue to threaten the habitat (Paulson 2009). Ground-water depletion due to irrigation could dry up some of the shallower ponds, which is also continuing to happen on the sandy ridges of Florida. Development around lakes can also lead to pollution from septic tanks. This degradation of the habitat may allow *L. auripennis* to outcompete this rare species.

### Listing Status

Purple skimmers are not listed by the Florida Fish and Wildlife Conservation Commission or the U.S. Fish and Wildlife Service (Service). However, the Center for Biological Diversity recently petitioned the Service to list the skimmer under the federal Endangered Species Act (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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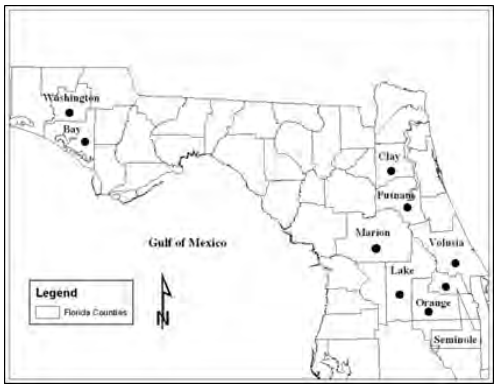


Figure 2. Known Florida county occurrences for the purple skimmer (Keppner 2012).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## PURPLE SKIMMER

*Libellula jesseana*

**Literature Cited (continued)**

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SAY'S SPIKETAIL

*Cordulegaster sayi*


Figure 1. Say's spiketails have a black thorax and abdomen with yellow, magenta, and white bands.

### Description

The Say's spiketail is a large dragonfly that reaches an average body length of about 2.4 to 2.7 inches (6 to 7 cm). Their thorax and abdomen are black with yellow, magenta, and white bands (Figure 1). Their eyes are green-gray and meet at one point on the top of the head. The female ovipositor extends just beyond the tip of the abdomen.

### Geographic Range and Distribution

This species is known from approximately 25 sites throughout southeastern Georgia and northern Florida (Stevenson et al. 2009; Figure 2). In Georgia, the Say's spiketail is known from 11 counties including Camden, Candler, Coffee, Effingham, Emanuel, Evans, Irwin, Liberty, Tattnall, Toombs, and Wayne; public lands supporting Say's spiketail populations include Fort Stewart and Gordonia-Alatamaha State Park. In Florida, it has a spotty distribution across northern Florida including known sites in Alachua, Bay, Clay, Columbia, Liberty, Okaloosa, Santa Rosa, and Washington counties; several conservation areas supporting Say's spiketail populations include Apalachicola Bluffs and Ravines Preserve, Blackwater River State Forest, Torreya State Park, Goldhead Branch State Park, and Camp Blanding Joint Training Center (Keppner 2013).

The majority of locations for *C. sayi* in Florida occur in the six counties from Liberty County west to Santa Rosa County. Keppner (2013) reports locations from Bay and Washington counties that represent 59% of the total locations reported from Florida. The gap in the distribution from Liberty County eastward to Columbia and Alachua counties appears to have been under-surveyed for the species or locations have not been made available (Keppner 2013). Since *C. sayi* and the muck-dwelling mud salamander (*Pseudotriton montanus*) have similar habitat types and are known to occur elsewhere together, the occurrence of the mud salamander in northeastern Florida (e.g., Nassau County) and as far south as Seminole County, Florida, suggests that *C. sayi* may eventually be discovered in these regions as well (D. Stevenson pers. comm. 2013).

### Habitat Requirements

Say's spiketail larvae are found in silt-bottom seepage streams in hardwood forests. Adults forage in open woodlands and clearings, especially longleaf pine-wiregrass sandhill habitats underlain by xeric sands. In both Georgia and Florida, the larvae are known to occur in mucky seepage habitats associated with sandhills or mesic hardwood forests (Stevenson et al. 2009, Keppner 2013).

### Life History

Say's spiketail adults have a flight season from February through April (Needham et al. 2000).

### Threats

Abbott (2007) reviewed the Say's spiketail for the International Union for the Conservation of Nature and stated that the species has a very limited range and is threatened by housing and urban development. Pesticide use in the vicinity of seepage streams may also be harmful to this species. Protecting seepage streams and surrounding uplands that feed the seepage stream habitat through percolation will help reduce threats to Say's spiketails. Rooting by wild pigs (*Sus scrofa*) may destroy or degrade the small mucky seepage habitats required by larval *C. sayi*.

### Listing Status

Say's spiketails are not listed by the Florida Fish and Wildlife Conservation Commission or the U.S. Fish and Wildlife Service (Service). However, the Center for Biological Diversity recently petitioned the Service to list the spiketail under the federal Endangered Species Act (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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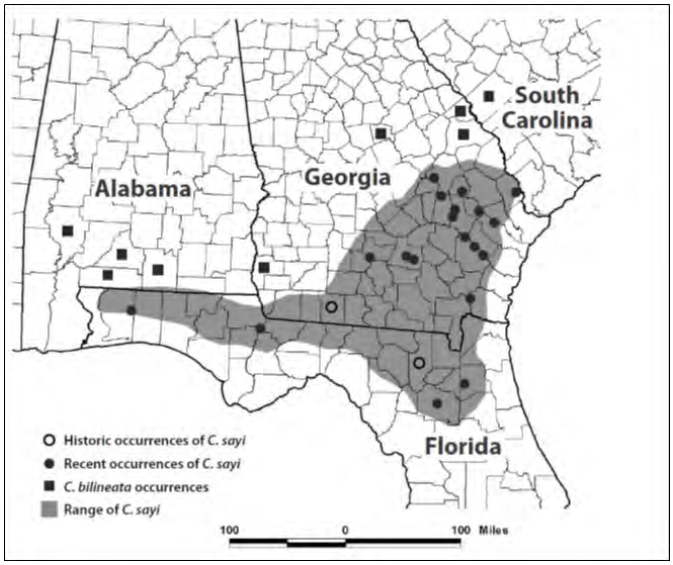


Figure 2. Range-wide distribution (shaded) of Say's spiketail. Solid circles represent recent (1995-present) records; open circles represent historic records (Stevenson et al. 2009). Some circles represent more than one site. Solid squares are records of brown spiketail (*Cordulegaster bilineata*) sites close to range of Say's spiketail.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SAY'S SPIKETAIL

*Cordulegaster sayi*

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Center for Biological Diversity. 2010. Petition to list 404 aquatic, riparian, and wetland species from the southeastern United States as threatened or endangered under the Endangered Species Act. Petition filed April 20, 2010. 1145 pages.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SHERMAN'S FOX SQUIRREL

*Sciurus niger shermani*


Figure 1. Sherman's fox squirrels typically inhabit xeric uplands.

### Description

The Sherman's fox squirrel (*Sciurus niger shermani*) is a large tree squirrel typically measuring 600 to 700 mm (23 to 28 in) in length (Figure 1). Its coloring is highly variable with dorsal fur ranging from silver to black, and variations of silver over black and black over silver (Florida Natural Areas Inventory 2001). Fox squirrels of the southeastern coastal plain vary in dorsal coloration from gray to tan agouti to completely non-agouti black, with buff or black on the ventrum (Moore 1956, Kiltie 1989). They almost always have a variable amount of white on the rostrum and ears (Kiltie 1989).

### Geographic Range and Distribution

Sherman's fox squirrels range from Georgia southward to peninsular Florida, exclusive of the southwestern portion of the state (FNAI 2001; Figure 2). This subspecies is known from and verified on Camp Blanding Joint Training Center (Gregory et al. 2006).

### Habitat Requirements

This species typically inhabits xeric uplands, including sandhill, pine flatwoods, pastures, and other open, ruderal habitats (such as pecan orchards) with scattered pines and oaks (FNAI 2001).

### Life History

Longleaf pine seeds and turkey oak acorns appear to be some of the main food items consumed by Sherman's fox squirrels in the sandhill community (Moore 1957). These squirrels have been observed to move their home ranges into live oak (*Quercus virginiana*) forests if a mast failure of turkey oak (*Q. laevis*) occurs (Kantola and Humphrey 1990). The highest quality habitat for Sherman's fox squirrels may therefore be habitat that includes both longleaf pine savanna and live oak forest (Kantola and Humphrey 1990). Additional food items include other acorns, fungi, bulbs, vegetative buds, insects, nuts, and staminate pine cones (Kantola 1992).

Sherman's fox squirrels use several different nests in their home ranges (Kantola and Humphrey 1990). Most nests are leaf nests made of Spanish moss, pine needles, twigs, and leaves, while a few nests are within tree cavities (Kantola and Humphrey 1990). In the Ordway-Swisher Biological Station, nests of this squirrel were found in 6 tree species: longleaf pine (*Pinus palustris*), slash pine (*P. elliottii*), post oak (*Q. stellata*), laurel oak (*Q.laurifolia*), live oak, and turkey oak (Kantola and Humphrey 1990). Turkey oak was used most frequently (68.6%) followed by longleaf pine (17.7%), live oak (4.9%), post oak (3.9%), laurel oak (3.9%) and slash pine (1%) (Kantola and Humphrey 1990). Sherman's fox squirrels in Florida occur at lower densities and have larger home ranges than estimates obtained for *Sciurus niger* elsewhere in its range (Wooding 1997).

A population of approximately 100 to 200 animals was estimated to inhabit the 37 $km^2$ (14 $mi^2$) area occupied by the Ordway-Swisher Biological Station, Putnam County, Florida (Kantola and Humphrey 1990). Other density estimates in Florida range from 7 to 38 individuals per $km^2$ (Wooding 1997, Humphrey et al.1985, Kantola 1986, Moore 1957). Average home range size for Sherman's fox squirrels is 16.7 ha (41.2 ac) for females and 42.8 ha (105.7 ac) for males (Kantola and Humphrey 1990). Kantola (1992) reports midwestern fox squirrel home ranges average 0.8 to 7.0 ha (2.0 to 17.3 ac). Sherman's fox squirrel adults defend mutually exclusive core areas (Kantola and Humphrey 1990). Males have home ranges that overlap with those of females and other males, but there is very little overlap in home ranges of adult females (Wooding 1997). The relatively large home ranges of this subspecies may result from a food supply that varies in time and space (Kantola and Humphrey 1990). The low carrying capacity in Florida may be explained by a lack of high quality, storable seeds, coupled with periodic failures of seed crops (Wooding 1997). Habitat that is low in productivity leads to low population densities, large home range sizes, and the low production of young per unit area (Wooding 1997).

### Threats

The biggest threat to Sherman's fox squirrel is destruction of habitat due to encroaching development (Kantola and Humphrey 1990, FWC 2005). Such habitat loss has already been significant; it is estimated that only 10 to 20% of Sherman's fox squirrel historic habitat is still intact (Bechtold and Knight 1982 as cited in Kantola 1992). Most of its habitat has been logged, converted to pasture, degraded by lack of fire, or used for agriculture, commercial development, and residential development (Bechtold and Knight 1982 as cited in Kantola 1992). Florida's longleaf pine forests in particular were reduced by 88% between 1936 and 1986, to the extent that by 1987 only 380,000 ha (1,467 $mi^2$) remained (Wooding 1997). Many of the other habitat types in which Sherman's fox squirrels occur are also declining. Mixed hardwood-pine forest is declining; natural pineland, sandhill, and scrub are in poor condition and declining. Further habitat destruction is expected to continue as Florida's human population continues to expand (FWC 2005, Zwick and Carr 2006, FWC 2008).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SHERMAN'S FOX SQUIRREL

*Sciurus niger shermani*

In addition to habitat loss, the quality of remaining habitat is also a concern. Kantola and Humphrey (1990) suggested that most remaining tracts of longleaf pine savanna in Florida were not of good quality. Logging and the suppression of fire have led to the replacement of pine trees by turkey oak over much of the Sherman's fox squirrel range (Kantola and Humphrey 1990). Some improvements have been made through restoration projects on public conservation lands and incentive programs for private landowners, but the current condition of natural pinelands is still poor on much of the historic extent (FWC 2005). Management of upland longleaf pine savannas for other specialist species, such as gopher tortoises (*Gopherus polyphemus*), red-cockaded woodpeckers (*Picoides borealis*), northern bobwhite (*Colinus virginianus*), and grassland bird species, can be compatible with the needs of Sherman's fox squirrels (Perkins et al. 2008) if due consideration is given to retention of mast-producing trees. Managers restoring degraded longleaf pine savannas should retain a component of site-appropriate mature oaks to provide mast and nest sites for Sherman's fox squirrel (Perkins et al. 2008). Greenberg and Simons (1999) described land managers as being "misguided" if they removed all mature oaks when attempting to restore or maintain longleaf pine and sandhill ecosystems. Prescribed fire is necessary to prevent encroachment of excessive hardwoods and maintain the open structure preferred by Sherman's fox squirrels in upland longleaf pine savanna and mixed pine-hardwood forests (Weigl et al. 1989, Kantola and Humphrey 1990, Perkins and Conner 2004, Lee et al. 2009).

Fragmentation of habitat poses another risk to Sherman's fox squirrel. Due to their slow, lumbering gait, fox squirrels are vulnerable to road mortality. Mortality from vehicle collisions is likely to increase as Florida's human population increases. Better understanding of Sherman's fox squirrel populations, habitat preferences, and habitat use may help in planning land use and road construction projects to avoid creating additional hazards.

Fragmentation of suitable habitat further isolates local populations, increasing vulnerability to local extinction events. Hunting of Sherman's fox squirrel may have been detrimental to local populations in the past, particularly those small, isolated populations that had low potential for recolonization (Kantola 1992). Presumably, this threat has decreased as hunting of this squirrel is no longer permitted.

Diseases may pose a significant threat to population stability and viability. White Oak Conservation Center (WOCC) in Nassau County, FL, recorded several Sherman's fox squirrel die-offs due to a fibromatosis outbreak throughout the property. The population at WOCC has yet to recover from the most recent die-off in 2002 to 2003 (S. Citino, WOCC, personal communication). Although squirrel poxvirus, a skin fungus that can cause high rates of mortality (Terrell et al. 2002), has been detected in Big Cypress fox squirrels (Kellam and Jansen 2010), its impact to the entire species is unknown (USFWS 2002).

### Listing Status

The Sherman's fox squirrel is currently listed as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission (FWC). FWC's Sherman's Fox Squirrel

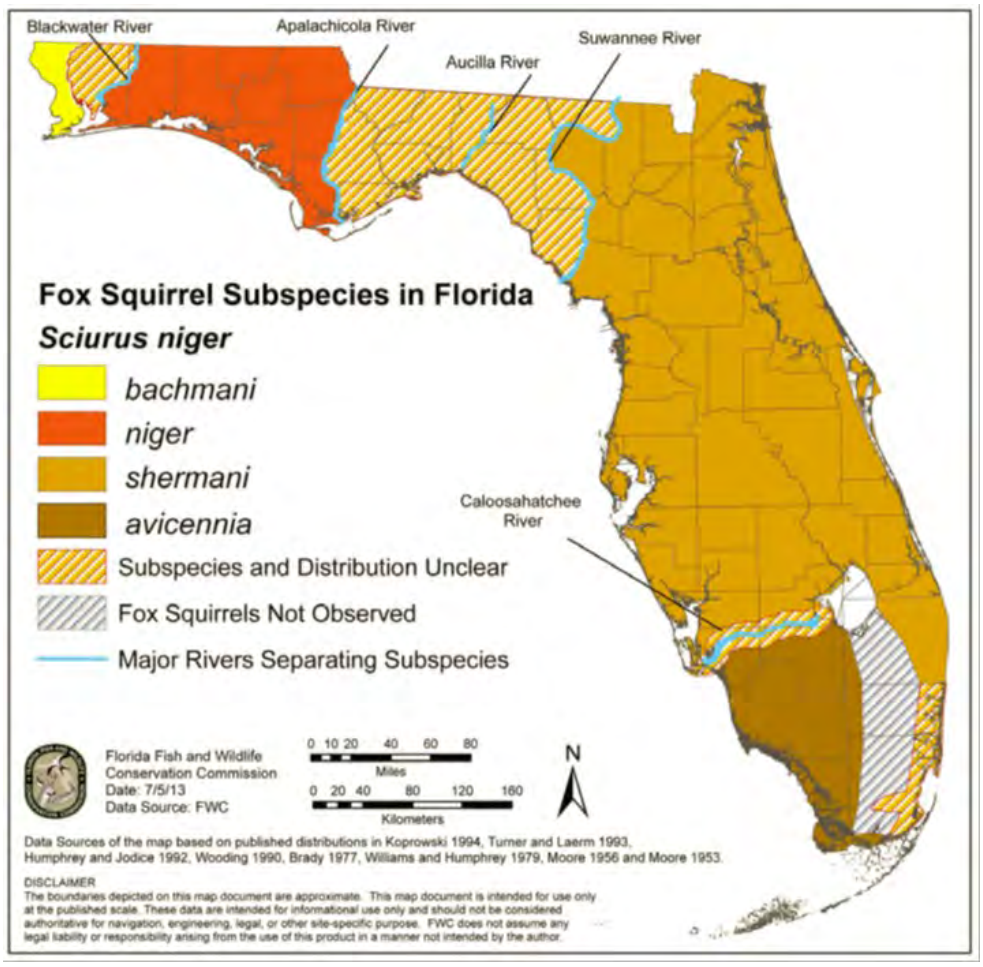


Figure 2. Range of the Sherman's fox squirrel in Florida, compared to that of other fox squirrel subspecies.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SHERMAN'S FOX SQUIRREL

*Sciurus niger shermani*

Biological Review Group concluded from their biological assessment that the Sherman's fox squirrel did not meet listing criteria. However, the lack of data necessary for an adequate evaluation of the subspecies was of great concern. Therefore the subspecies was recommended to remain as a Species of Special Concern until sufficient data have been collected. The Sherman's fox squirrel is not listed, nor has it been petitioned to be listed, under the federal Endangered Species Act.

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Note: A portion of the information in this species account was used directly from the Florida Fish and Wildlife Conservation Commission's Sherman's fox squirrel Species Action Plan; dated November 1, 2013. 50 pages.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SOUTHEASTERN AMERICAN KESTREL

*Falco sparverius paulus*


Figure 1. Male American kestrel perched atop a snag.

### Description

The smallest falcon in North America, southeastern American kestrels (*Falco sparverius paulus*) are distinguished in flight by long pointed wings and deep, sometimes fluttering, wing-beats. Adult kestrels are sexually dimorphic; males have buffy underparts with variable spotting, blue-gray wings, a streaked rufous back, and a mostly solid rufous tail, whereas females have buffy underparts with heavy streaking and barred rufous wings, back, and tail (Figure 1). Both sexes have 2 vertical black stripes on each side of their head; one across the base of the beak and one across the back of the head . Female American kestrels are larger than male kestrels. Body mass in Florida, in summer, averages 100 g (0.22 lb) for males and 120 g (0.26 lb) for females.

### Geographic Range and Distribution

The southeastern American kestrel was once widely distributed throughout southeastern states; today, the subspecies occurs primarily in Florida and is patchily distributed elsewhere in the coastal plain of Georgia and South Carolina. Within Florida, the southeastern American kestrel was once distributed as far south as the rockland pine forests of Dade County (Holt and Sutton 1926), but now breeds no farther south than Highlands and Lee counties (Figure 2; Robertson and Woolfenden 1992; FWC 2003). The southeastern American kestrel is known from Camp Blanding Joint Training Center (Hipes and Jackson 1994).

### Habitat Requirements

The southeastern American kestrel appears to have evolved in the southeastern sandhill ecosystem. The typical sandhill landscape consists of a widely spaced canopy of longleaf pine (*Pinus palustris*) or slash pine (*P. elliottii* var *densa*) with wiregrass (*Aristida stricta*) and forb dominated groundcover. This ecosystem provides both prey and nesting sites (e.g., tree cavities) for kestrels (Bohall-Wood and Collopy 1986; Hoffman and Collopy 1987; Collopy 1996). Southeastern American kestrels also use a variety of other natural communities in Florida including scrub, scrubby flatwoods, and dry prairie. Pastures, parks, golf courses, and orange groves are also used (Stys 1993), but no information is available about their survivorship and reproductive success in these human-modified habitats.

### Life History

Southeastern American kestrels establish breeding territories year-round and have high territory fidelity (Bohall-Wood and Collopy 1986). Southeastern American kestrel territory size has not been measured, but likely varies based on habitat quality, prey availability, and the presence of nesting cavities and perches. Stys (1993) suggested 0.5 km² (124 ac) as an approximation for territory size for mitigation and conservation planning purposes. Territories that include areas of unsuitable plant communities (e.g., dense pinelands or other closed canopy forest) are probably much larger.

Southeastern American kestrels are secondary cavity nesters, meaning they depend on cavities excavated by woodpeckers, or other natural cavities, in trees for nesting sites. Most natural nest cavities are in dead longleaf pine, sand pine (*P. clausa*), or various oak (*Quercus* spp.) trees. Nesting also can occur in live pines in cavities originally excavated by red-cockaded woodpeckers (*Picoides borealis*) and subsequently enlarged by other woodpeckers (Gault et al. 2004). Kestrels have been recorded nesting in abandoned or occupied buildings, in man-made nest boxes (Smallwood and Collopy 2009), and in utility transmission towers (Beasley and Parrish 2009).

Courtship and pair bonding begins in early January (Bohall-Wood and Collopy 1986). From mid-March through May, 3-5 eggs per clutch are laid. Egg color varies from white to a yellowish or light reddish-brown, typically blotched or mottled with gray or brown (Smallwood and Bird 2002). Incubation lasts 29-31 days and young fledge in 28-30 days. Sexual maturity is reached when kestrels are 1 year old and life expectancy is estimated at an average of 2 years and 9 months for kestrels that survive their first winter (Smallwood and Bird 2002).

American kestrels hunt for food by searching the ground from elevated perches and hovering or soaring over open areas without perches. Major prey items of the southeastern American kestrel are insects, lizards, and less frequently small rodents or birds (Bohall-Wood and Collopy 1986).

### Threats

Population declines of southeastern American kestrels in Florida have been largely attributed to clearing of older pine forests, conversion of sandhill and other upland habitats for agriculture and urban development, and fire suppression. These habitat changes led to a lack of suitable nest sites and a loss of ground cover suitable for prey (Hoffman and Collopy 1987, Smallwood and Collopy 2009).

However, southeastern American kestrel habitat relationships are poorly understood at both the plant community level and the landscape level, and therefore reasons for

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SOUTHEASTERN AMERICAN KESTREL

*Falco sparverius paulus*

kestrel population decline are still unclear.

Loss of suitable nesting habitat (i.e., tree cavities) and foraging habitat (i.e., open ground cover) are contributing factors but they cannot alone explain the kestrel's imperiled status. For example, recent bird surveys of restored sandhills throughout Florida (J. Rodgers, FWC, unpublished data; K. Miller, FWC, unpublished data) indicate that southeastern American kestrels are either rare or absent at every location, with the possible exception of Eglin Air Force Base. Habitat fragmentation may have a negative effect on kestrels given that juvenile southeastern American kestrels have a median dispersal distance <5 km (Miller and Smallwood 1997).

Threats to sandhill ecosystems identified by Florida's State Wildlife Action Plan (FWC 2005), including altered fire regime, habitat destruction or conversion, fragmentation of habitats, and the absence or scarcity of keystone species (i.e., cavity excavators), are likely to have a negative impact on southeastern American kestrels. Therefore, national and state-level conservation initiatives for protection and management of existing sandhill habitat will likely benefit the southeastern American kestrel to some degree.

### Listing Status

Southeastern American kestrels are listed as Threatened by the Florida Fish and Wildlife Conservation Commission. They are not listed, nor have they been petitioned to be listed, under the federal Endangered Species Act.

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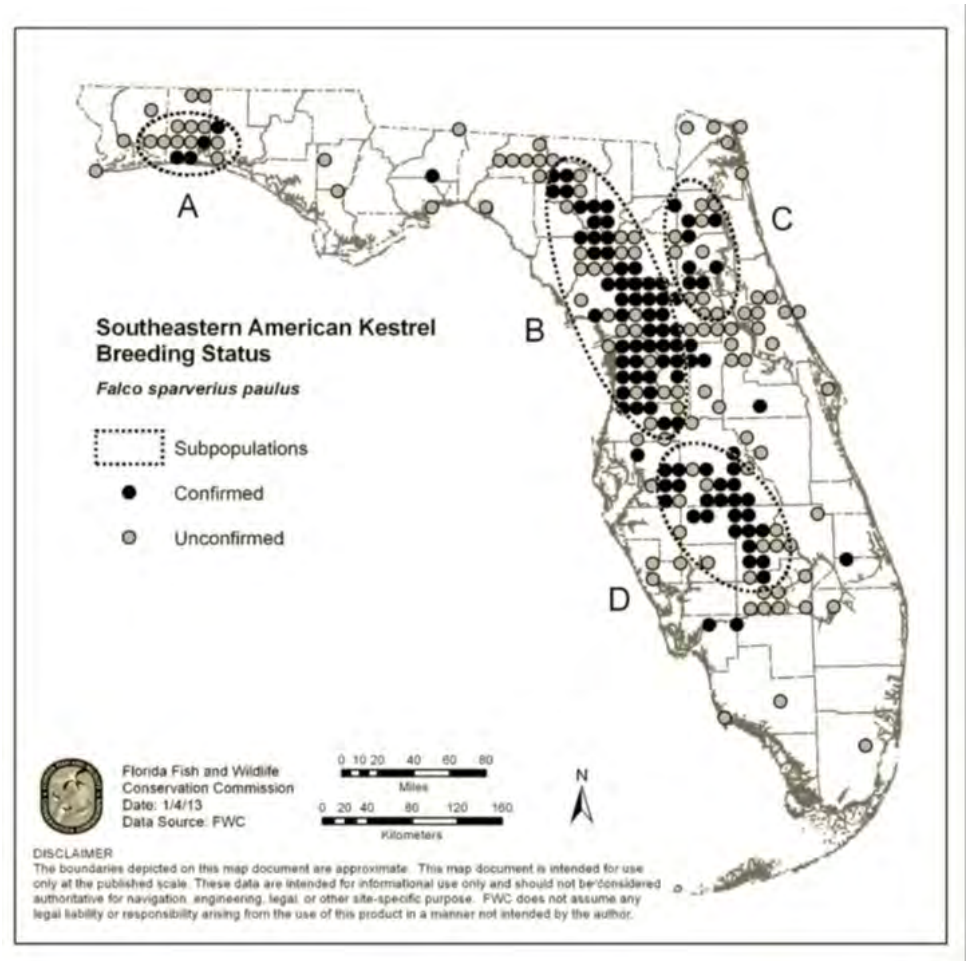


Figure 2. Distribution of the non-migratory southeastern American kestrel. Four largest regional subpopulations (approximated by dashed lines): A) Western Panhandle, B) Brooksville Ridge and vicinity, C) Trail Ridge and vicinity, D) Lake Wales Ridge and vicinity. Points represent 7.5 minute quadrangles where breeding activity was recorded as "Confirmed" (black dots) or "Probable" or "Possible" (gray dots) during Florida's Breeding Bird Atlas (FWC 2003).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SOUTHEASTERN AMERICAN KESTREL

*Falco sparverius paulus*

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SOUTHERN HOGNOSE SNAKE

*Heterodon simus*


Figure 1. The southern hognose snake is a small snake with a sharply pointed snout.

### Description

The southern hognose snake (*Heterodon simus*) is a small (ca. 20 inches [508 mm]), stocky snake with a sharply pointed snout, keeled scales, and a divided anal scale (Conant and Collins 1991, Hipes et al. 2000). The dorsal base color is sandy gray to tan with three rows of dark blotches, while the ventral surface is white to cloudy gray and has no pattern (Hipes et al. 2000, Reichling 2008, Figure 1). As with other hognose species, diagnostic defensive behaviors include hissing, flattening of the head and neck, and playing dead (Hipes et al. 2000, Reichling 2008).

### Geographic Range and Distribution

The southern hognose snake historically ranged from southeastern North Carolina, south to Lake Okeechobee and westward to southern Mississippi (Conant and Collins 1991, Hipes et al 2000, Ernst and Ernst 2003, Reichling 2008). The species may be extirpated or extinct from the westward portions of the range (Tuberville et al. 2000).

Populations in Florida are scattered and localized within the panhandle and peninsula and may be absent from formerly vouchered sites (Hipes et al. 2000). The species has been observed on Camp Blanding Joint Training Center in Clay and surrounding counties (Katy NeSmith, Zoologist, Florida Natural Areas Inventory, pers. comm.).

### Habitat Requirements

The southern hognose snake inhabits xeric habitats, including sandhill, scrub, and xeric hammock but is also found in oldfield habitats and some slightly more mesic environments (Ashton and Ashton 1981, Hipes et al. 2000, Reichling 2008). This species is often associated with ephemeral wetlands, where the southern toad (*Anaxyrus terrestris*) is a major prey item (Ashton and Ashton 1981, Hipes et al. 2000).

### Life History

As evident by its strongly upturned snout, the southern hognose snake is fossorial, utilizing loose, sandy soils for burrowing (Reichling 2008).

### Threats

The decline of the southern hognose snake is associated with the loss, alteration, and degradation of xeric habitats due to commercial and residential development, agriculture, and mining (Hipes et al. 2000). Additional threats include depredation of eggs and hatchlings by fire ants (*Solenopsis invicta*) (Tuberville et al. 2000, Reichling 2008), road mortality (Enge and Wood 2003), and general prosecution of snakes by humans. Localized commercial collection for the pet trade may also be an issue (Enge and Wood 2003).

### Listing Status

The southern hognose snake is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2012). The Service is in the process of developing the 90-day finding for the petition and will subsequently solicit information for use in the 12-month finding, if applicable.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SOUTHERN LANCE

*Elliptio ahenea*

### Description

The southern lance (*Elliptio ahenea*) is a bivalve that exhibits an approximate 2:1 ratio of length to height. It has compressed valves and a biangulated posterior slope that generally ends at a 90 degree angle to the ventral surface. The species prefers soft bottomed substrates with minimal water flow (Johnson 1972).

### Geographic Range and Distribution

The southern lance is a Florida endemic, confirmed from the St. Mary's, St. Johns, Kissimmee, and Suwannee rivers, but is absent from other Gulf drainages, although it may also be present in the Ochlockonee River drainage (Johnson 1972; Williams and Butler 1994). Although the species has not been collected from Camp Blanding Joint Training Center, it has been documented from the Black Creek basin.

### Life History

Adults are sedentary filter feeders, while the larvae are parasitic on fish species during the glochidial stage of development (Watters 1992).

### Threats

This species is susceptible to the typical filter feeder threats including eutrophication, pollution, and urban runoff.

### Listing Status

The southern lance is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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Note: A portion of the information in this species account was used directly from the NatureServe *Elliptio ahenea* page (http://natureserve.org/explorer).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SPOTTED TURTLE

*Clemmys guttata*


Figure 1. The spotted turtle is a secretive animal preferring slow moving waters.

### Description

The spotted turtle (*Clemmys guttata*) is small black turtle (up to 12.5 cm [4.9 in]) with orange to yellow spots on the head and carapace (Figure 1). The carapace is smooth and lacks any keeling or serrations. The plastron is yellow, while marginal scutes may have black areas. The skin is black to gray, while the dorsal surfaces of the limbs are orange, pink, or salmon red. Older individuals may be melanistic and lack the characteristic spots. This species is sexually dimorphic with females usually larger than males (Ernst et al. 1994).

### Geographic Range and Distribution

The spotted turtle is found on the Atlantic Coastal Plain from north central Florida to Maine and westward across the northern United States and southern Canada to Lake Michigan (Hipes et al. 2000). Although not confirmed on Camp Blanding Joint Training Center, the species has been documented from several nearby counties (Alachua, Baker, Marion, Putnam, and St. Johns) (Ashton and Ashton 1985, Berry 1992, Hipes et al. 2000).

### Habitat Requirements

The spotted turtle is a secretive animal preferring slow moving waters of bogs, swamps, flatwood ponds, and ditches with abundant vegetation (Ernst and Barbour 1989, Hipes et al. 2000).

### Life History

The elusiveness of this species in Florida has greatly limited our knowledge of the species' ecology in the state (Berry 1992). Spotted turtles are semi-aquatic and equally at home on land or in water, but are usually found in aquatic habitats with soft bottoms and abundant vegetation cover (Ernst and Barbour 1989).

The breeding season is from March until May, with mating usually occurring in the water (Ernst and Barbour 1989). Nesting occurs from May through July, with females laying one to two clutches of two to eight elliptical, white eggs (Ernst and Barbour 1989, Ernst et al. 1994). Estimated incubation time is between 70 and 83 days (Ernst and Barbour 1989).

Spotted turtles are opportunistic omnivores and may scavenge for their food (Ernst et al. 1994, Berry 1992). Vegetation includes grasses and filamentous green algae (Ernst et al. 1994). Animals consumed include a wide variety of insects and other arthropods, mollusks, annelids, fishes, and amphibians (Ernst and Barbour 1989, Ernst et al. 1994). Predators of spotted turtles include wading birds and mammals, such as skunks and raccoons (Ernst et al. 1994).

### Threats

The spotted turtle's decline is associated with habitat loss and degradation due to commercial and residential development, silviculture, and agriculture (Hipes et al. 2000). They may also be susceptible to hydrological alterations associated with drainage projects and groundwater withdrawal (Hipes et al. 2000). Collection for the pet trade may also be a threat (Ernst et al. 1994).

### Listing Status

The spotted turtle is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2012). The Service is in the process of developing the 90-day finding for the petition and will subsequently solicit information for use in the 12-month finding, if applicable.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## ST. JOHN'S ELEPHANTEAR

*Elliptio monroensis*

### Description

The St. John's elephantear (*Elliptio monroensis*) is a bivalve and is similar to its congener *E. dariensis*, which reaches much larger sizes and thickness than *E. monroensis*, and the latter species generally has a more pronounced posterior ridge. *E. dariensis* is endemic to the Altamaha River system in Georgia while *E. monroensis* is endemic to the St. John's River in Florida (Butler 1994).

### Geographic Range and Distribution

The St. John's elephantear has been collected from the following waterbodies: Black Creek, Econlockhatchee River, Julington Creek, Lake Monroe, Lake Baresford, and Lake Woodruff (Butler 1994). Although the species has not been collected from Camp Blanding Joint Training Center, it has been documented from the Black Creek basin.

### Habitat Requirements

This species requires sandy substrate in lakes and creeks with little current (Heard 1979).

### Life History

Adults are sedentary filter feeders, while the larvae are parasitic on fish species during their glochidial stage of development (Watters 1992). The glochidial host and natural history of the species are unknown at present (NatureServe 2013).

### Threats

This species is susceptible to the typical filter feeder threats including eutrophication (i.e., excessive nutrients), pollution, and urban runoff.

### Listing Status

The St. John's elephantear is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CBD 2010). The Service made a substantial 90-day finding for the petition and is currently soliciting information for use in the 12-month finding.

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Note: Some information in this species account was used directly from the NatureServe *Elliptio monroenisis* page (http://natureserve.org/explorer).

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## STRIPED NEWT

*Notophthalmus perstriatus*


Figure 1. The striped newt has two red stripes running from the head to the tail.

### Description

The striped newt (*Notophthalmus perstriatus*) is a small, olive green to brown salamander (up to 10.5 cm [4.1 in]) with two dorsolateral red stripes running from the head to the tail (Conant and Collins 1991, Figure 1). The ventral surface is yellow with black spots (Conant and Collins 1991). A terrestrial immature eft stage also exhibits the dorsolateral stripes, but on an orange to red base color (Reichling 2008). During the mating season, male striped newts exhibit a flattened tail, fleshy flanges on the hind limbs, hard scaly projections on the toes, and a swollen vent.

Larval coloration is distinct from that of the adults. Their base coloration is greenish yellow, but they may be translucent and lack coloration, and the stripes are made up of two dorsolateral bands of gray and black (Mecham and Hellman 1952).

### Geographic Range and Distribution

The striped newt ranges across southern Georgia and north Florida south to central Florida (Christman and Means 1992). This newt is patchily distributed within its range and there is a major disjunctive gap between western metapopulations in the Apalachicola National Forest and those of the eastern portion of the range (Reichling 2008). The striped newt is known from Camp Blanding Joint Training Center (Hipes and Jackson 1996; A. Farmer, Florida Fish and Wildlife Conservation Commission, pers. comm. 2009).

### Habitat Requirements

Striped newts inhabit fire-maintained, xeric pine uplands, principally sandhill, but also scrub and pine flatwoods. Breeding occurs in small, isolated, ephemeral wetlands imbedded in the aforementioned terrestrial habitats (Hipes et al. 2000).

### Life History

There are very few data on the terrestrial habits of the striped newt. Breeding migration to ephemeral ponds occurs between January and March (Dodd 1993), with females having been documented to travel greater than 700 meters to a pond (Dodd and Cade 1998).

### Threats

The major threat to the striped newt is alteration, degradation, and conversion of breeding and terrestrial habitats (Hipes et al. 2000). Greenberg et al. (2003) note that the striped newt may be intolerant of successional changes associated with fire suppression. Introduction of fishes into isolated, ephemeral wetlands negatively affects the breeding ecology of the species (Hipes et al. 2000). The stochastic nature of droughts in the striped newt's range has led to the evolution of plasticity of larval development (Reichling 2008). The striped newt is a classic bet hedger, in having several reproductive strategies: paedeomorphism (sexually mature larvae); transformation to the eft phase to complete sexual development in the terrestrial environment; and direct development from aquatic larvae to sexually mature adults (Means et al. 1994).

### Listing Status

The striped newt is not listed by the Florida Fish and Wildlife Conservation Commission or under the federal Endangered Species Act (ESA). However, the Coastal Plains Institute petitioned the U.S. Fish and Wildlife Service to list the species under the ESA (CPI 2008). The Service made a 12-month finding of warranted but precluded for the petition, hence the species retains the Candidate status.

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## STRIPED NEWT

*Notophthalmus perstriatus*

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# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SWALLOW-TAILED KITE

*Elanoides forficatus*


Figure 1. Swallow-tailed kites have striking black-and-white coloring.

### Description

The swallow-tailed kite (*Elanoides forficatus*) is a large but light raptor, weighing only 15 ounces on average and measuring 22 inches long with a 51 inch wingspan (Figure 1). Most often seen in flight, it sports a long, forked tail and long, narrow wings. It appears small-headed. At all times of year, the adults are black and white. The head, neck, lower body, and under wing linings are white. The eye, small bill, upper body, upper wing, and tail are black. On the underwing, the black of the outer wing narrows to a point along the wing's rear edge and just touches the body. Usually, some of the black upper parts have a blue cast, which is likely created by the swallow-tailed kite's powder feathers. The upper parts of South American birds have a green cast.

### Geographic Range and Distribution

In North America, the swallow-tailed kite breeds at a few scattered locations in the Southeastern Coastal Plain, from extreme east Texas to South Carolina (Figure 2). The greatest breeding densities occur in Florida's peninsula, the only place where the range is continuous. In the 1800's, the swallow-tailed kite nested as far north as Wisconsin and ranged over as many as 21 eastern states. A population of swallow-tailed kites also breeds from southern Mexico through Central America and much of South America. North American kites winter in South America, but blend into resident populations, so that their exact distribution is not understood.

### Habitat Requirements

In North America, breeding colonies favor woodlands with trees that rise well above the canopy and with ready access to wet prairies or marshes for food. Mature, forested wetlands dominated by slash pines and cypresses are typical breeding habitat in Florida. Pine-hardwood forests are used in South Carolina, where nests are placed in loblolly pines that average 104 feet tall. A mosaic of wetland habitats with trees of various heights is a key characteristic. Non-native Australian pine offers good height, but often fails to support nests. In Central and South America, the swallow-tailed kite breeds in humid lowland forests and cloud forests. Large trees are also important for communal roosts, as the kites stage before fall migration. Wintering habitats are not well documented.

### Life History

The migratory habits of this kite are not completely understood. During the spring, early migrants arrive in Florida in late February, and dates for Texas are probably similar, since nesting starts in mid-March. Migration is likely to follow more than one route over the Gulf of Mexico and around the Gulf, through Central America and Mexico. Before fall migration, adults and young stage in large roosts, which are empty by late September. Fall migrants form small flocks that soar to high altitudes and appear to segregate by age, with juveniles departing last and probably on their own.

The swallow-tailed kite probably forms pairs before reaching the United States in spring. Bonding rituals have not been identified, but the pair chooses a nest site usually within 80 to 750 yards of other swallow-tailed kite nests. They usually build a new stick nest near the top of a tall tree, but sometimes reoccupy an old one. The nest is lined with lichen, Spanish moss, and pine needles, which help hold the sticks together. Without actually helping, non-breeding kites often attempt to participate in the nesting process, but are rejected.

For 28 days, the pair incubate 2-3 whitish eggs marked with reddish brown. Nesting swallow-tailed kites may travel as far as 15 miles in search of concentrated food sources. The male brings food to the female during the first half of the nesting cycle, and she tears it up for the chicks. In many nests, the smaller, younger chick dies from a combination of starvation and aggression from its older sibling. After 4 weeks, the remaining chick begins to flex and flap its wings. It fledges about a week later. Some young swallow-tailed kites remain close to the nest site, but many move with their parents and may continue to be fed until migration.

The swallow-tailed kite captures and eats much of its prey on the wing by plucking it from vegetation or snatching it from the air, such as dragonflies and June bugs. The diet shifts to the most available food sources and includes many insects, snakes, the chicks of other bird species, and frogs. Fairly unique among raptors, this kite also eats fruit in winter from the rubber tree (*Hevea brasiliensis*) and the macurije tree (*Matayba oppositifolia*). Its thick, spongy stomach lining appears well adapted to absorb the stings of wasps, bees, and fire ants. Other insects in its diet are grasshoppers, leaf-footed bugs, and palmetto weevils. Many larvae are consumed, and the swallow-tailed kite will bring an entire wasp's nest to its own nest. Adults rarely eat on a perch, and this kite often feeds in loose groups.

### Threats

Habitat loss, collection of its highly-prized eggs, and widespread shooting of adults decimated a thriving population in the 19th cen-

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## SWALLOW-TAILED KITE

*Elanoides forficatus*

tury. Currently, the ongoing conversion of forested wetlands to agriculture, residential lots, and other commercial development threaten the recovery of this raptor. The challenge is to reintegrate and expand its fragmented habitats, like the moist slash pine forest. Protecting existing nesting "neighborhoods" is also important, because the species shows high site fidelity (C. Faulhaber, pers. comm., 2014). Preferred nesting habitat includes tall pines or cypress with relatively dense understory.

The last breeding stronghold of the swallow-tailed kite in the United States, Florida, may determine its future in North America. Between the 1780's and the 1980's, Florida lost nearly 9.3 million acres, or 46%, of its wetlands, the greatest loss of acreage for any state. More specifically, 90,000 acres of Florida's forested wetlands were destroyed between the mid-1970's and the mid-1980's. Agriculture accounted for two thirds of this loss, while urbanization consumed the other third. By 1989, only 12% of the state's pine forests were standing. In Florida, public lands can only support approximately 200 pairs of these kites. Therefore, participation from private landowners will be critical for the conservation of this bird.


Figure 2. Range map for the swallow-tailed kite; used directly from the "All About Birds" website, sponsored by the Cornell Lab of Ornithology, at: http://www.allaboutbirds.org/guide/Swallow-tailed_Kite/id.

### Listing Status

The swallow-tailed kite is not listed by either the Florida Fish and Wildlife Commission or the U.S Fish and Wildlife Service (Service). However, the Service considers the kite a species of special concern and allocates time and resources for its protection.

### Literature Cited

Faulhaber, C. 2014. Personal communication via e-mail to Jodie Smithem of the U.S. Fish and Wildlife Service.

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Note: Unless noted, all information in this species account was used directly from the "Swallow-tailed Kite" website, sponsored by Audubon, at: http://birds.audubon.org/species/swakit.

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## TRICOLORED HERON

*Egretta tricolor*


Figure 1. Tricolored herons were once known as Louisiana herons.

### Description

The tricolored heron *(Egretta tricolor)* measures about 26 inches long and weighs approximately 13 ounces, with a 36-inch wingspan. Long, slim, and ornately colored, this fancy heron has notably long legs, neck, and bill (Figure 1). Contrasting with straw colored back plumes, the upper parts, including the head and neck, are slate blue. Below the base of the neck, the under-parts are white. During breeding season, the tricolored heron sports a short white head plume, a buffy throat and fore-neck, a blue face, and a blue bill tipped with black. The eyes are reddish and the legs pinkish. Non-breeding adults have a yellow face, bill, and legs; the throat and fore-neck are white. On juvenile tricolored herons, rusty red adorns the head, neck, upper back, and the front parts of the wings.

### Geographic Range and Distribution

In North America, most tricolored herons breed coastally from New Jersey through Florida and then west and south along the Gulf Coast. A few breed into New England and the coastal plain. Populations concentrate around places like Florida's Cape Canaveral, Louisiana's Sabine River estuary, and Texas's mid-coast bays. The tricolored heron's winter range covers much of this same area, with most birds withdrawing below North Carolina. Tricolored herons also breed and winter coastally from Mexico south to Peru and northern Brazil (Figure 2). Almost all tricolored herons breeding north of North Carolina migrate south; fewer of these herons are seen along the southern Atlantic seaboard in winter than in summer. Northern migrants winter into the southeastern U.S., the Caribbean, and Central America. Immediately after breeding, the tricolored herons disperse, but less widely than other herons or egrets. Spring migration probably starts as early as February and ends as late as early May.

### Habitat Requirements

Tricolored herons most often breed in coastal wetlands such as mangroves, estuaries, lagoons, and salt marshes, but they also use freshwater marshes like the Florida Everglades. Wintering birds are generalists that are more attracted by food sources than by a specific habitat type. Rarely found on dry land, tricolored herons prefer wetlands with low vegetation and shallow water, suitable for wading up to their chests.

### Life History

In colonies with other herons, tricolored herons usually nest in short trees, tall shrubs, and mangroves. Males establish territories with twig shaking displays, nest platform construction, and exaggerated preening. Courtship displays include the "snap-stretch," in which the male elongates his body upward, then collapses down with bill upheld, neck folded in an S, and plumes erect. As his neck sways, the male emits an "Unh!" Pairs are monogamous. Males gather twigs and pass them to the female, who constructs a loose nest, with increasingly smaller twigs, and finally, course grasses. Both sexes incubate three to four bluish-green eggs for about 22 days; together they brood, feed, and defend the yellowish hatchlings.

For the first week after hatching, parent herons regurgitate clumps of food onto the nest floor, which the hatchlings eat until they are strong enough to be fed directly. Young birds are fed for several weeks. When they are able to fly, begging juveniles pursue their parents around the colony. Adults lead the juveniles to feeding areas, where their association appears to end.

Along shorelines and in water as deep as seven inches, tricolored herons actively pursue small fish like topminnows, killifish, and livebearers, which together comprise almost 90% of the diet. Other prey items include marine worms, water bugs, and spiders. This heron waits in ambush, then walks methodically, runs, or twirls with open wings, and even hovers over fish schools. Typically, the bird then crouches and thrusts out its long neck to snatch up prey.

### Threats

Although tricolored heron populations appear stable in North America, they are not secure. In Florida, the Florida Fish and Wildlife Conservation Commission's (FWC) Tricolored Heron Biological Review Group concluded that tricolored herons have declined in the state based on analysis of FWC survey data and Breeding Bird Survey Data from the Everglades (FWC 2011). The wetlands in which this heron breeds and forages are disappearing at an alarming rate, despite mitigation efforts, government studies, and repeated warnings. Other threats may include human disturbance at foraging and breeding sites, increased pressure from predators, altered hydrology, and exposure to environmental contaminants (FWC 2011).

### Listing Status

Tricolored herons currently are a Species of Special Concern for the Florida Fish and Wildlife Conservation Commission. However, the FWC's Tricolored Heron Biological Review Group concluded from their biological assessment that the tricolored heron meets the criteria for being listed as Threatened under Rule 68A-27, F.A.C. The listing status is expected to change to Threatened when the Commission approves the Imperiled Species Management Plan in 2015. Tricolored herons are also protected under the

# Candidate Conservation Agreement with Assurances for Multiple At-Risk Species in North Florida

## TRICOLORED HERON

*Egretta tricolor*

federal Migratory Bird Treaty Act, but are not listed under the federal Endangered Species Act.

**Literature Cited**

Florida Fish and Wildlife Conservation Commission. 2011. Tricolored Heron Biological Status Review Report. 14 page

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Note: Unless noted, all information in this species account was used directly from the "Tricolored Heron" website, sponsored by Audubon, at: http://birds.audubon.org/species/triher.


Figure 2. Range map for the tricolored heron, used directly from the "All About Birds" website, sponsored by the Cornell Lab of Ornithology, at: http://www.allaboutbirds.org/guide/tricolored_heron/id.

# APPENDIX III – Matrix of Stressors and Conservation Actions per Enrolled Habitat Type

**Table 1. Matrix of stressors and conservation actions for FLATWOODS.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat through fire suppression or inadequate prescribed fire program. | Prescribed fire will be used on approximately 2-5 year cycles. | Number of acres burned and time of year burn was implemented. Target is to burn 3,200 to 8,000 acres annually. |
| A.2. Degradation or loss of habitat through forest management practices that result in a dense canopy and limited herbaceous understory, not resulting from fire exclusion alone. | Manage natural stands and plantations by reducing or maintaining pine basal area to between 60 and 80 square feet per acre, unless threatened or endangered species require otherwise. Replant any harvested plantations with containerized longleaf pine. | Number of acres thinned, harvested, and/or replanted with longleaf pine. |
| A.3. Degradation or loss of habitat through forest management practices that result in reduced habitat suitability for critical life functions, not resulting from fire exclusion alone. | Snags, den trees, and fallen logs will be left undisturbed unless they are a safety hazard to troop maneuvers. | Notification of any salvage cuts that took place and the density of snags that remain, if applicable. |
| A.4. Fragmentation of habitat from incompatible land-use that results in isolated populations. | Road maintenance as needed and no new paved road construction. | Road maintenance implemented. |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic predators. | Assess level of depredation from informal observance during general management practices and respond accordingly. | Level of depredation and type of predators observed and control methods used, if necessary. |
| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
| E.1. Competition, predation, and disease introduction from invasive and exotic | Monitor and control invasive and exotic species and noxious weeds through early detection, | Type of invasive or exotic species present and control methods used. |

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| species. | isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 200 acres). |
| E.2. Loss of demographic viability and/or increased susceptibility to stochastic environmental factors (e.g., weather events, disease) because of small population size and/or isolation from other populations. | Establish and maintain large areas of suitable habitat through appropriate management actions such as prescribed fire and basal area thinning where needed. | See reporting requirements for Factors A.1 and A.2. |

[1]**Species Benefitted:** gopher frog, striped newt, swallow-tailed kite, Sherman's fox squirrel, eastern diamondback rattlesnake, Florida pine snake, gopher tortoise

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**Table 2. Matrix of stressors and conservation actions for SANDHILL.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat through fire suppression or inadequate prescribed fire program. | Prescribed fire will be used on approximately 1-3 year cycles. | Number of acres burned and time of year burn was implemented. Target is to burn 4,000 to 12,800 acres annually, with at least 30-40% of those acres burned during the growing season. |
| A.2. Degradation or loss of habitat through forest management practices that result in a dense canopy and limited herbaceous understory, not resulting from fire exclusion alone. | Manage natural stands by reducing or maintaining pine basal area to between 20 and 60 square feet per acre, unless threatened or endangered species require otherwise. Harvest and remove existing sand pine, slash pine, and turkey oak dominated stands; replant with containerized longleaf pine. | Number of acres thinned, harvested, and/or replanted with longleaf pine. |
| A.3. Degradation or loss of habitat through forest management practices that result in reduced habitat suitability for critical life functions, not resulting from fire exclusion alone. | Snags, den trees, and fallen logs will be left undisturbed unless they are a safety hazard to troop maneuvers. | Notification of any salvage cuts that took place and the density of snags that remain, if applicable. |
| A.4. Fragmentation of habitat from incompatible land-use that results in isolated populations. | Road maintenance as needed and no new paved road construction. | Road maintenance implemented. |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic | Assess level of depredation from informal observance during general management | Level of depredation and type of predators observed and control |

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| predators. | practices and respond accordingly. | methods used, if necessary. |
| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
| E.1. Competition, predation, and disease introduction from invasive and exotic species. | Monitor and control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Type of invasive or exotic species present and control methods used. Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 168 acres). |
| E.2. Loss of demographic viability and/or increased susceptibility to stochastic environmental factors (e.g., weather events, disease) because of small population size and/or isolation from other populations. | Establish and maintain large areas of suitable habitat through appropriate management actions such as prescribed fire and basal area thinning where needed. | See reporting requirements for Factors A.1 and A.2. |

[1]**Species Benefitted:** gopher frog, striped newt, Southeastern American kestrel, swallow-tailed kite, Say's spiketail, Florida mouse, Sherman's fox squirrel, eastern diamondback rattlesnake, Florida pine snake, gopher tortoise, southern hognose snake

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**Table 3. Matrix of stressors and conservation actions for SCRUB.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat through fire suppression or inadequate prescribed fire program. | Prescribed fire will be used on approximately 5-20 year cycles. | Number of acres burned and time of year burn was implemented (to be reported at least once every five years). |
| A.2. Degradation or loss of habitat through forest management practices that result in a dense canopy and limited herbaceous understory, not resulting from fire exclusion alone. | Manage natural stands by reducing or maintaining scrub vegetation to less than eight feet in height, any sand pine canopy to less than 15 percent cover, and bare soil at 10-50 percent. | Number of acres thinned and/or harvested (to be reported at least once every five years). |
| A.3. Fragmentation of habitat from incompatible land-use that results in isolated populations. | Road maintenance as needed and no new paved road construction. | Road maintenance implemented. |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic predators. | Assess level of depredation from informal observance during general management practices and respond accordingly. | Level of depredation and type of predators observed and control methods used, if necessary. |
| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
| E.1. Competition, predation, and disease introduction from invasive and exotic species. | Monitor and control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Type of invasive or exotic species present and control methods used. Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 3 acres). |
| E.2. Loss of demographic viability and/or | Establish and maintain large areas of suitable | See reporting requirements for |

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| increased susceptibility to stochastic environmental factors (e.g., weather events, disease) because of small population size and/or isolation from other populations. | habitat through appropriate management actions such as prescribed fire and vegetation height reduction where needed. | Factors A.1 and A.2. |

[1]**Species Benefitted:** gopher frog, striped newt, Florida mouse, eastern diamondback rattlesnake, Florida pine snake, gopher tortoise

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**Table 4. Matrix of stressors and conservation actions for EPHEMERAL WETLANDS.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat through fire suppression or inadequate prescribed fire program. | Prescribed fire will be used in the surrounding uplands at a return interval appropriate to that habitat type (i.e., flatwoods, sandhill, scrub). Ephemeral wetlands will be allowed to burn when their associated uplands are burned. | Number of ponds, associated acreages burned, and time of year burn was implemented. |
| A.1. Degradation or loss of habitat through fire suppression or inadequate prescribed fire program. | Where wading bird colonies are not present, mechanical and/or chemical means will be used, if necessary, when fire is not sufficient to maintain an open habitat structure/prevent woody encroachment. | Description of conditions and control methods used. |
| A.2. Degradation or loss of habitat from impoundments, dredging and channelization, siltation, pollutants, and water temperature changes. | Implement the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual* (e.g., retain natural vegetation for erosion control, water quality, and wildlife habitat; do not allow vehicles within known wetland areas, unless on established roads and crossings). | Notification of adherence to the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual*. Notification of temperature, pH, dissolved oxygen, and turbidity levels (to be reported at least once every three years). |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic predators. | Assess level of depredation from informal observance during general management practices and respond accordingly. | Level of depredation and type of predators observed and control methods used, if necessary. |

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| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
|---|---|---|
| E.1. Competition, predation, and disease introduction from invasive and exotic species. | Monitor and control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Type of invasive or exotic species present and control methods used. Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 1 acre). |

[1]**Species Benefitted:** gopher frog, striped newt, Florida sandhill crane, little blue heron, swallow-tailed kite, tricolored heron, purple skimmer, spotted turtle

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**Table 5. Matrix of stressors and conservation actions for FORESTED WETLANDS.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat from impoundments, dredging and channelization, siltation, pollutants, and water temperature changes. | Implement the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual* (e.g., retain natural vegetation for erosion control, water quality, and wildlife habitat; do not allow vehicles within known wetland areas, unless on established roads and crossings). | Notification of adherence to the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual*. Notification of temperature, pH, dissolved oxygen, and turbidity levels (to be reported at least once every three years). |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic predators. | Assess level of depredation from informal observance during general management practices and respond accordingly. | Level of depredation and type of predators observed and control methods used, if necessary. |
| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
| E.1. Competition, predation, and disease introduction from invasive and exotic species. | Monitor and control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Type of invasive or exotic species present and control methods used. Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 75 acres). |

[1]**Species Benefitted:** swallow-tailed kite, Duke's skipper, purple skimmer, Say's spiketail, spotted turtle

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**Table 6. Matrix of stressors and conservation actions for SURFACE WATERS.**

| Stressor | Planned Conservation Action[1] | Annual Reporting Requirement |
|---|---|---|
| **Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.** | | |
| A.1. Degradation or loss of habitat from impoundments, dredging and channelization, siltation, pollutants, and water temperature changes. | Implement the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual* (e.g., prohibit aerial application or mist blowing of pesticide; trees within stream channels or on the immediate stream bank will not be harvested). | Notification of adherence to the general management practices described in the Florida Department of Agriculture and Consumer Services' *Silviculture Best Management Practices Manual*. Notification of temperature, pH, dissolved oxygen, and turbidity levels (to be reported at least once every three years). |
| **Factor C. Disease or predation.** | | |
| C.1. Nest, hatchling, juvenile, and adult depredation from native and exotic predators. | Assess level of depredation from informal observance during general management practices and respond accordingly. | Level of depredation and type of predators observed and control methods used, if necessary. |
| **Factor E. Any other natural or manmade factors affecting the species continued existence.** | | |
| E.1. Competition, predation, and disease introduction from invasive and exotic species. | Monitor and control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species. | Type of invasive or exotic species present and control methods used. Target is to reduce or maintain these species to one percent or less of the acreage enrolled in this Agreement (i.e., 18 acres). |

[1]**Species Benefitted:** little Oecetis longhorn caddisfly, Black Creek crayfish, purple skimmer, Say's spiketail, American eel, southern lance, St. John's elephantear, spotted turtle

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# APPENDIX IV – Monitoring Locations for the Enrolled Habitat Types

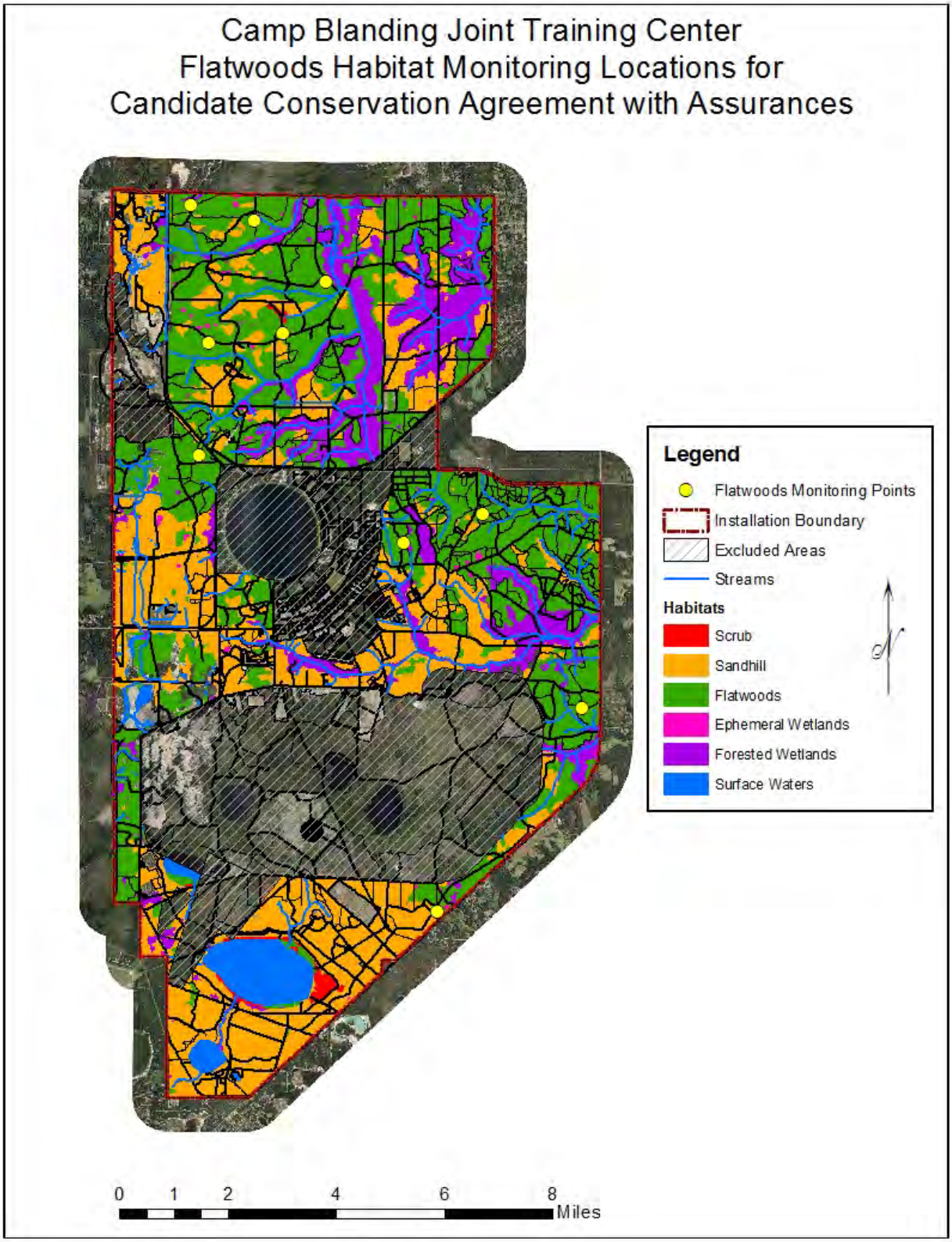


Figure 1. Monitoring locations for flatwoods (n=10).

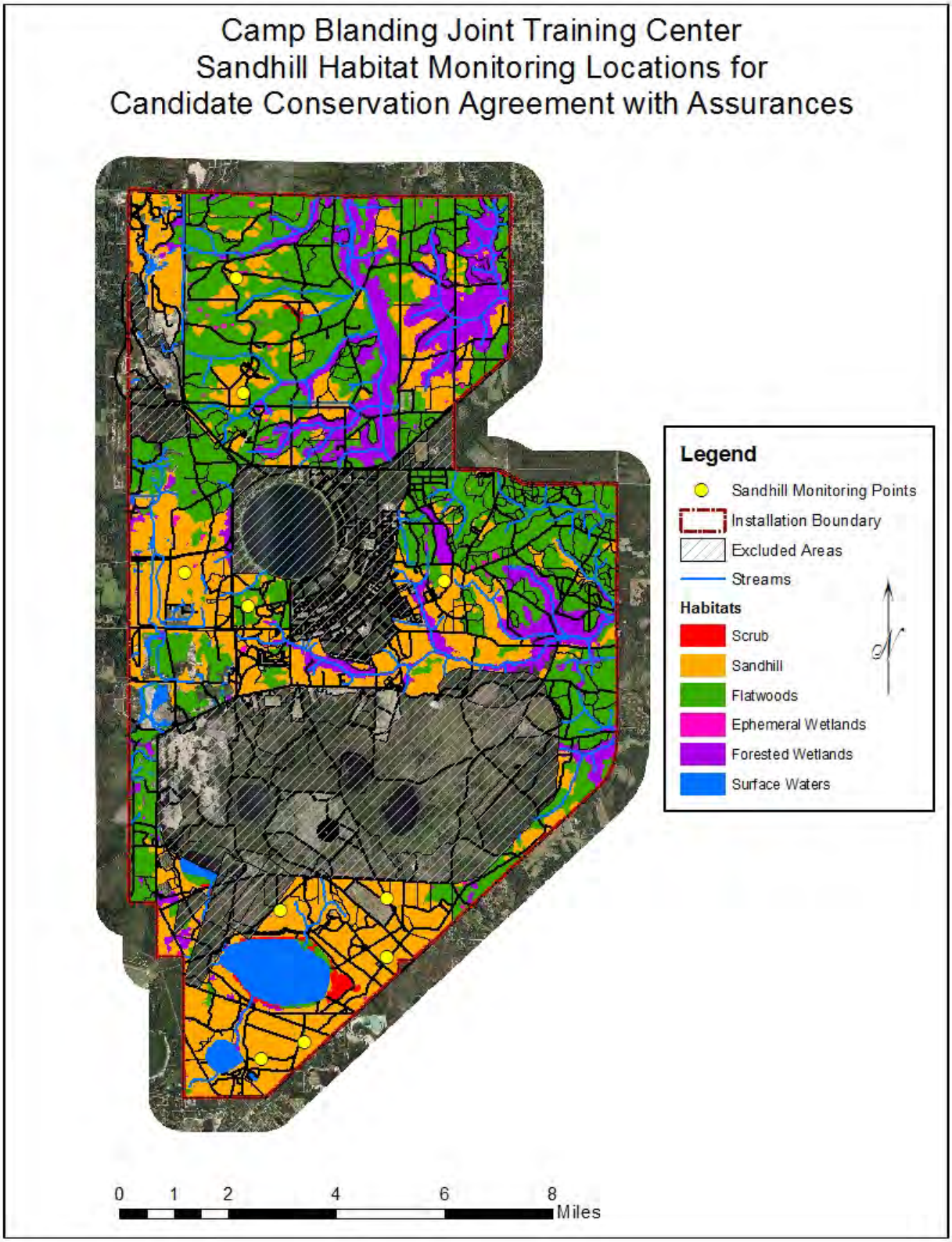


Figure 2. Monitoring locations for sandhill (n=10).

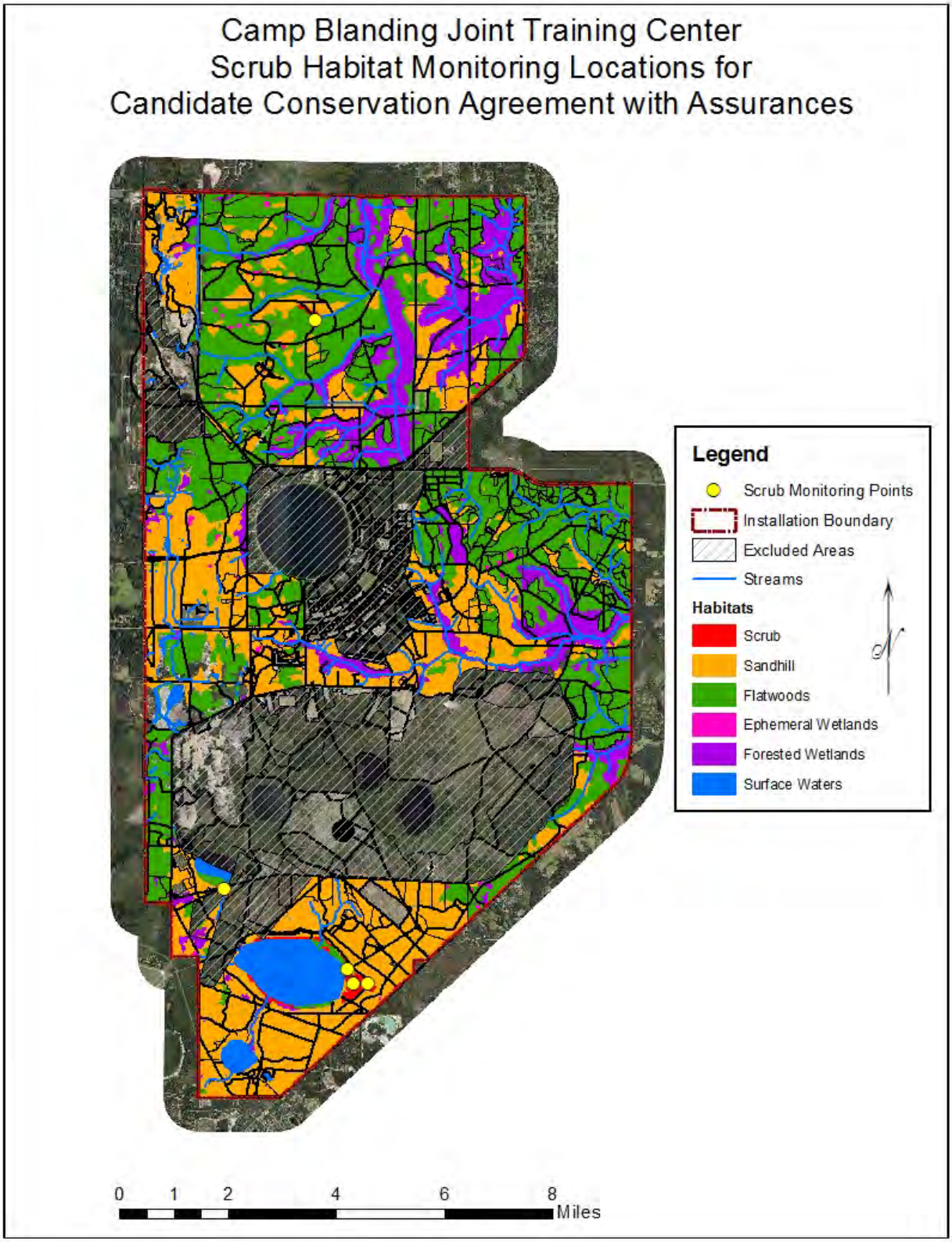


Figure 3. Monitoring locations for scrub (n=5).

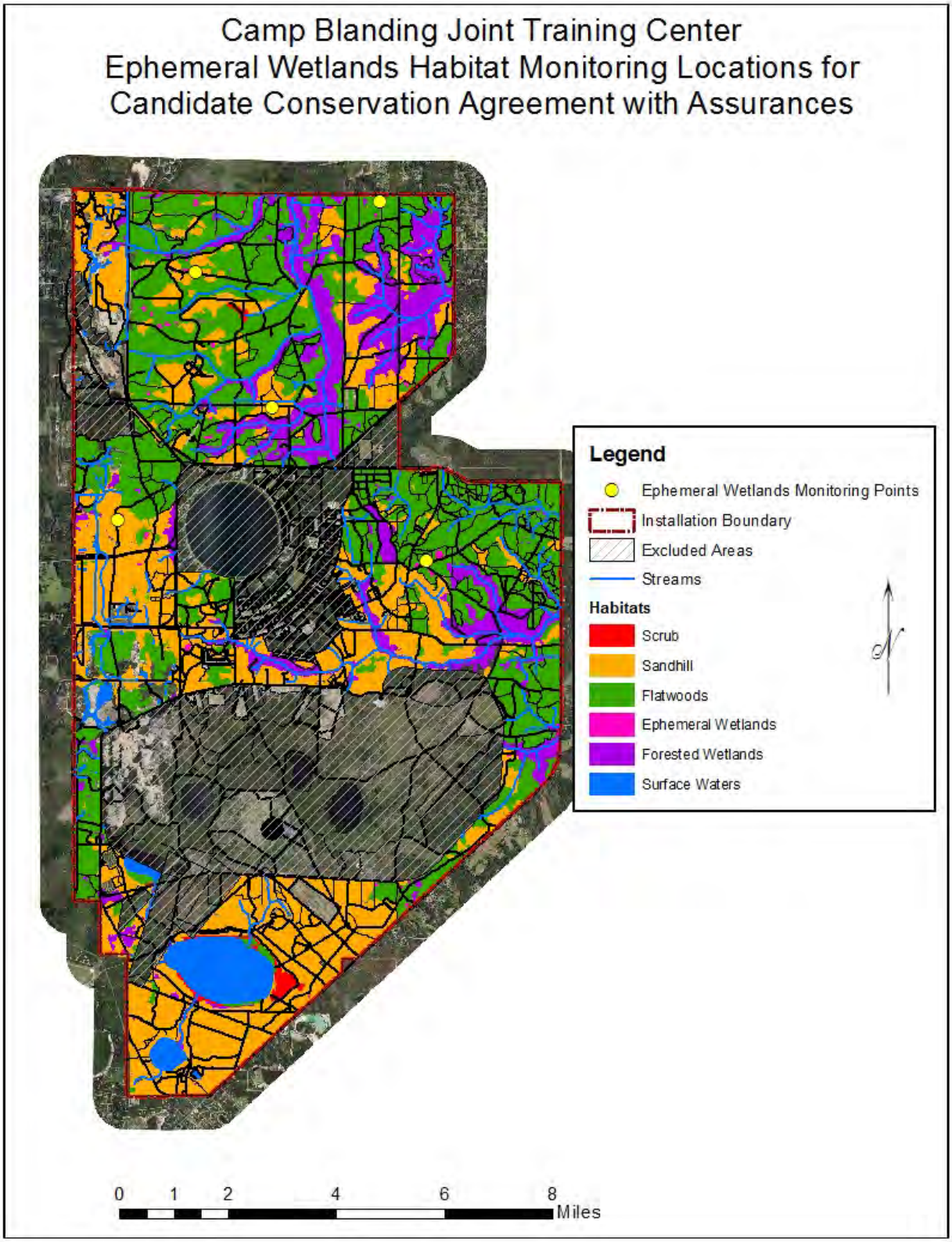


Figure 4. Monitoring locations for ephemeral wetlands (n=5).

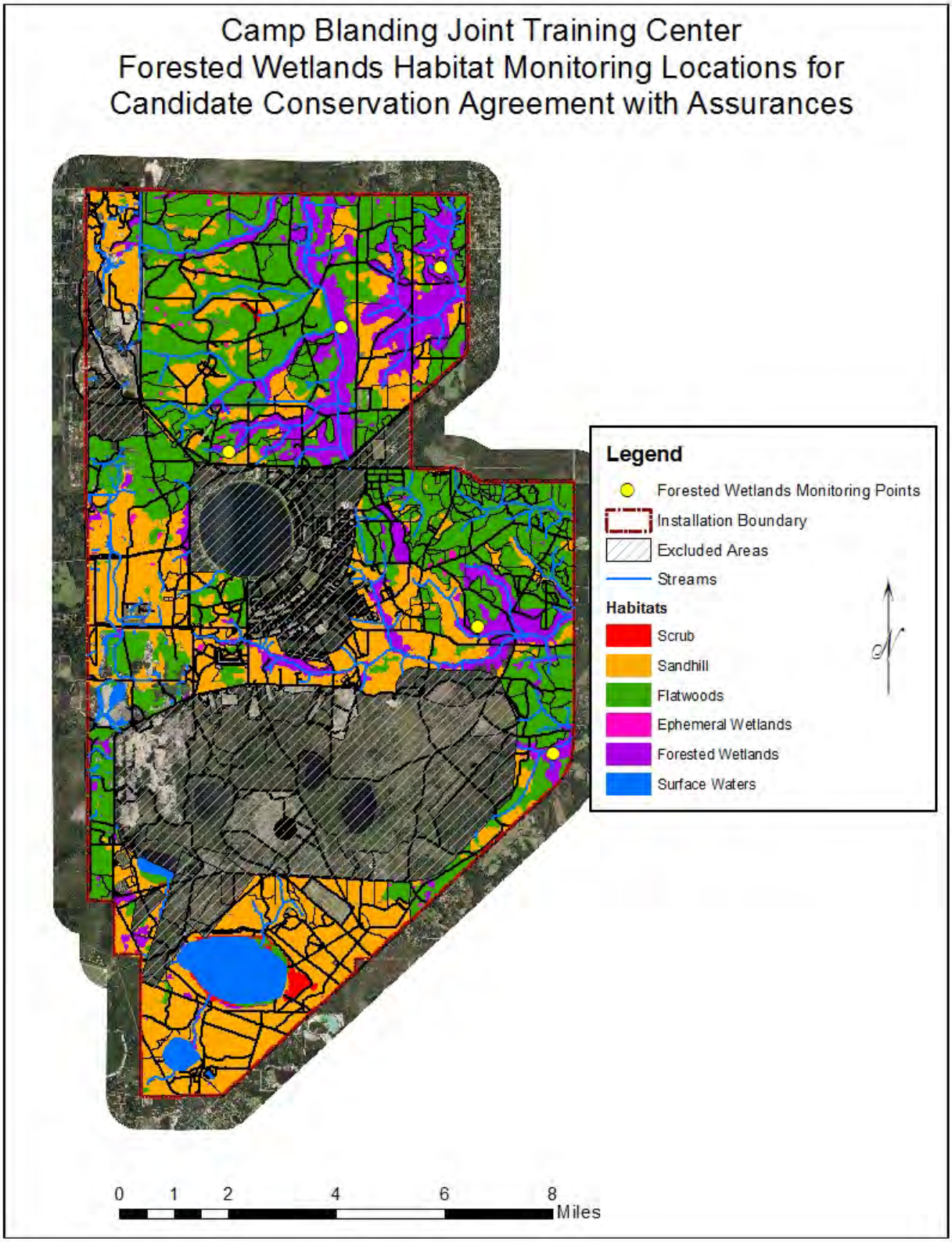


Figure 5. Monitoring locations for forested wetlands (n=5).

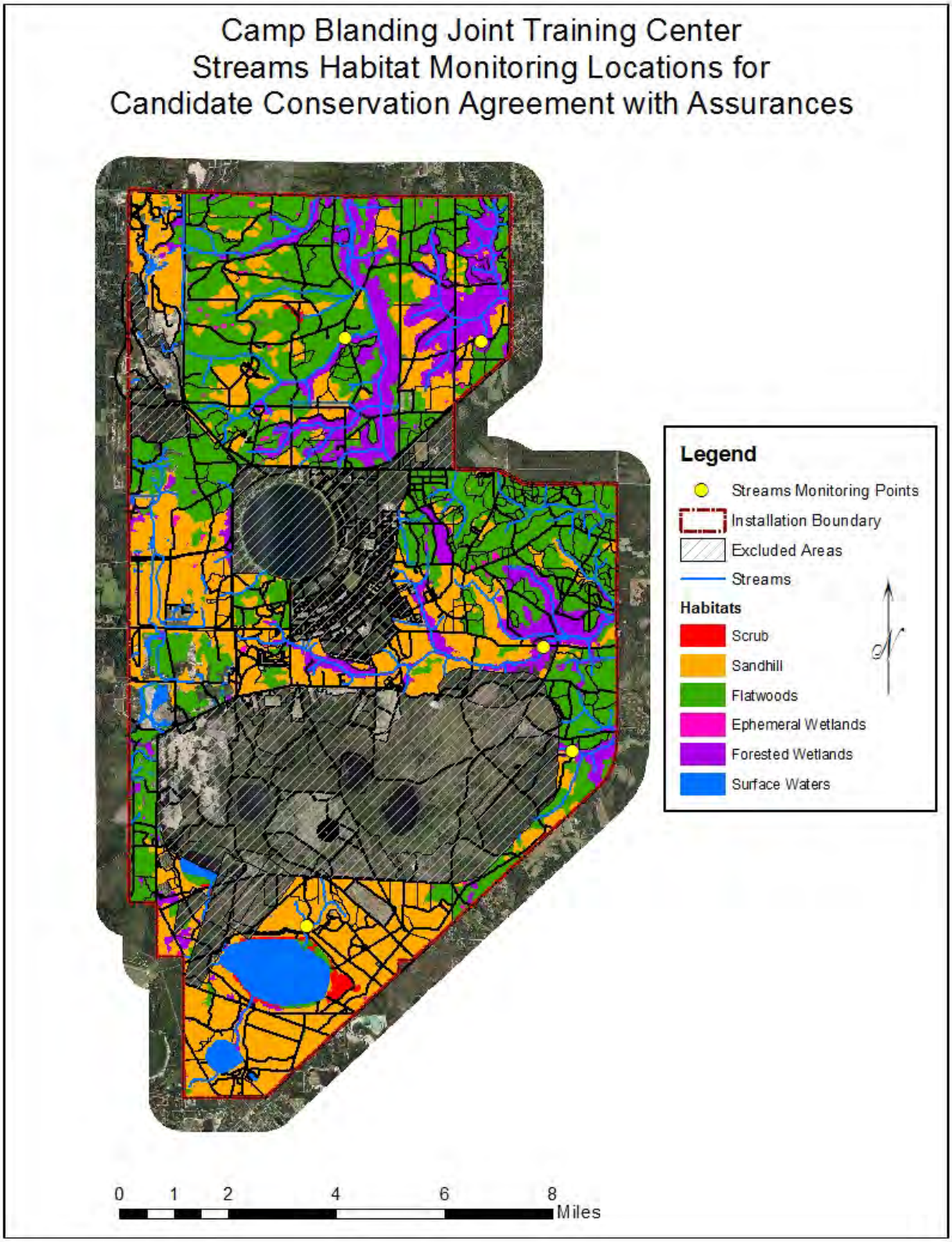


Figure 6. Monitoring locations for streams (n=5).

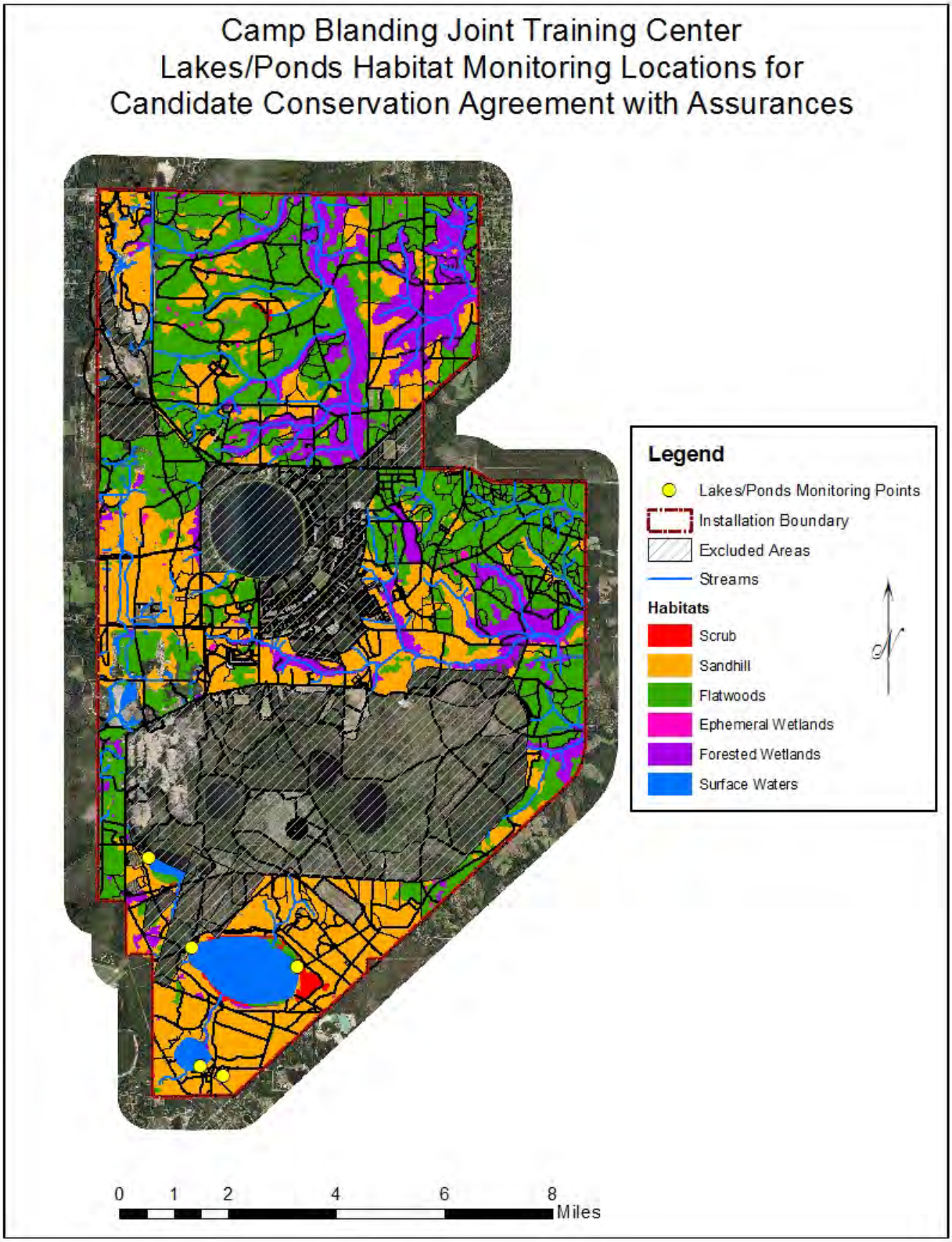


Figure 7. Monitoring locations for lakes/ponds (n=5).

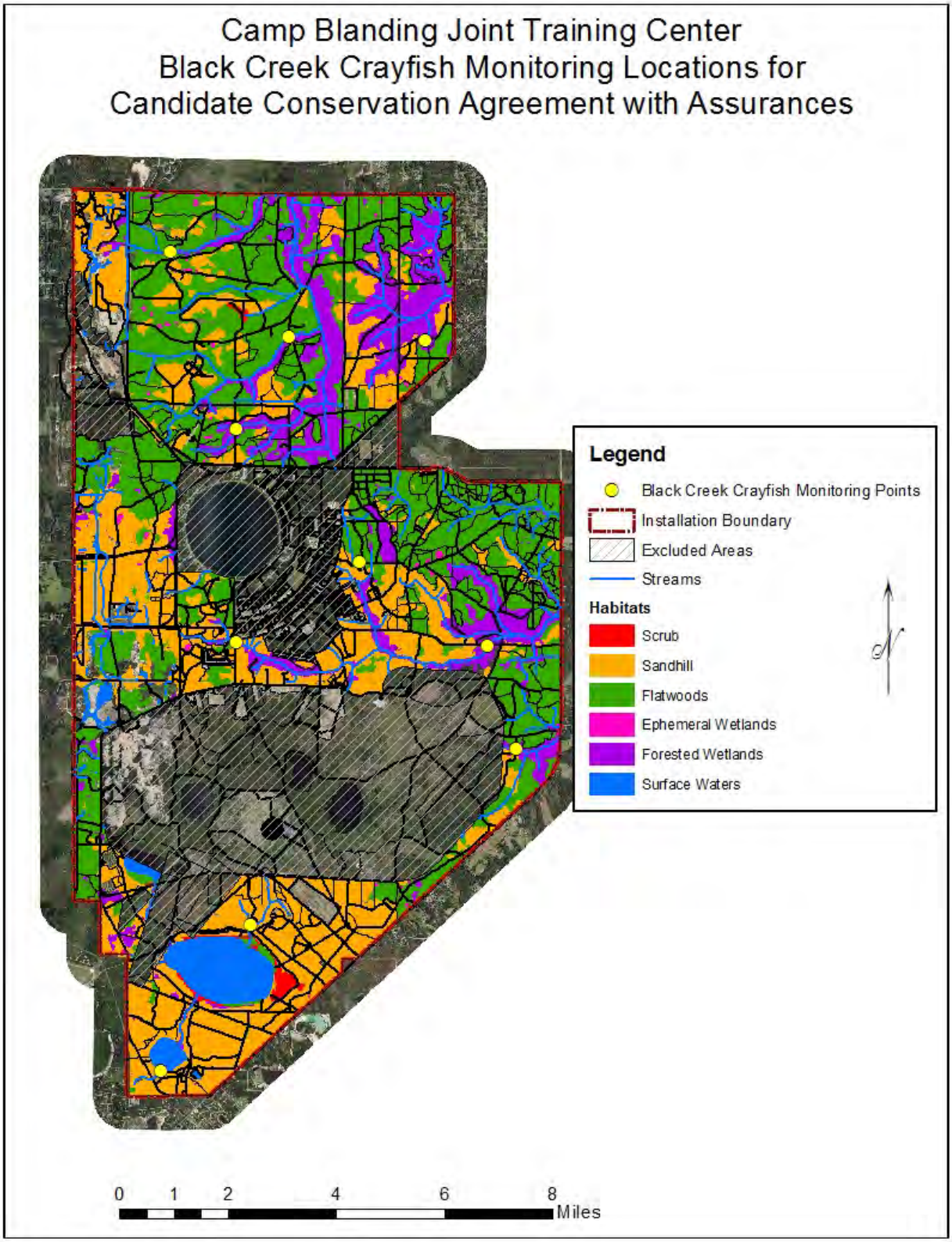


Figure 8. Monitoring locations for Black Creek crayfish surveys (n=10).