APPENDIX H – T&E REPORTS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Georgia Ecological Services Field Office
355 East Hancock Avenue
Room 320
Athens, GA 30601
Phone: (706) 613-9493 Fax: (706) 613-6059

In Reply Refer To: February 28, 2020
Consultation Code: 04EG1000-2020-SLI-1378
Event Code: 04EG1000-2020-E-02535
Project Name: Saunders Demonstration Mine

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

This list identifies threatened, endangered, proposed and candidate species, as well as critical habitat, that may be affected by your proposed project. This list may change before your project is completed. Under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation.

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*). Projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html).

Wind energy projects should follow the wind energy guidelines http://www.fws.gov/windenergy/ for minimizing impacts to migratory birds and bats.

Guidance for minimizing impactsof communcation towers on migratory birds can be found under the "Bird Hazards" tab at: www.fws.gov/migratorybirds.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Georgia Ecological Services Field Office
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Athens, GA 30601
(706) 613-9493

Project Summary

Consultation Code: 04EG1000-2020-SLI-1378

Event Code: 04EG1000-2020-E-02535

Project Name: Saunders Demonstration Mine

Project Type: MINING

Project Description: heavy mineral sand demonstration mining project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/30.523742267443925N82.11752613020312W

Counties: Charlton, GA

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered

Reptiles

NAME	STATUS
Eastern Indigo Snake *Drymarchon corais couperi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/646	Threatened
Gopher Tortoise *Gopherus polyphemus* Population: eastern No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6994	Candidate

Amphibians

NAME	STATUS
Frosted Flatwoods Salamander *Ambystoma cingulatum*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.

Species profile: https://ecos.fws.gov/ecp/species/4981

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Altamaha Environmental Consulting

414 Club Drive
Hinesville, Georgia 31313
912.255.2003

2018-2019 Survey for Protected Amphibians/Reptiles on the Twin Pines Site, Charlton County, Georgia

DIRK J. STEVENSON

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United States Department of the Interior

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Species profile: https://ecos.fws.gov/ecp/species/4981

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

2018-2019 Survey for Protected Amphibians/Reptiles on the Twin Pines Tract, Charlton County, Georgia

Executive Summary

From November 2018 – April 2019, I conducted amphibian and reptile surveys on four tracts (Adirondack, Keystone, Loncala, TIAA) that are part of the Twin Pines Site, Charlton County, Georgia. These field surveys were species-specific, targeting 2 reptile species (eastern indigo snake, gopher tortoise) and 3 amphibians (frosted flatwood salamander, striped newt, gopher frog) which are federally listed and-or state listed.

Isolated depressional wetlands (i.e., cypress-gum ponds) on-site (n = 41) were reviewed to determine their habitat characteristics and potential suitability for the amphibian species, especially the frosted flatwoods salamander. Almost all wetlands were considered poor habitat due to historic/current disturbances from commercial forestry practices (to both wetlands and adjacent uplands). Twelve depressional wetlands were surveyed by dip-netting and minnow trapping during February-March 2019; no frosted flatwoods salamanders or striped newts were found.

Transect surveys for gopher tortoises identified 118 active/inactive tortoise burrows. Visual encounter surveys conducted at/near each of these gopher tortoise burrows during the winter months (conducted on 2-3 separate dates) did not document any evidence of eastern indigo snake presence on-site. Scoping gopher tortoise burrows in April 2019 with a gopher tortoise burrow camera revealed resident tortoises in 23 adult-sized burrows, 11 subadult-sized burrows, and in 1 juvenile-sized burrow; occupancy of another 4 active adult burrows, 11 active subadult burrows, and 2 active juvenile burrows could not be determined conclusively and these burrows may also contain tortoises.

The state-rare gopher frog was observed on-site (6 adult frogs were observed, all in tortoise burrows). Three "special concern" animal species tracked by Georgia Department of Natural Resources (redface topminnow, pine snake, black swampsnake) were documented on-site during the course of these surveys.

Below I summarize the results of my field surveys for federal-and-state-listed amphibians and reptiles on the Twin Pines Site. Aerial photos and topographic map figures of survey sites are shown in Figures 1 and 2, respectively.

FEDERALLY LISTED SPECIES

Frosted Flatwoods Salamander (*Ambystoma cingulatum*)

Background

The Frosted Flatwoods Salamander (*Ambystoma cingulatum*) is federally listed as Threatened and state listed by the Georgia Department of Natural Resources as Threatened. This salamander is endemic to mesic longleaf pine-wiregrass flatwoods and savannahs where it breeds in isolated, ephemeral depressional wetlands (Palis 1997; Jensen and Stevenson 2008). Optimal breeding habitats are kept open-canopied by occasional fire events and the basins of these wetlands are typically carpeted with graminaceous vegetation (Bishop and Haas 2005, Palis 1997; US FWS 1999). Adult salamanders spend over 90% of their lives in fire-maintained, mesic longleaf/slash pine−wiregrass flatwoods surrounding breeding sites (Palis and Means 2005). Late winter-early spring surveys for larvae are the most effective and efficient way to document the presence of this salamander (Bishop et al. 2006, Bevelhimer et al. 2008).

Since 2003, the frosted flatwoods salamander has been documented from only one site in Georgia−a breeding pond on Fort Stewart (Liberty County). There are no recent records (i.e., post-2000) for Charlton County, Georgia (John Jensen, Georgia Department of Natural Resources, pers. comm., 2019). The nearest (i.e., closest to the Twin Pines site) historic frosted flatwoods salamander records (with year date of most recent collection and distance from Twin Pines, in parenthesis) include: a) Chesser Island, on what is now the Okefenokee National Wildlife Refuge, Charlton County, Georgia (1922; ca. 17 km N of Twin Pines study area); b) a site in Duval County, Florida (1980; ca. 30 km SE of the study area); c) State Hwy. 177, SSE Waycross, Ware County, Georgia (1980; ca. 56 km N of the study area) (John Jensen, Georgia Department of Natural Resources, pers. comm., 2019; Kevin Enge, Florida Fish and Wildlife Conservation Commission, pers. comm., 2019).

Survey Methods

In December, 2018, I visited all wetlands on-site that could be considered potential breeding pond habitats for the frosted flatwoods salamander (i.e., isolated

depressional wetlands forested with pond cypress (*Taxodium ascendens*), black gum (*Nyssa biflora*), slash pine (*Pinus elliottii*), and myrtle-leaved holly (*Ilex myrtifolia*) (Figure 3). Earlier in 2018, these wetland systems had been delineated and mapped by TTL staff.

Each wetland (n = 41) was evaluated as to its potential suitability for frosted flatwoods salamander reproduction modeled after a ranking system developed by Palis (2002). Specifically, for each wetland I evaluated:

1) Pond Hydrology: Based on canopy-subcanopy species and other vegetation present in the wetland basin. For a site to be considered for surveys it had to be an ephemeral wetland that would possess an appropriate hydroperiod, during an average year, to allow frosted flatwoods salamander larval development.

2) Presence/Absence of Graminaceous Vegetation in Pond: Each pond was qualitatively scored 1, 2, or 3, as follows: 1 = Sites with abundant graminaceous vegetation (especially *Carex*, *Rhynchospora*, *Eriocaulon*, *Xyris*, and *Panicum* spp.) throughout the wetland basin; 2 = Sites with some, albeit patchy, graminaceous vegetation in basin; 3 = sites lacking, or nearly so, graminaceous vegetation.

3) Fire History of Pond: As above, each pond was qualitatively scored 1, 2, or 3, as follows: 1 = Sites with a regular history of fire management and/or fire events that have promoted the open-canopied and grassy conditions in the pond basin needed for salamander reproduction; 2 = Sites that are noticeably fire-suppressed, but have had some recent fire history; 3 = Sites that are severely fire-suppressed, shaded and impenetrably shrubby, and/or lacking ground cover.

4) Condition of Upland Habitats Surrounding Pond: As above each pond was scored a 1, 2, or 3, as follows: 1 = wetland sites surrounded by mesic, intact and fire-managed longleaf/slash pine–wiregrass flatwoods; 2 = wetland sites surrounded by planted pine habitats lacking intact ground cover layers (i.e., no wiregrass, indicating profound soil disturbance); 3 = surrounding uplands as # 2 above, significantly degraded and showing evidence of having recently been clearcut, site-prepped and bedded, and/or treated with herbicides as part of commercial forestry operations.

Wetland habitat ranks are shown in Table 1. None of the 41 ponds that I reviewed were surrounded by naturally-functioning, intact longleaf/slash pine−wiregrass flatwoods habitat and upland habitat conditions for all sites was scored a "3". In fact, at all sites, upland habitats have been grossly degraded by silvicultural practices (bedding, ditching, fire suppression, etc.) and there are no areas of upland habitat remaining that are characterized by undisturbed soil and an intact, wiregrass-dominated groundcover.

Similarly, isolated wetlands on-site are also in poor condition due to bedding (historically, beds have been plowed into the ecotones and often into the basins of depressional wetlands on-site), ditching, historic fire suppression, and other disturbances. Although some ponds on-site possessed graminaceous vegetation in their basins, we suspect these wetlands had long been fire-suppressed (with a concomitant increase in canopy and shrub layer vegetation) before being burned by a catastrophic wildfire on 6 May 2017. As it passed through the basins of isolated depressions that most likely had been fire-suppressed for many years this fire event killed many of the larger slash pine, pond cypress, black gum and myrtle-leaved holly in these wetlands. Unusually thick mats of sphagnum moss are now present in many of these wetlands.

I selected 12 of the 41 ponds, including sites spread over the entire property (i.e., ponds on the Adirondack, Keystone, Loncala and TIAA tracts) as survey sites for frosted flatwoods salamanders (Figure 4). Some graminaceous vegetation is present in the basins of these wetlands (Figure 5). The wet winter of 2018−2019 included frequent rain events and filled these pond basins − providing appropriate hydroperiod conditions for salamander reproduction. I sampled each of these 12 wetlands for frosted flatwoods salamander larvae during February-March 2019 using dipnets and minnow traps (Figure 6). Some of the minnow traps deployed (during surveys conducted from 2/28 – 3/9/2019) were provided with glow-sticks, as doing so may enhance capture rates of ambystomatid salamander larvae (Bennett et al. 2012). However, *Ambystoma* larvae, including those of the frosted flatwoods salamander, are also commonly captured in minnow traps not provided with glow-sticks (Stevenson, unpubl. data).

Results and Discussion

The 12 survey ponds were sampled from 27 February− 9 March 2019. My surveys included 17.25 person-hours dip netting and 175 trap-nights. No frosted flatwoods salamander larvae were found. On these surveys I captured 2 species of salamanders, 6 species of anurans, 9 species of fishes, and 4 species of snakes (Tables 2 and 3). During the same period frosted flatwoods salamander larvae were found on Fort Stewart, Georgia, indicating the species bred at this site during the fall-winter of 2018-2019 (Chris Coppola, U.S. Fish and Wildlife Service, pers. comm., 2019).

The disappearance of the frosted flatwoods salamander from Chesser Island and Okefenokee National Wildlife refuge lands is most likely attributed to anthropogenic disturbances the region suffered prior to being acquired by the U.S. Fish and Wildlife Service (Jensen 1995). Large-scale declines and extirpations of frosted flatwoods salamanders have been attributed to habitat loss and degradation from commercial forestry practices (Means et al. 1996, Palis 1997). In fact, the impetus, in part, for the federal listing of the species in 1999 was widespread loss of habitat due to silviculture (US FWS 1999). It is probable that my inability to document frosted flatwoods salamanders − as well as two easily sampled frog species typical of pine flatwoods habitats, the southern chorus frog (*Pseudacris nigrita*) and ornate chorus frog (*Pseudacris ornata*) – on Twin Pines is due to their extirpation, historically, from habitat changes caused by forestry operations (Figure 7).

The uplands on the Twin Pines site − although in some areas underlain by hydric-to-mesic flatwoods soils that historically may have supported the specific pine savannah habitats required by frosted flatwoods salamanders− are, as detailed above, grossly degraded from commercial forestry operations that (based on a review of aerial photographs) date at least to the early 1970s (Figures 8 and 9). Today, these uplands no longer support intact ground vegetation (e.g., wiregrass, *Aristida stricta*) as is typical of habitat still occupied by this species.

Eastern Indigo Snake (*Drymarchon couperi*)

Background

The eastern indigo snake was federally listed as Threatened in 1978 and is state listed by the Georgia Department of Natural Resources as Threatened. The snake is generally, albeit locally, distributed in southeastern Georgia with several recent records (i.e., 2000-present) available for Trail Ridge, Charlton County, Georgia (Enge et al. 2013). An extant eastern indigo snake population occurs at the Okefenokee National Wildlife Refuge, Charlton County, Georgia, approx. 18 km N of the Twin Pines site (Stevenson 2010). Other indigo snake records located relatively close to the Twin Pines site (with year date of most recent collection and distance from Twin Pines, in parenthesis) include Cary State Forest, Nassau County, Florida (1965; 21 km E of Twin Pines) and Whitehouse Naval Outlying Field, Duval County, Florida (1996; 29 km SE of Twin Pines) (Enge et al. 2013; Kevin Enge, Florida Fish and Wildlife Conservation Commission, pers. comm., 2019).

I conducted surveys for eastern indigo snakes following methods described by Stevenson et al. (2003, 2009) and Bauder et al. (2017) that are effective for the species in the southern Georgia portion of its range. Specifically, I conducted visual encounter surveys for indigo snakes overwintering in gopher tortoise colonies. I surveyed for basking indigo snakes, and shed skins, at/near all active/inactive gopher tortoise burrows on-site (n = 118) on 2-3 dates during the cooler months (my surveys were conducted from 17 December 2018 to 19 March 2019). Maps of indigo snake survey areas and gopher tortoise burrow locations are provided (Figures 10 and 11).

On each indigo snake survey, each tortoise burrow was carefully examined for the presence of fresh snake tracks (if found, burrows with tracks are scoped with a gopher tortoise burrow camera in an effort to locate snakes resting deep inside the burrow). From 1-4 TTL biologists assisted me on these surveys.

No eastern indigo snakes or eastern indigo snake shed skins were found by my visual encounter surveys at the Twin Pines site, and no fresh snake tracks were located at burrows. A single pygmy rattlesnake (*Sistrurus miliarius*), the shed skin of an eastern coachwhip (*Coluber flagellum*) and two observations of gopher frogs (*Rana capito*) were observed during my surveys (Table 4).

In addition to the above visual encounter surveys, all active/inactive gopher tortoise burrows on-site were visited on 2-4 April 2019. As part of a tortoise survey, most subadult-and-adult-sized burrows were scoped with a tortoise burrow camera at this time (see Gopher Tortoise account below). No indigo snakes or shed skins were found during this effort.

The indigo snake is an extremely vagile species that often moves between upland and wetland habitats in search of food (Stevenson et al. 2010, Breininger et al. 2011). Individual snakes studied in southern Georgia had large home ranges, for some large males up to 3,500 acres in size (Hyslop et al. 2014). A lack of indigo snake observations during focused surveys doesn't demonstrate that the species is never present or transient on the Twin Pines site (even if the species doesn't winter on-site it is possible that snakes from adjacent tracts, if present that is, may occasionally visit the Twins Pines site to forage). However, there are no recent credible sightings known for the property (i.e., from TTL and other staff who have spent considerable field time on-site).

STATE-LISTED SPECIES

Gopher Tortoise (*Gopherus polyphemus*)

The gopher tortoise is a federal candidate for listing and is state-listed as Threatened by the Georgia Department of Natural Resources.

Gopher tortoise survey methods closely followed those recommended by Smith et al. (2009). From a review of soil maps and vegetation, combined with initial field reconnaissance, it became apparent that, on-site, gopher tortoise burrows were limited to habitats underlain by the soil type classified as Mandarin Fine Sand (MAA). Mandarin soils are fine to loamy sands and are somewhat poorly-drained; seasonally, the water table may be within 1.5-2 m of ground surface (we observed water ca. 1.5 - 2 m below ground surface in most burrows located at site Loncala-A during January, 2019). Mandarin is classified as a suitable soil, but not as a preferred soil, for the tortoise (U.S. Department of Agriculture Natural Resources Conservation Service, 2013).

To locate burrows, we walked line transects, with observers spaced ca. 5 m apart, through all areas of potential habitat. Except for eight burrows on the Adirondack tract that we first located in March 2019, we flagged and collected geospatial data for all active (i.e., intact burrows with fresh tortoise tracks) and inactive (i.e., intact burrows, but lacking fresh tracks) tortoise burrows on the Twin

Pines site during the summer-fall of 2018 (for a grand total of 118 active/inactive burrows) (Figures 10 and 11).

On the Twin Pines site, the sandy, well-drained environments that support gopher tortoises have historically been site-prepped and bedded and are now in planted pine, usually slash pine. Tortoises are not especially common or widespread on Twin Pines site, occurring only in 4-5 fairly small and discrete areas of sandy, open-canopied plantation habitat; individual tortoise colonies support ca. 10-15 adult tortoises, or less.

On 2-4 April 2019, we revisited the 118 burrows and (except for 17 burrows that were now abandoned) we measured each burrow with calipers (50 cm inside the burrow entrance); burrow width is related to tortoise carapace length and thus one can estimate the size of the tortoise occupying a particular burrow from its width (Martin and Layne 1987). We classified gopher tortoise burrow widths to size class as follows: juvenile burrows are 0-7.85 cm in width; subadult burrows 7.86- 25.7 cm wide; adult burrows are 25.8+ cm wide (these widths correspond to carapace lengths of 0-12 cm, 12.1-24 cm, and 24+ cm, respectively.

Also on 2-4 April, to obtain an accurate tortoise population estimate for the Twin Pines site we scoped gopher tortoise burrows using a burrow camera system (burrow camera built by Emmett Blankenship, Environmental Management Systems, Inc., Canton, GA) (Figure 12). (Note: 19 burrows that were less than 14 cm in burrow width were not scoped because of their small size; however, they were closely examined using a mirror or flashlight and in doing so we observed tortoises in 5 of these burrows; we scoped all remaining burrows).

With the burrow camera (or using flashlights/mirrors), we observed gopher tortoises in 23 adult-sized burrows, 11 subadult-sized burrows, and in 1 juvenile-sized burrow. For another 4 active adult-sized burrows, 11 active subadult-sized burrows, and 2 active juvenile burrows, we could not determine conclusively whether or not the burrow was in fact occupied by a tortoise.

Four adult gopher frogs and one Florida pinesnake were observed during these surveys. Tortoise survey data is provided in Table 5.

Striped Newt (*Notophthalmus perstriatus*)

Until recently the striped newt was considered a candidate for federal listing under the Endangered Species Act. In December 2018, the U.S. Fish and Wildlife Service determined that federal listing is not warranted at this time (US FWS 2018). The species is state listed as Threatened by the Georgia Department of Natural Resources. This amphibian is known to have declined and disappeared from portions of its historic range on Trail Ridge, near the Okefenokee Swamp National Wildlife Refuge, due to commercial forestry operations (Dodd and LaClaire 1993, Farmer et al. 2017). Since 1990, the striped newt has been found at a single site in Charlton County, Georgia, a pond on the Okefenokee NWR (located ca. 18 km N of Twin Pines); the newt was last found at this site in 1994 (Farmer et al. 2017).

My dipnet and minnow trap surveys of 12 isolated wetlands on-site did not document the striped newt. Naturally-functioning longleaf pine–wiregrass sandhills, the preferred habitat for transformed examples of this newt, are lacking on-site. Due to the profound habitat changes and perturbations from commercial forestry practices (see Frosted Flatwoods Salamander Account above) it is unlikely that the species persists on the Twin Pines site, if in fact it was ever present.

Gopher Frog (*Rana capito*)

The gopher frog, state-listed as Rare by the Georgia Department of Natural Resources, was documented on the Twin Pines site, including observations for the Adirondack, Keystone, and Loncala tracts (Figure 13). A total of six gopher frogs were observed, including three adults seen in gopher tortoise burrows during indigo snake surveys or gopher tortoise surveys and three adults observed in tortoise burrows while scoping burrows with the burrow camera. Two frogs were captured and voucher photographs were taken of these specimens. Dates and specific location information for these records are provided in Table 5.

Dipnet and minnow trap surveys of 12 isolated wetlands that I conducted on-site during February-March 2019 did not document egg masses or tadpoles of the gopher frog. On 23 April 2019, I visited two wetlands on the Loncala tract (30.57433°N, 82.11841° W and 30.57040°N, 82.12284° W) that were not among the 12 survey sites but that are located fairly close (within a quarter mile or less) of

three of our gopher frog sightings; both sites were in poor condition (e.g., choked with sphagnum, thick with bay trees) and no gopher frog tadpoles were found.

An isolated wetland I surveyed in March 2019 (A-04; 30.525379°N, 82.09925° W), dry when revisited on 23 April 2019, is a potential breeding pond for the gopher frog (Figure 3). A small cypress pond, converted in part into a borrow pit and located offsite and just south of the Keystone tract (30.51613°N, 82.11790°W), may be a breeding site used by gopher frogs.

OTHER STATE-LISTED AND SPECIAL CONCERN ANIMAL SPECIES

As a by-product of the herpetofaunal surveys I conducted on the Twin Pines site from November 2018−April 2019, a total of 38 species of amphibians and reptiles were observed on-site (comprised of 3 species of salamanders, 11 species of anurans, 3 species of turtles, 7 species of lizards, 13 species of snakes, and the American alligator) (Appendix 1). The state-listed (Threatened) southern hog-nosed snake (*Heterodon simus*), state-listed (Rare) mimic glass lizard (*Ophisaurus mimicus*) and state-listed (Unusual) Spotted Turtle (*Clemmys guttata*) were not found on-site and the extremely limited, if any, suitable habitat on-site for these taxa. There are no spotted turtle records close to the Twin Pines site (Stevenson et al. 2015).

The state-listed Bachman's sparrow (*Peucaea aestivalis*) was documented from one location on-site and from a second location just east of the site boundary. Three special concern animal species that are monitored by the Georgia Department of Natural Resources Biotics Division were found on site: redface topminnow *Fundulus rubifrons*, Florida pine snake (*Pituophis melanoleucus*), and black swampsnake (*Liodytes pygaea*); locality data for these species is presented in Supplemental File 1.

Literature Cited

Bauder, J.M., D.J. Stevenson, C.S. Sutherland, and C.L. Jenkins. 2017. Occupancy of potential overwintering habitat on protected lands by two imperiled snake species in the Coastal Plain of the southeastern United States. Journal of Herpetology 51(1):73-88.

Bennett, S.H., J.L. Waldron, and S.M. Welch. 2012. Light bait improves capture success of aquatic funnel-trap sampling for larval amphibians. Southeastern Naturalist 11(1): 49−58.

Bevelhimer, M. S., D. J. Stevenson, N. R. Giffen, and K. Ravenscroft. 2008. Annual surveys of larval *Ambystoma cingulatum* reveal large differences in dates of pond residency. Southeastern Naturalist 7:311–322.

Bishop, D. C. and C. A. Haas. 2005. Burning trends and potential negative effects of suppressing wetland fires on flatwoods salamanders. Natural Areas Journal 25:290–294.

Bishop, D. C., J. G. Palis, K. M. Enge, D. J. Printiss, and D. J. Stevenson. 2006. Capture rate, body size, and survey recommendations for larval *Ambystoma cingulatum* (Flatwoods Salamanders). Southeastern Naturalist 5:9–16.

Breininger, D.R., M.R. Bolt, M.L. Legare, J.H. Drese, and E.D. Stolen. 2011. Factors influencing home-range sizes of eastern indigo snakes in central Florida. Journal of Herpetology 45(4):484−490.

Dodd, C.K., Jr., and L.V. LaClaire. 1995. Biogeography and status of the striped newt (*Notophthalmus perstriatus*) in Georgia, USA. Herpetological Natural History 3(1):37−46.

Enge, K.M., D.J. Stevenson, M.J. Elliott, and J.M. Bauder. 2013. The historical and contemporary distribution of the eastern indigo snake (*Drymarchon couperi*). Herpetological Conservation and Biology 8(2): 288–307.

Farmer, A.L., K.M. Enge, J.B. Jensen, D.J. Stevenson, and L.L. Smith. 2017. A range-wide assessment of the status and distribution of the striped newt (*Notophthalmus perstriatus*). Herpetological Conservation and Biology 12(3): 585−598.

Hyslop, N.L., J.M. Meyer, R.J. Cooper, and D.J. Stevenson. 2014. Effects of body size and sex of *Drymarchon couperi* (Eastern Indigo Snake) on habitat use, movements, and home range size in Georgia. Journal of Wildlife Management 78(1):1–11.

Jensen, J.B. 1995. Survey of potential habitat on Okefenokee National Wildlife Refuge for *Ambystoma cingulatum*, *Rana capito*, and *Notophthalmus perstriatus*. Report to the U.S. Fish and Wildlife Service.

Jensen, J.B., and D.J. Stevenson. 2008. Species Account: Flatwoods Salamander, *Ambystoma cingulatum*. *In* Jensen, J., C. Camp, W. Gibbons, and M. Elliott (Eds.). Amphibians and Reptiles of Georgia. University of Georgia Press. Athens. 575 pp.

Martin, P.L., and J.N. Layne. 1987. Relationship of gopher tortoise body size to burrow size in a southcentral Florida population. Florida Scientist 50(4): 264−267.

Means, D. B, J. G. Palis, and M. Baggett. 1996. Effects of slash pine silviculture on a Florida population of flatwoods salamander. Conservation Biology 10:426–437.

Palis, J. G. 1997. Distribution, habitat, and status of the flatwoods salamander (*Ambystoma cingulatum*) in Florida, USA. Herpetological Natural History 5:53–65.

Palis, J.G. 2002. Distribution of potential habitat for the federally threatened flatwoods salamander (*Ambystoma cingulatum*) on Fort Stewart, Georgia. Report submitted to the Fort Stewart Fish and Wildlife Branch.

Palis, J. G. and D. B. Means. 2005. *Ambystoma cingulatum*. Pages 608–609 *in* M.J. Lannoo (ed.), Amphibian Declines: The Conservation Status of United States Species. The University of California Press, Berkeley.

Smith, L.S., J. Stober, H.E. Balbach, and W.D. Meyer. 2009. Gopher Tortoise Survey Handbook. U.S. Army Corps of Engineers – Construction Engineering Research Laboratory. ERDC/CERL TR-09-07.

Stevenson, D.J. 2010. Results of eastern indigo snake (*Drymarchon couperi*) surveys conducted at Okefenokee National Wildlife Refuge, Charlton County, Georgia. Unpublished report to Okefenokee National Wildlife Refuge. 8 pp. + appendices.

Stevenson, D.J., K.J. Dyer, and B.A. Willis-Stevenson. 2003. Survey and monitoring of the eastern indigo snake in Georgia. Southeastern Naturalist 2:393-408.

Stevenson, D.J., J.B. Jensen, E.A. Schlimm, and M. Moore. 2015. The distribution, habitat use, activity, and status of the Spotted Turtle (*Clemmys guttata*) in Georgia. Chelonian Conservation and Biology 14(2):136–142.

Stevenson, D.J., M.R. Bolt, D.J. Smith, K.M. Enge, N.L. Hyslop, T.M. Norton, and K.J. Dyer. 2010. Prey records for the Eastern Indigo Snake (*Drymarchon couperi*). Southeastern Naturalist 9(1): 1–18.

Stevenson, D.J., K.M. Enge, L. Carlile, K.J. Dyer, T.M. Norton, N.L. Hyslop, and R.A. Kiltie. 2009. An Eastern Indigo Snake (*Drymarchon couperi*) mark-recapture study in southeastern Georgia. Herpetological Conservation and Biology 4(1):30–42.

United States Department of Agriculture Natural Resources Conservation Service. 2013. Working Lands for Wildlife WHIP Guidance: Gopher Tortoise Phase 2-Georgia. 23 pp.

United States Fish and Wildlife Service (US FWS). 1999. Endangered and threatened wildlife and plants; final rule to list the flatwoods salamander as a threatened species. Federal Register 64(62):15691–15704.

United States Fish and Wildlife Service (US FWS). 2018. Endangered and threatened wildlife and plants; 12-month findings on petitions to list 13 species as endangered or threatened species. Federal Register 83(243):65127–65134.

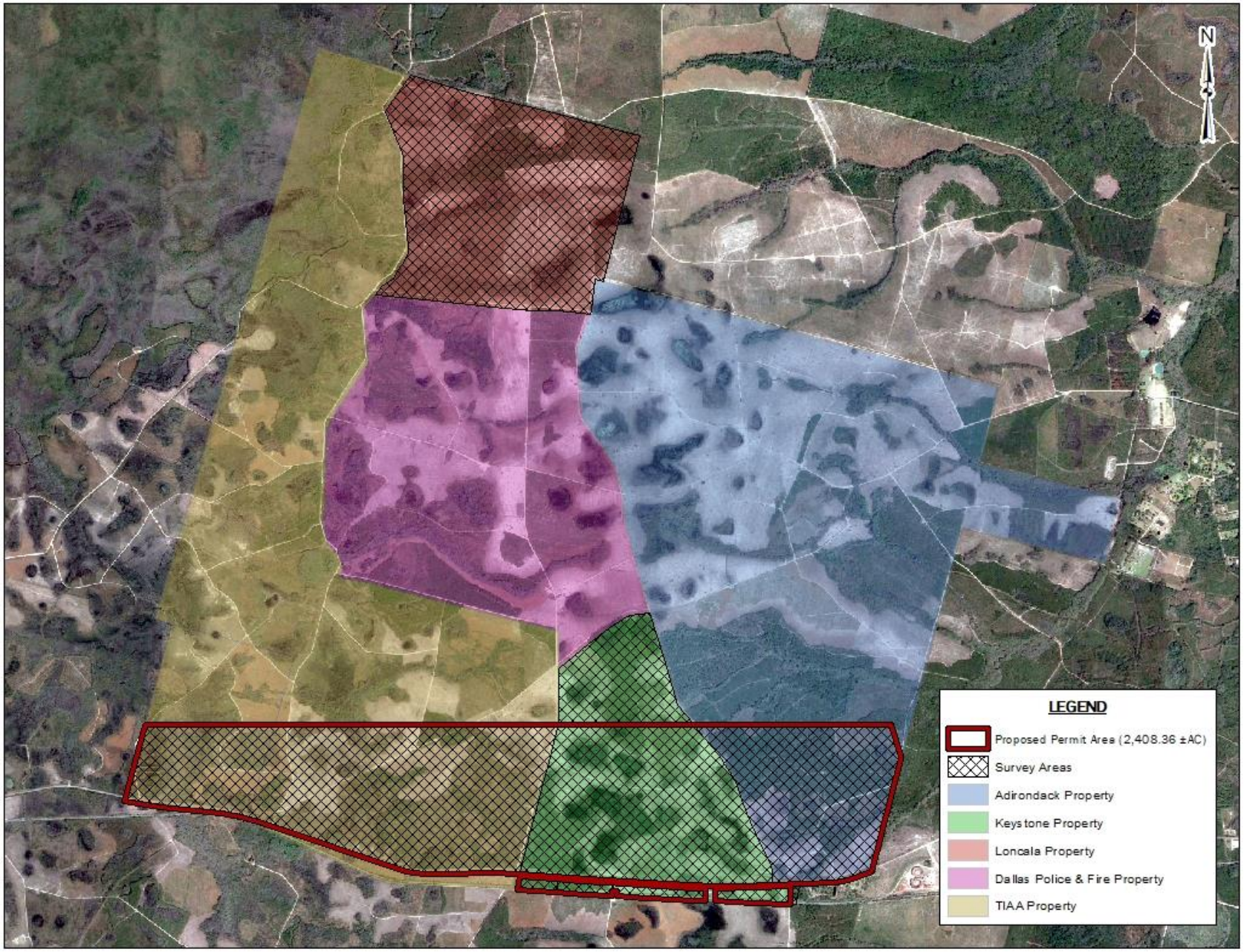

Figure 1. An aerial photograph of the Twin Pines site amphibian/reptile survey areas.

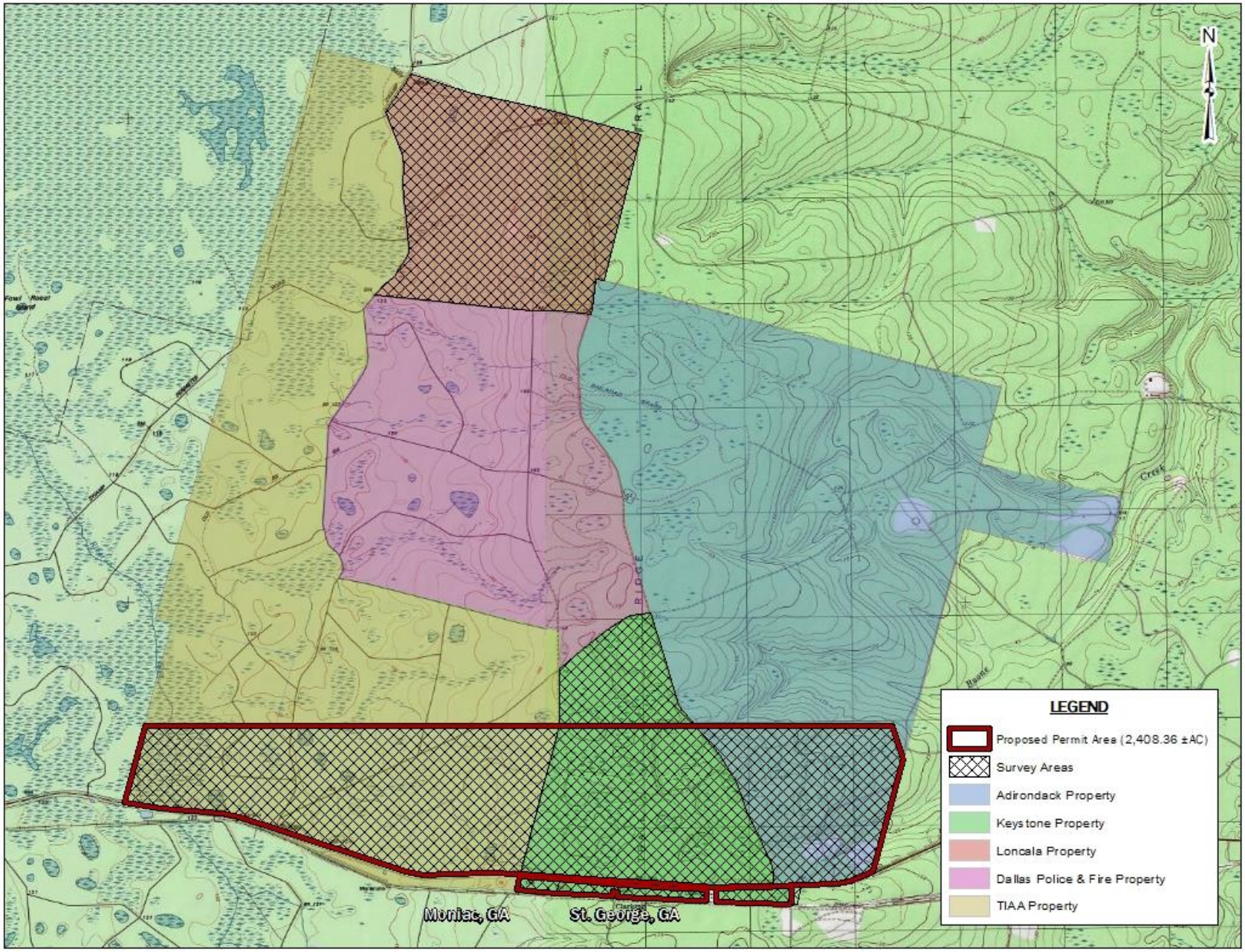

Figure 2. A USGS topographic map of the Twin Pines site amphibian/reptile survey areas.

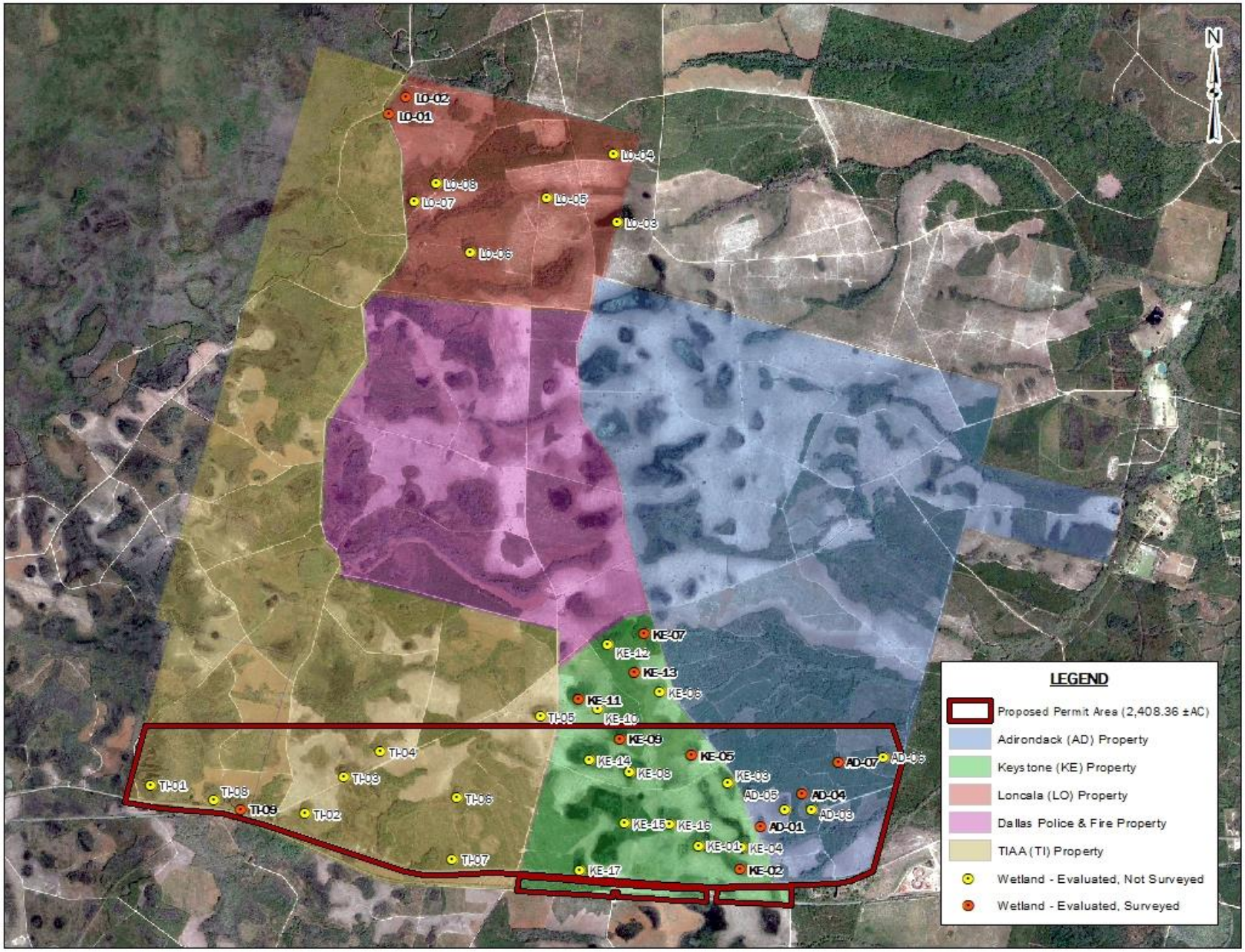

Figure 3. Locations of the 41 isolated depressional wetlands, including 12 survey sites, that were reviewed for the frosted flatwoods salamander, striped newt, and gopher frog.

Figure 4. Frosted flatwoods salamander survey site (Keystone-11). Note presence of graminacous vegetation and fire-scarred pond cypress.

Figure 5. Frosted flatwoods salamander survey site (Loncala-01). Note scattered graminacous vegetation and fire-killed trees in wetland.

Figure 6. Frosted flatwoods salamander survey site (Adirondack-04). Two minnow traps are visible in the foreground. A gopher frog was found in a gopher tortoise burrow ca. 2 km to the NE.

Figure 7. Wetland margin/pine upland ecotone of frosted flatwoods salamander survey site shown in Figure 1 (Keystone-11). Note parallel rows of beds extending into ectotone and standing water (result of soil compaction).

Figure 8. Pine upland habitat (part of a commercial slash pine plantation) adjacent to the frosted flatwoods salamander survey site shown in Figure 4 (Keystone-11). Note anthropogenic disturbance from parallel rows of deeply plowed beds (planted with slash pine) and the absence of a wiregrass-dominated ground cover.

Figure 9. Pine upland habitat adjacent to frosted flatwoods salamander survey site (Keystone-02). Pond can be seen in the background, Note incised ditch extending out from depressional wetland and the dominance of broomsedge in what is a recent clearcut and bedded landscape.

Figure 10. Locations of active/inactive gopher tortoise burrows and gopher frog observations on the Adirondack and Keystone tracts. The tortoise burrows shown on this map were surveyed on multiple dates for eastern indigo snakes.

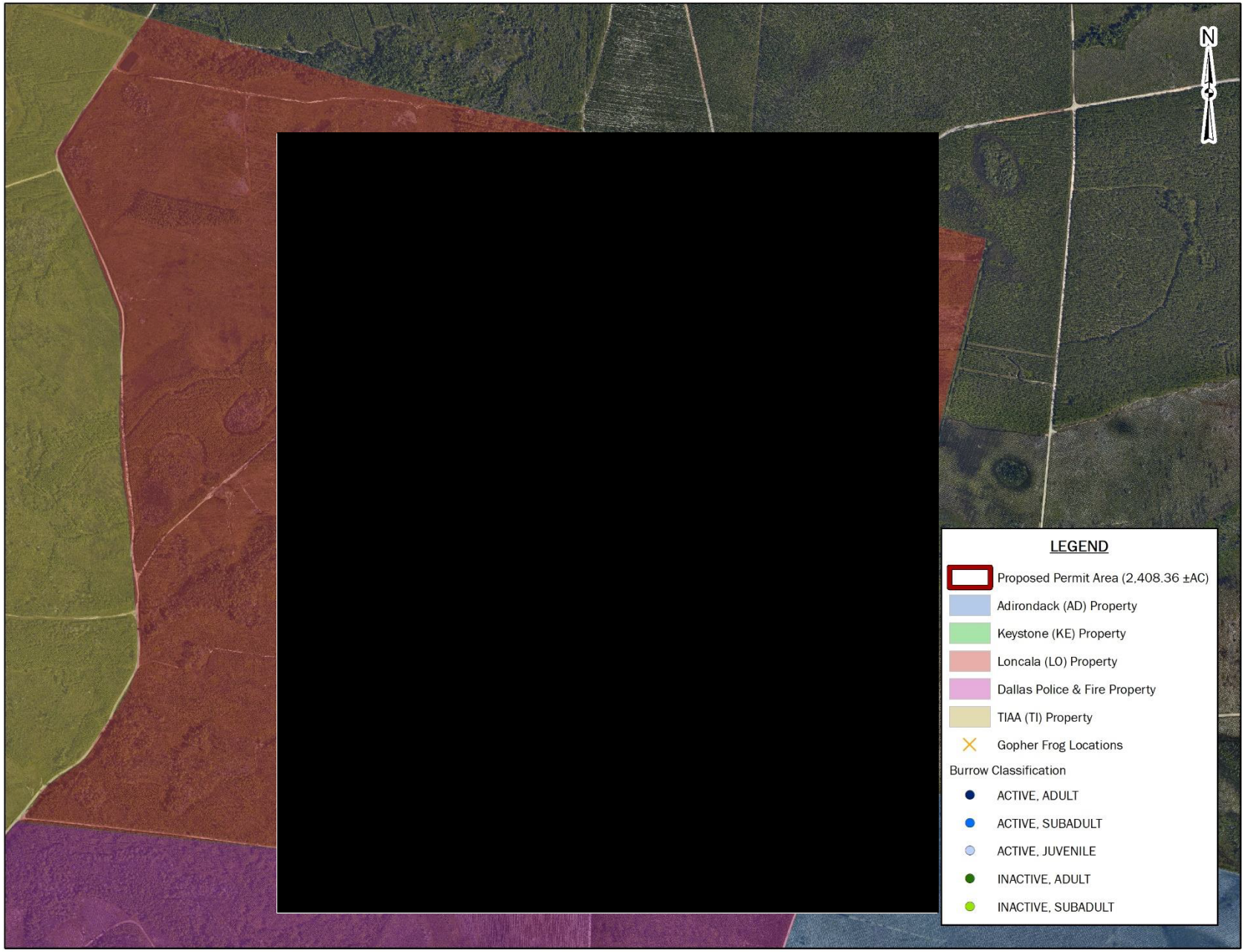

Figure 11. Locations of active/inactive gopher tortoise burrows and gopher frog observations on the Loncala tract. The tortoise burrows shown on this map were surveyed on multiple dates for eastern indigo snakes.

Figure 12. Using a burrow camera to examine the burrow of an adult gopher tortoise.

Figure 13. An adult gopher frog (*Rana capito*) found in a gopher tortoise burrow on the Twin Pines Site.

Tables

Table 1. Habitat Review of Isolated Wetlands on the Twin Pines Site, Charlton County, Georgia
(*see text for explanation of ranking system*)

Pond Code	Latitude	Longitude	Hydrology	Vegetation	Fire History	Intact Ground Cover?	Bedded?	Habitat Condition	Upland Habitat	Survey Site?
KEYSTONE										
KE-01	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year planted pine	No
KE-02	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year p. pine	Yes
KE-03	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year p. pine	No
KE-04	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year p. pine	No
KE-05	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	2-year p. pine	Yes
KE-06	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	2-year p. pine	No
KE-07	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	planted pine	Yes
KE-08	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	2-year p. pine	No
KE-09	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	8-year p. pine	Yes
KE-10	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	planted pine	No
KE-11	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	2-year p. pine	Yes
KE-12	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	8-year p. pine	No
KE-13	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	8 year p. pine	Yes
KE-14	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	2-year p. pine	No
KE-15	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year p. pine	No
KE-16	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year p. pine	No
KE-17	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	2-year p. pine	No
LONCALA										
LO-01	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	8-10-year p. pine	Yes
LO-02	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	8-10 year p. pine	Yes
LO-03	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	recent clearcut	No
LO-04	[redacted]	[redacted]	Unsuitable	3	3	No	Yes	3	recent clearcut	No
LO-05	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	recent clearcut	No
LO-06	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	ca. 8-10 p. pine	No
LO-07	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	recent clearcut	No
LO-08	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	recent clearcut	No

Table 1. Habitat Review of Isolated Wetlands on the Twin Pines Site, Charlton County, Georgia (Continued)

ADIRON									
AD-01	[redacted]	[redacted]	Suitable	2	2	No	Yes	3	2-year p. pine	Yes
AD-02	[redacted]	[redacted]	Unsuitable	3	3	No	Yes	3	2-year p. pine	No
AD-03	[redacted]	[redacted]	Unsuitable	3	3	No	Yes	3	12-year slash pine	No
AD-04	[redacted]	[redacted]	Suitable	2	3	No	Yes	3	12-yr slash pine	Yes
AD-05	[redacted]	[redacted]	Unsuitable	3	3	No	Yes	3	recent clearcut	No
AD-06	[redacted]	[redacted]	Unsuitable	3	3	No	Yes	3	10-year slash pine	No
AD-07	[redacted]	[redacted]	Suitable	2	3	No	Yes	3	8-15 year slash pine	Yes
TIAA									
TI-01	[redacted]	[redacted]	Unsuitable	2	2,3	No	Yes	3	clearcut	No
TI-02	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-12 year slash pine	No
TI-03	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year slash pine	No
TI-04	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	2-year slash pine	No
TI-05	[redacted]	[redacted]	Suitable	3	2,3	No	Yes	3	2-year slash pine	No
TI-06	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	planted pine	No
TI-07	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	planted pine	No
TI-08	[redacted]	[redacted]	Unsuitable	3	2,3	No	Yes	3	2-year slash pine	No
TI-09	[redacted]	[redacted]	Suitable	2	2,3	No	Yes	3	2-year slash pine	Yes

Table 2. Frosted Flatwoods Salamander Survey Data

Pond Code	Survey Dates	Personnel	Dipnet Hours	Trap-Nights	Vegetation Sampled[1]	Amphibians Observed[2]
KEYSTONE						
KE-02	2/28-3/1/2019	ds, jk, ct	1.5	16	1	RSPH (L), AGRY (A), POCU (A), HFEM (A), EQUA (L)
KE-05	2/26-2/27/2019	ds, jk, ct	1.5	16	1, 2, 3, 4, 5, 6	RSPH (L), AGRY (A), EQUA (L)
KE-07	2/26-2/27/2019	ds, jk, ct	1.5	16	1, 2, 3, 4, 5, 6	RSPH (A, L), AGRY (A), POCU (A), RGRY (A)
KE-09	2/27-2/28/2019	ds, jk, ct	1.5	24	1, 4, 5, 6	RSPH (L)
KE-11	2/27-2/28/2019	ds, jk, ct	2	12	1, 2, 3, 4, 5, 6	RSPH (L), AGRY (A), EQUA (L), ATER (A), AQUE (A)
KE-13	2/27/2019	ds, jk, ct	1.5	0	5	RSPH (L), POCU (L)
LONCALA						
LO-01	2/28-3/1/2019	ds, jk, ct	1	12	1, 5	RSPH (L), HFEM (A)
LO-02	2/28-3/1/2019	ds, jk, ct	1	12	1	RSPH (L), EQUA (L)
ADIROND						
AD-01	3/7-3/8/2019	ds, jk, cs	1.5	12	2, 4, 5, 6	RSPH (E, L), AGRY (A), EQUA (L)
AD-04	3/7-3/8/2019	ds, jk, cs	1.5	12	2, 3, 4, 5, 6	POCU (L)
AD-07	3/7-3/8/2019	ds, jk, cs	1.25	14	1, 2, 4, 5	RSPH (A, L), EQUA (L)
TIAA						
TI-09	3/8-3/9/2019	ds, jk, cs	1.5	29	1	RSPH (L), HCIN (A), EQUA (L), SINT (A)

[1]1=Carex; 2=Panicum; 3=Rhynchospora; 4=Eriocaulon; 5=Sphagnum; 6=Xyris

[2]E=Egg mass; L=Larva; A=Adult
AGRY (Acris gryllis); EQUA (Eurycea quadrigitata); HCIN (Hyla cinerea); HFEM (Hyla femoralis); POCU (Pseudacris ocularis); RGRY (Rana grylio); RSPH (Rana sphenocephala); SINT (Siren intermedia); ATER (Anaxyrus terrestris); AQUE (Anaxyrus quercicus)

Table 3: Amphibians, Reptiles and Fishes Observed at Frosted Flatwoods Salamander Survey Sites

Wetland Site Code	K-02	K-05	K-07	K-09	K-11	K-13	L-01	L-02	A-01	A-04	A-07	T-09
SALAMANDERS												
dwarf salamander (*Eurycea quadridigitata*)	L	L			L			L	L		L	L
lesser siren (*Siren intermedia*)												A
ANURANS[1]												
southern toad (*Anaxyrus terrestris*)					A							
oak toad (*Anaxyrus quercicus*)					A							
southern cricket frog (*Acris gryllus*)	A	A	A		A				A		A	
little grass frog (*Pseudacris ocularis*)	A		A			L				L		
pinewoods treefrog (*Hyla femoralis*)	A						A					
green treefrog (*Hyla cinerea*)												A
pig frog (*Rana grylio*)			A									
southern leopard frog (*Rana sphenocephala*)	L	L	A, L	L	L	L	L	L	E, L		A, L	L
SNAKES												
banded watersnake (*Nerodia fasciata*)									X			X
black swampsnake (*Liodytes pygaea*)							X					
eastern ribbonsnake (*Thamnophis sauritus*)				X					X			
cottonmouth (*Agkistrodon piscivorus*)											X	
FISHES												
eastern mudminnow (*Umbra pygmaea*)							X	X				
redfin pickerel (*Esox americanus*)	X		X	X			X					X
redface topminnow (*Fundulus rubrifrons*)	X	X			X							X
pygmy killifish (*Leptolucania ommata*)												X
eastern mosquitofish (*Gambusia holbrooki*)	X	X	X	X	X		X	X			X	X
warmouth (*Lepomis gulosus*)											X	

Table 3: Amphibians, Reptiles and Fishes Observed at Frosted Flatwoods Salamander Survey Sites (Continued)

banded sunfish (*Enneacanthus obesus*)	X	X	X		X	X	X	X
pygmy sunfish (*Elassoma* sp.)	X							X
mud sunfish (*Acantharcus pomotis*)								X

[1]E = Eggs; L = Larvae; A = Adult, X=Species observed

Table 4. Eastern Indigo Snake Survey Data: Twin Pines Site, Charlton County, Georgia

Site	Survey #	Date	Time	Tortoise Burrows Surveyed	Weather	Results
ADIROND						
Adirondack	1	3/6-3/7/2019	1000-1600	8	sunny, clear 70 F	no indigo snakes found
Adirondack	2	3/19/2019	1550-1630	8	very cloudy, 62 F	no indigo snakes found
KEYSTONE						
Keystone A	1	12/17/2018	1140-1255	5	calm, partly cloudy, 57-60 F	no indigo snakes found, pigmy rattlesnake, burrow 01
Keystone A	2	1/18/2019	1030-1055	5	calm, mostly sunny, 64 F	no indigo snakes found
Keystone A	3	2/26/2019	1130-1200	5	cloudy, warm 68 F	no indigo snakes found
Keystone B	1	12/17/2018	1415-1636	40	calm, mostly cloudy, 61-64 F	no indigo snakes found, gopher frog, burrow 03; e. coachwhip shed, burrow 04
Keystone B	2	1/18/2019	1130-1340	40	calm, mostly sunny, 70 F	no indigo snakes found
Keystone B	3	2/26/2019	1500-1630	40	cloudy, warm 74 F	no indigo snakes found, gopher frog, burrow 02
LONCALA						
Loncala A	1	12/18/2018	1022-1142	22	calm, mostly sunny, 62-64 F	no indigo snakes found
Loncala A	2	1/17/2019	1500-1600	22	calm, sunny, 67 F	no indigo snakes found
Loncala A	3	2/26/2019	1230-1300	22	cloudy, warm 70 F	no indigo snakes found
Loncala B	1	12/18/2018	1216-1408	19	calm, mostly sunny, 67 F	no indigo snakes found
Loncala B	2	1/17/2019	1145-1420	19	calm, mostly sunny, 63 F	no indigo snakes found
Loncala B	3	2/26/2019	1310-1340	19	cloudy, warm 70 F	no indigo snakes found
Loncala C	1	12/18/2018	1452-1503	3	calm, mostly sunny, 68 F	no indigo snakes found
Loncala C	2	1/17/2019	1430-1450	3	calm, mostly sunny, 65 F	no indigo snakes found
Loncala C	3	2/26/2019	1345-1400	3	cloudy, warm 72 F	no indigo snakes found
Loncala D	1	2/26/2019	1405-1435	21	cloudy, warm 72 F	no indigo snakes found
Loncala D	2	3/19/2019	1430-1530	21	very cloudy, 62 F	no indigo snakes found

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
ADIRON							
4/3/2019	A-01	[redacted]	INACTIVE	21	SUBADULT	No	
4/3/2019	A-02	[redacted]	ACTIVE	25	SUBADULT	Yes	pine snake
4/3/2019	A-03	[redacted]	INACTIVE	21	SUBADULT	Yes	
4/3/2019	A-04	[redacted]	INACTIVE	31.5	ADULT	No	
4/3/2019	A-05	[redacted]	ACTIVE	11.5	SUBADULT	Undet.	
4/3/2019	A-06	[redacted]	ACTIVE	33	ADULT	Yes	
4/3/2019	A-07	[redacted]	INACTIVE	27.5	ADULT	No	gopher frog
4/3/2019	A-08	[redacted]	INACTIVE	11	SUBADULT	Undet.	
KEYSTONE							
4/3/2019	K-A-01	[redacted]	ACTIVE	32.5	ADULT	No	
4/3/2019	K-A-02	[redacted]	ACTIVE	35	ADULT	No	
4/3/2019	K-A-03	[redacted]	ACTIVE	35.5	ADULT	Yes	
4/3/2019	K-A-04	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/3/2019	K-A-05	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-01	[redacted]	INACTIVE	30	ADULT	Yes	
4/4/2019	K-B-02	[redacted]	ACTIVE	19.5	SUBADULT	No	
4/4/2019	K-B-03	[redacted]	INACTIVE	9	SUBADULT	Undet.	
4/4/2019	K-B-04	[redacted]	INACTIVE	9	SUBADULT	Undet.	
4/4/2019	K-B-05	[redacted]	INACTIVE	26	ADULT	No	
4/4/2019	K-B-06	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-07	[redacted]	INACTIVE	26	ADULT	Yes	
4/4/2019	K-B-08	[redacted]	ACTIVE	13	SUBADULT	Yes	
4/4/2019	K-B-09	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-10	[redacted]	ABAN (ACT)	N/A	JUVENILE	No	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/4/2019	K-B-11	[redacted]	INACTIVE	22	SUBADULT	No	
4/4/2019	K-B-12	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-13a	[redacted]	INACTIVE	37	ADULT	Yes	
4/4/2019	K-B-13b	[redacted]	INACTIVE	22	SUBADULT	No	
4/4/2019	K-B-14	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-15	[redacted]	INACTIVE	13.5	SUBADULT	Yes	
4/4/2019	K-B-16	[redacted]	INACTIVE	24	SUBADULT	No	
4/4/2019	K-B-17	[redacted]	ACTIVE	33	ADULT	Yes	
4/4/2019	K-B-18	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-19	[redacted]	ACTIVE	31	ADULT	No	
4/4/2019	K-B-20	[redacted]	ACTIVE	30	ADULT	Yes	
4/4/2019	K-B-21	[redacted]	ACTIVE	13	SUBADULT	Yes	
4/4/2019	K-B-22	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-23	[redacted]	INACTIVE	32	ADULT	No	
4/4/2019	K-B-24	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-25	[redacted]	ACTIVE	16.5	SUBADULT	Yes	
4/4/2019	K-B-26	[redacted]	ACTIVE	12	SUBADULT	Yes	
4/4/2019	K-B-27	[redacted]	ACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-28	[redacted]	ACTIVE	25.5	SUBADULT	Yes	
4/4/2019	K-B-35	[redacted]	INACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-36	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-37	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-38	[redacted]	ACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-39	[redacted]	ACTIVE	12	SUBADULT	Undet.	
LONCALA							
4/2/2019	L-A-01	[redacted]	ACTIVE	36	ADULT	Yes	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/2/2019	L-A-02	[redacted]	INACTIVE	26	ADULT	No	
4/2/2019	L-A-03	[redacted]	INACTIVE	35	ADULT	No	
4/2/2019	L-A-04	[redacted]	INACTIVE	32	ADULT	No	
4/2/2019	L-A-05	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/2/2019	L-A-06	[redacted]	INACTIVE	29.5	ADULT	No	
4/2/2019	L-A-07	[redacted]	ACTIVE	11.2	SUBADULT	Undet.	
4/2/2019	L-A-08	[redacted]	INACTIVE	29.6	ADULT	No	
4/2/2019	L-A-09	[redacted]	INACTIVE	34	ADULT	No	
4/2/2019	L-A-10	[redacted]	ACTIVE	40.2	ADULT	Yes	gopher frog
4/2/2019	L-A-11	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/2/2019	L-A-12	[redacted]	ACTIVE	34.2	ADULT	Yes	
4/2/2019	L-A-13	[redacted]	ACTIVE	13	SUBADULT	Undet.	
4/2/2019	L-A-14	[redacted]	INACTIVE	22	SUBADULT	No	
4/2/2019	L-A-15	[redacted]	ACTIVE	33	ADULT	Yes	gopher frog
4/2/2019	L-A-16	[redacted]	INACTIVE	26.5	ADULT	No	
4/2/2019	L-A-17	[redacted]	INACTIVE	29.7	ADULT	No	
4/2/2019	L-A-18	[redacted]	INACTIVE	30.5	ADULT	No	
4/2/2019	L-A-19	[redacted]	ACTIVE	34	ADULT	Yes	
4/2/2019	L-A-20	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/2/2019	L-A-21	[redacted]	INACTIVE	29.2	ADULT	No	
4/2/2019	L-A-22	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/3/2019	L-B-01	[redacted]	INACTIVE	31.5	ADULT	No	
4/3/2019	L-B-02	[redacted]	INACTIVE	28	ADULT	No	
4/3/2019	L-B-03	[redacted]	INACTIVE	33	ADULT	No	
4/3/2019	L-B-04	[redacted]	INACTIVE	24	SUBADULT	No	
4/3/2019	L-B-05	[redacted]	INACTIVE	33.5	ADULT	No	
4/3/2019	L-B-06	[redacted]	INACTIVE	32	ADULT	No	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/3/2019	L-B-07	[redacted]	ACTIVE	34.5	ADULT	Yes	
4/3/2019	L-B-08	[redacted]	ACTIVE	35	ADULT	No	
4/3/2019	L-B-09	[redacted]	INACTIVE	37.5	ADULT	No	
4/3/2019	L-B-10	[redacted]	ACTIVE	13	SUBADULT	Undet.	
4/3/2019	L-B-11	[redacted]	ACTIVE	11	SUBADULT	Undet.	gopher frog
4/3/2019	L-B-12	[redacted]	INACTIVE	35	ADULT	No	
4/3/2019	L-B-13	[redacted]	ACTIVE	35	ADULT	Yes	
4/3/2019	L-B-14	[redacted]	ACTIVE	30.5	ADULT	Yes	
4/3/2019	L-B-15	[redacted]	INACTIVE	29.5	ADULT	No	
4/3/2019	L-B-16	[redacted]	INACTIVE	32	ADULT	No	
4/3/2019	L-B-17	[redacted]	INACTIVE	33	ADULT	No	
4/3/2019	L-B-18	[redacted]	ACTIVE	32	ADULT	Yes	
4/3/2019	L-B-19	[redacted]	INACTIVE	15.5	SUBADULT	Undet.	
4/3/2019	L-C-01	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/3/2019	L-C-02	[redacted]	INACTIVE	29	ADULT	No	
4/3/2019	L-C-03	[redacted]	ACTIVE	38.5	ADULT	Yes	
4/2/2019	L-D-01	[redacted]	ACTIVE	30	ADULT	Yes	
4/2/2019	L-D-02	[redacted]	INACTIVE	28	ADULT	No	
4/2/2019	L-D-03	[redacted]	INACTIVE	43	ADULT	No	
4/2/2019	L-D-04	[redacted]	INACTIVE	28	ADULT	No	
4/2/2019	L-D-05	[redacted]	INACTIVE	24	SUBADULT	No	
4/2/2019	L-D-06	[redacted]	ACTIVE	32.5	ADULT	Yes	
4/2/2019	L-D-07	[redacted]	ACTIVE	23	SUBADULT	Yes	
4/2/2019	L-D-08	[redacted]	ACTIVE	29	ADULT	Yes	
4/2/2019	L-D-09	[redacted]	INACTIVE	20	SUBADULT	Undet.	
4/2/2019	L-D-10	[redacted]	ACTIVE	33.5	ADULT	Yes	
4/2/2019	L-D-11	[redacted]	ACTIVE	14	SUBADULT	Yes	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/2/2019	L-D-12	[redacted]	ACTIVE	31	ADULT	Yes	
4/2/2019	L-D-13	[redacted]	INACTIVE	25	SUBADULT	Yes	
4/2/2019	L-D-14	[redacted]	ACTIVE	35.5	ADULT	No	
4/2/2019	L-D-15	[redacted]	INACTIVE	41.5	ADULT	No	
4/3/2019	L-D-16	[redacted]	INACTIVE	32.5	ADULT	No	
4/3/2019	L-D-17	[redacted]	INACTIVE	37.5	ADULT	Undet.	
4/3/2019	L-D-18	[redacted]	ACTIVE	6	JUVENILE	Yes	
4/3/2019	L-D-19	[redacted]	ACTIVE	6	JUVENILE	Undet.	
4/3/2019	L-D-20	[redacted]	ACTIVE	7.5	JUVENILE	Undet.	
4/3/2019	L-D-21	[redacted]	ACTIVE	43.5	ADULT	Yes	

[1]ABA (ACT) and ABA (INA) indicate burrows that were abandoned when visited in April 2019 but had been classifies as Active (ACT) or Inactive (INA) in November 2018.

Appendix 1: Amphibian/Reptile Species List for Twin Pines, Charlton County, Georgia
A= Adirondack, K = Keystone, L = Loncala, T = Tia Tract

Reptiles

American Alligator	*Alligator mississippiensis*	L, T
Gopher Tortoise	*Gopherus polyphemus*	A, K, L
Coastal Plain Cooter	*Pseudemys floridana*	L
Eastern Box Turtle	*Terrapene carolina*	A
Eastern Glass Lizard	*Ophisaurus ventralis*	T
Green Anole	*Anolis carolinensis*	A, K, L, T
Fence Lizard	*Sceloporus undulatus*	A, K
Southeastern Five-lined Skink	*Plestiodon inexpectatus*	K
Broadhead Skink	*Plestiodon laticeps*	K, L
Ground Skink	*Scincella lateralis*	K, L
Six-lined Racerunner	*Aspidoscelis sexlineata*	A, L
Eastern Garter Snake	*Thamnophis sirtalis*	K, L
Eastern Ribbon Snake	*Thamnophis sauritus*	A, K, T
Banded Watersnake	*Nerodia fasciata*	A, T
Black Swampsnake	*Liodytes pygaea*	L
Black Racer	*Coluber constrictor*	A, K, L, T
Eastern Coachwhip	*Coluber flagellum*	K
Rough Greensnake	*Opheodrys aestivus*	A, T
Florida Pine Snake	*Pituophis melanoleucus*	A, K
Corn Snake	*Pantherophis guttatus*	A, K
Scarlet Kingsnake	*Lampropeltis elapsoides*	K, L
Cottonmouth	*Agkistrodon piscivorous*	A, L, T
Pygmy Rattlesnake	*Sistrurus miliarius*	A, K, L, T
Timber Rattlesnake	*Crotalus horridus*	A

Amphibians

Dwarf Salamander	*Eurycea quadridigitata*	A, K, L, T
Lesser Siren	*Siren intermedia*	T
Two-toed Amphiuma	*Amphiuma means*	A
Southern Toad	*Anaxyrus terrestris*	A, K, L
Oak Toad	*Anaxyrus quercicus*	K, L
Southern Cricket Frog	*Acris gryllus*	A, K, L, T
Little Grass Frog	*Pseudacris ocularis*	A, K
Pinewoods Treefrog	*Hyla femoralis*	A, K, L, T
Green Treefrog	*Hyla cinerea*	K, T
Gopher Frog	*Rana capito*	A, K, L
Southern Leopard Frog	*Rana sphenocephala*	A, K, L, T
Bronze Frog	*Rana clamitans*	K
Bullfrog	*Rana catesbeiana*	K
Pig Frog	*Rana grylio*	K, L

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Results of Eastern Indigo Snake Surveys on the Twin Pines Site, Charlton County, Georgia: Year 2

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Results of Eastern Indigo Snake Surveys on the Twin Pines Site, Charlton County, Georgia: Year 2

In November-December 2019, I again conducted eastern indigo snake (*Drymarchon couperi*) surveys on the Twin Pines Site, Charlton County, Georgia.

Similar to my first round of indigo snake surveys (conducted December, 2018 – March, 2019 [see Stevenson, 2019]), these surveys followed the field methods described by Stevenson et al. (2003) and Bauder et al. (2017). Specifically, I conducted visual encounter surveys for indigo snakes overwintering in gopher tortoise colonies. I surveyed for basking indigo snakes, and for indigo snake shed skins, at/near all active/inactive gopher tortoise burrows on-site (*n* = 106 burrows) on three dates from 19 November – 18 December 2019. Approximately two weeks separated each survey event for each respective site. Maps of indigo snake survey areas and gopher tortoise burrow locations are provided.

On each indigo snake survey, each tortoise burrow was carefully examined for the presence of fresh snake tracks (if found, burrows with tracks are scoped with a gopher tortoise burrow camera in an effort to locate snakes resting deep inside the burrow). From 1-4 TTL biologists assisted me on these surveys.

No eastern indigo snakes or eastern indigo snake shed skins were found by my visual encounter surveys at the Twin Pines site, and no fresh snake tracks were located at burrows. A single pygmy rattlesnake (*Sistrurus miliarius*) and the shed skin of a Florida pinesnake (*Pituophis melanoleucus*) were observed (Table 1). No gopher frogs (*Rana capito*) were observed during these surveys.

A lack of indigo snake observations during focused surveys doesn't demonstrate that the species is never present or transient on the Twin Pines site (even if the species doesn't winter on-site it is possible that snakes from adjacent tracts, if present that is, may occasionally visit the Twins Pines site to forage). However, there are no recent credible sightings known for the property (i.e., from TTL and other staff who have spent considerable field time on-site) and my dedicated surveys during two consecutive years failed to locate the species.

Literature Cited

Bauder, J.M., D.J. Stevenson, C.S. Sutherland, and C.L. Jenkins. 2017. Occupancy of potential overwintering habitat on protected lands by two imperiled snake species in the Coastal Plain of the southeastern United States. Journal of Herpetology 51(1):73-88.

Stevenson, D.J. 2019. 2018−2019 Surveys for Protected Amphibians/Reptiles on the Twin Pines Site, Charlton County, Georgia. Unpubl. Report. 32 pp.

Stevenson, D.J., K.J. Dyer, and B.A. Willis-Stevenson. 2003. Survey and monitoring of the eastern indigo snake in Georgia. Southeastern Naturalist 2:393-408.

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2019 Survey for Rare, Threatened and Endangered Plants

Twin Pines Mining Block 1

Charlton County, Georgia

FINAL REPORT

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2019 Survey for Rare, Threatened and Endangered Plants

Executive Summary

From January 2019 – December 2019 I conducted surveys for rare plants on approximately 2,424 acres of land in Charlton County, GA proposed for heavy mineral sands mining by Twin Pines Minerals, LLC (U.S. Army Corps of Engineers permit application # SAS-2018-00554). These surveys targeted plants listed or proposed to be listed under the federal Endangered Species Act as threatened or endangered, as well as plants listed under the Wildflower Preservation Act of Georgia as unusual, rare, threatened or endangered, and plants that are tracked by the state of GA Department of Natural Resources (GA DNR, Wildlife Resources Division, Wildlife Conservation Section). Uplands and wetlands on site were degraded by former silvicultural activity so I concentrated survey efforts in areas where habitat was most likely to harbor rare species (e.g. graminaceous wetlands, open sphagnum bogs, bayheads containing hardwood species, uplands where planting beds were eroded to some degree, uplands consisting of gopher tortoise-appropriate soils and uplands with minimal midstory density).

I detected six plant species that are tracked by GA DNR (*Asclepius pedicillata, Asimina pygmaea, Fuirena scirpoidea, Quercus chapmanii, Rhexia nuttallii, Tillandsia bartramii*), two species that are listed under the GA Wildflower Preservation Act (*Sarracenia minor, Sarracenia psitticina*), and no species that are federally listed or proposed to be listed under the Endangered Species Act. Of these, three tracked species (*Asimina pygmaea, Fuirena scirpoidea, Rhexia nuttallii*) were numerous and widespread where appropriate habitat was present.

Introduction

In 2018 Twin Pines Minerals LLC and TTL inc. (agent) consulted with federal and state agencies (U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Georgia Department of Natural Resources, and U.S. Environmental Protection Agency) as part of a preliminary planning process for a proposed 2,424 acre heavy mineral sands mining project on Trail Ridge east of Okefenokee National Wildlife Refuge in Charlton County, Georgia [U.S. Army Corps of Engineers permit application # SAS-2018-00554]. One outcome of the consultation was a request that threatened and endangered species surveys be conducted on the site prior to permit approvals. As an experienced botanist and ecologist with Terra-Ignea Enterprises LLC, I was subcontracted by TTL to conduct surveys for target plant species beginning January 2019 and concluding by December 2019.

Methods

U.S. Fish and Wildlife Service and Georgia Department of Natural Resources provided TTL with a list of target plant species with ranges overlapping the proposed mining tracts and for which habitat was likely to occur on the tracts. These included three candidate plant species proposed for listing under the Endangered Species Act (*Hartwrightia floridana, Coreopsis integrifolia, Balduina atropurpurea*). An additional 24 species of plants, either listed under the GA Wildflower Preservation Act or state-tracked, were added to the list by GA DNR botanists (Table 1), for a total of 27 target plant species that agencies requested be considered.

I assessed target plant species habitat availability and quality on the proposed mining area using satellite imagery, National Wetlands Inventory maps, topographic maps and soils maps followed by ground-truthing. Although the entire proposed project site has been severely impacted by prior silvicultural activity, I selected 450 acres of highest quality flatwoods available (uplands where planting beds were eroded to some degree, uplands consisting of gopher tortoise-appropriate soils and uplands with minimal midstory density, Figures 1-4) and surveyed all of that area despite habitat being marginal at best (pine planting beds up to 0.5 m high, obvious intensive prior herbicide treatment, severe 2017 wildfire effects and subsequent salvage logging, Figures 5-8). I walked on parallel transects that were approximately 50 m apart, with a TTL staff approximately 10 m to each side of me (three of us total), throughout the selected flatwoods

habitat during four separate survey periods to catch peak bloom time for all target plant species; survey periods were April 15-26, May 29-June 5, July 15-22 and October 7-14.

I identified 45 wetlands totaling approximately 472 acres for plant surveys using primarily satellite imagery. Three people (myself and two TTL staff) walked approximately 10 m apart around wetland ecotones to survey all 45 wetlands for target wetland plant species from April 15-26. Because many of the wetlands were in extremely degraded condition (mechanical site preparation for silviculture, planted with *Pinus elliotii*, disturbed by feral swine and severely impacted by wildfire as a result of long-term fire suppression, Figures 9-11), during the first survey I scored wetland characteristics (hydrology, fire, graminoids, midstory, canopy, surrounding upland) on a scale of 1-3, 1 being intact and 3 being severely degraded (Table 2). In subsequent survey periods, I only surveyed the 32 wetlands (329 acres) with a cumulative score < 12 and/or that had target species occurrences in the first survey. Subsequent survey periods for wetlands remaining in the survey were May 29-June 5, July 15-22 and October 7-14.

I recorded all plant locations using a Trimble R1 GNSS receiver with sub-meter accuracy and a Trimble Nomad 1050 handheld data collection device. If I could not identify species with 100% certainty in the field, I collected specimens and identified them with a dissecting microscope, using 'Flora of the Southern and Mid-Atlantic States' (Weakley 2015) as the authoritative reference.

I used geospatial software (ArcGIS) to map precise locations of all observed occurrences of target plant species (Figures 1-4) and summarized findings in an Excel database (Table 1). I shared all Excel database files, maps and GIS files with TTL staff.

Results

Within the proposed mining project boundary, as of August 2019, I documented a total of 1000 occurrences of target plants, with some of those occurrences representing single plants and some representing clusters of plants. I detected four target plant species that are tracked by GA DNR: *Asimina pygmaea, Fuirena scirpoidea, Quercus chapmanii* and *Tillandsia bartramii* (Table 1). Of these, *Asimina pygmaea* and *Fuirena scirpoidea* were abundant and widespread. I also encountered two additional species that are state-tracked that were not on the original target species list: *Asclepius pedicillata* and *Rhexia nuttallii* (Table 1), with *Rhexia nuttallii* being abundant and widespread. I documented two species that are listed and under the GA Wildflower Preservation Act: *Sarracenia minor* and *Sarracenia psitticina* (Table 1 and Figures 1-4). I failed to detect any plant species protected or proposed for protection under the federal Endangered Species Act. Because there were records of four other state-tracked species near to the proposed project site, I added them to the target species list: *Epidendrum magnolia*, *Platanthera chapmanii*, *Platanthera integra*, and *Platanthera nivea*. I did not observe any of those species within the proposed project area.

Although not exhaustive, I compiled a general list of plant species encountered on site as I opportunistically observed them (Table 3.) The list includes 104 species, mostly forbs that I was able to identify in the field or that I identified using a scope and 'Weakley's Flora.'

References

ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

Georgia Department of Natural Resources Wildlife Resources Division. Georgia Biodiversity Portal. <<https://georgiabiodiversity.org/>> *Accessed 29 October 2019.*

U.S. Army Corps of Engineers. Permit application # SAS-2018-000554.

U.S.D.A. Natural Resources Conservation Service. Web Soil Survey. <<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>> *Accessed 29 October 2019.*

U.S. Fish and Wildlife Service. Environmental Conservation Online System. << https://ecos.fws.gov/ecp/>> *Accessed 29 October 2019.*

U.S. Fish and Wildlife Service. National Wetlands Inventory. Wetlands Data. <<https://www.fws.gov/wetlands/data/Data-Download.html>> *Accessed 29 October 2019.*

Weakley, A.S. 2015. Flora of the Southern and Mid-Atlantic States.

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Table 1. Target plant species 2019. # occurrences = documented on proposed mine site. Protection status: GA tracked = not listed; U.S. petitioned/under review = candidate species for protection under U.S. Endangered Species Act; GA unusual, threatened or rare = listed under GA Wildflower Preservation Act. Added by (entity who added the species to the target species list): JMK = J.M. Klaus Conservation Services/Terra-Ignea Enterprises; GA DNR = Georgia Department of Natural Resources; US FWS = U.S. Fish and Wildlife Service.

Scientific name	Common name	# occurrences	Protection status	Flower/fruit time	Added by
Asclepias pedicellata	Savannah Milkweed	9	GA tracked	July-August	JMK
Asimina pygmaea	Dwarf Pawpaw	413	GA tracked	April-July	GA DNR
Balduina atropurpurea	Purple honeycomb-head	0	U.S. petitioned/under review	August-November	US FWS
Coreopsis integrifolia	Floodplain tickseed	0	U.S. petitioned/under review	August-November	US FWS
Ctenium floridanum	Florida Orange-grass	0	GA tracked	June-October	GA DNR
Epidendrum magnoliae	Green-fly orchid	0	GA unusual	June-July	JMK
Fuirena scirpoidea	Southern Umbrella-sedge	206	GA tracked	July-November	GA DNR
Galactia floridana	Florida Milk-pea	0	GA tracked	June-September	GA DNR
Gymnopogon chapmanianus	Chapman's Skeleton Grass	0	GA tracked	August-November	GA DNR
Hartwrightia floridana	Hartwrightia	0	U.S. petitioned/under review	July-December	US FWS
Justicia angusta	Narrowleaf Water-willow	0	GA tracked	March-November	GA DNR
Lachnocaulon beyrichianum	Southern Bog-button	0	GA tracked	May-October	GA DNR
Litsea aestivalis	Pond Spice	0	GA rare	March-May	GA DNR
Palafoxia integrifolia	Palafoxia	0	GA tracked	August-November	GA DNR
Peltandra sagittifolia	Arrow Arum	0	GA tracked	July-September	GA DNR
Piloblephis rigida	Pennyroyal	0	GA tracked	January-December	GA DNR
Platanthera chapmanii	Chapman's fringed orchid	0	GA tracked	July-September	JMK
Platanthera integra	Yellow fringeless orchid	0	GA tracked	July-September	JMK
Platanthera nivea	Snowy orchid	0	GA tracked	June	JMK
Pteroglossaspis ecristata	Wild Coco	0	GA threatened	June-October	GA DNR
Quercus chapmanii	Chapman Oak	4	GA tracked	September-December	GA DNR
Rhexia nuttallii	Nutall meadowbeauty	253	GA tracked	June	JMK
Rhynchospora fernaldii	Fernald's Beakrush	0	GA tracked	June-January	GA DNR
Sarracenia minor var. minor	Hooded Pitcherplant	78	GA unusual	April-June	GA DNR
Sarracenia psittacina	Parrot Pitcherplant	8	GA threatened	March-July	GA DNR
Schoenolirion albiflorum	White Sunnybell	0	GA tracked	May-June	GA DNR
Scutellaria arenicola	Sandhill Skullcap	0	GA tracked	May-September	GA DNR
Spiranthes floridana	Florida Ladies-tresses	0	GA tracked	April-June	GA DNR
Sporobolus teretifolius	Wireleaf dropseed	0	GA tracked	July-October	GA DNR
Stokesia laevis	Stokes Aster	0	GA tracked	June-September	GA DNR
Tephrosia chrysophylla	Sprawling Goats Rue	0	GA tracked	April-November	GA DNR
Tillandsia bartramii	Bartram's Air-plant	29	GA tracked	June-September	GA DNR
Verbesina heterophylla	Diverse-leaf Crownbeard	0	GA tracked	April-July	GA DNR

Table 2. Scoring system for wetlands.

	1	2	3
Hydrology	Intact	Some degradation, easily restored	Severely degraded, restoration difficult
Fire	Frequent	Evidence of some past fire suppression	Evidence of severe fire suppression
Graminoids	Abundant	Some	Sparse or none
Midstory	Sparse	Patchy	Dense throughout basin
Canopy	< 50% closed	> 50% closed	Complete closure
Upland	Intact	Ditched & bedded, low groundcover quality	Severely degraded, low groundcover quality

Table 3. All plants identified during 2019 surveys (not an exhaustive plant list).

Scientific name	**Scientific name**	**Scientific name**	**Scientific name**	**Scientific name**
Acer rubrum	*Crotalaria maritima*	*Lachnanthes caroliniana*	*Polygala lutea*	*Scutellaria integrifolia*
Aletris lutea	*Cyrilla racemosa*	*Lachnocaulon anceps*	*Polygala nana*	*Serenoa repens*
Anchistia virginica	*Eleocharis sp.*	*Leucothoe axillaris*	*Pteridium aquilinum*	*Seymeria cassoides*
Andropogon virginicus	*Erigeron philadelphicus*	*Liatris tennuifolia*	*Pterocaulon pycnostachyum*	*Smilax auriculata*
Aristida spiciformis	*Eryngium integrifolium*	*Lobelia glandulosa*	*Quercus chapmanii*	*Smilax bona-nox*
Asclepius cinerea	*Eupatorium capillifoloium*	*Lyonia ferruginea*	*Quercus laurifolia*	*Smilax glauca*
Asclepius connivens	*Euthamia caroliniana*	*Lyonia fruticosa*	*Quercus myrtifolia*	*Smilax laurifolia*
Asclepius pedicellata	*Fuirena scirpoidea*	*Lyonia lucida*	*Quercus virginiana*	*Solidago sp.*
Asimina incana	*Galactia regularis*	*Magnolia virginica*	*Rhexia nuttallii*	*Sophronanthe hispida*
Asimina pygmaea	*Gelsemium sempervirens*	*Mikania scandens*	*Rhexia sp.*	*Stipulicida setacea*
Baccharis halimifolia	*Gordonia lasianthus*	*Myrica caroliniensis*	*Rhododenron canescens*	*Tephrosia spicata*
Balduina angustifolia	*Helenium vernale*	*Nyssa biflora*	*Rhododenron viscosum*	*Tillandsia bartramii*
Balduina uniflora	*Hypericum brachyphyllum*	*Onoclea sensibilis*	*Rhus copellinum*	*Trichostema sp.*
Bejaria racemosa	*Hypericum sp.*	*Panicum hemitomon*	*Rhynchospora latifolia*	*Trilisa ordoratissima*
Bidens mitis	*Hypericum tetrapetalum*	*Persea palustris*	*Sabatia brachiata*	*Typha sp.*
Calopogon pallidus	*Hypoxis sp.*	*Physostegia virginiana*	*Sabatia dodecandra*	*Vaccinium arboreum*
Carphephorus corymbosus	*Ilex coriacea*	*Pinguicula cerulea*	*Sabatia macrophylla*	*Vaccinium myrsinites*
Cleistesiopsis divaricata	*Ilex glabra*	*Pinus elliotii*	*Sagittaria sp.*	*Vaccinium stamineum*
Clethra alnifolia	*Iris virginica*	*Pinus pallustris*	*Salix sp.*	*Vitis sp.*
Cliftonia monophylla	*Juncus polycephalos*	*Pluchea odorata*	*Sarracenia minor*	*Wisteria frutescens*
Acer rubrum	*Kalmia hirsuta*	*Polygala cruciata*	*Sarracenia psitticina*	

Figure 1. Twin Pines 2019 proposed mining project area with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

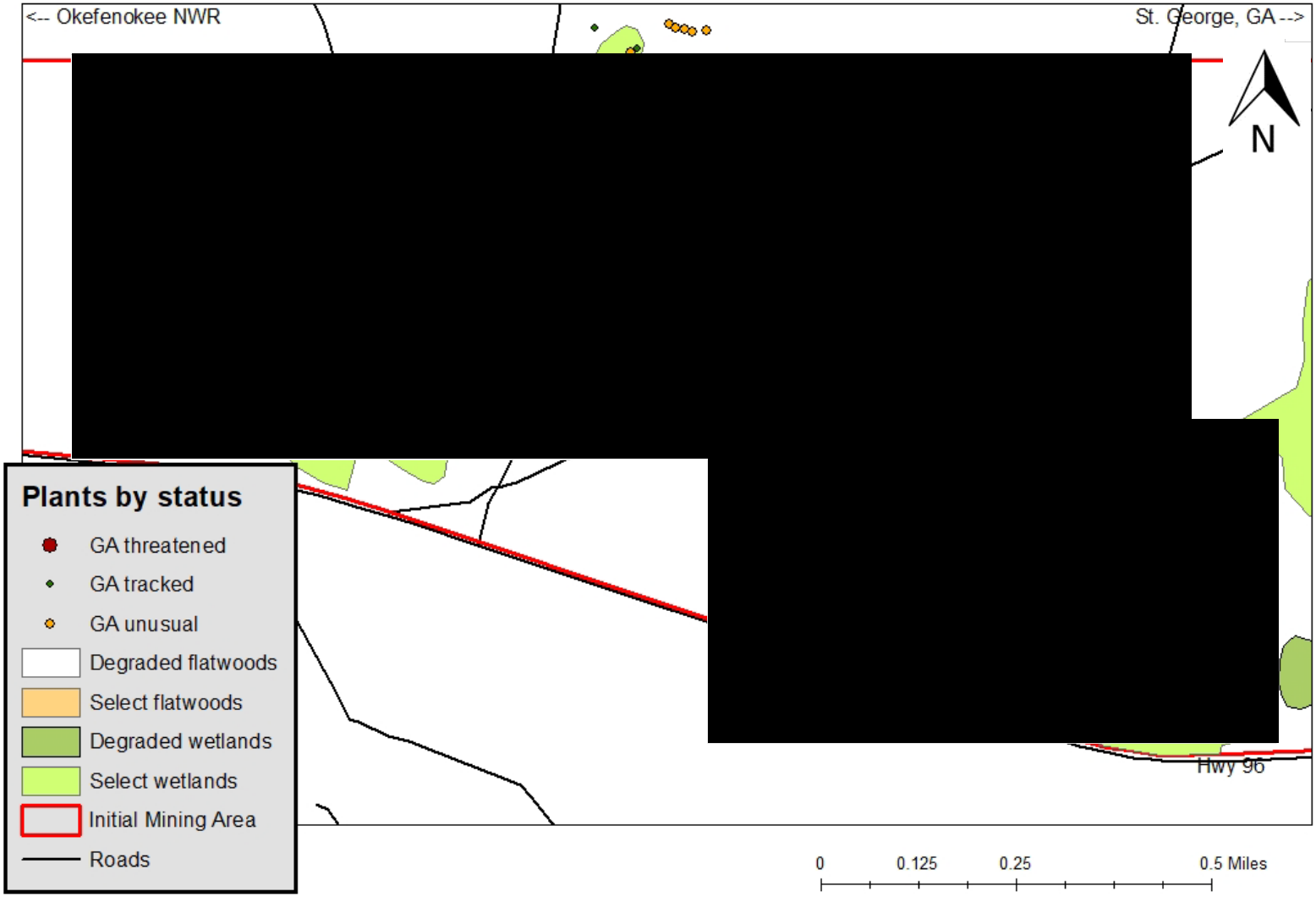

Figure 2. Twin Pines 2019 proposed mining project area, western section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

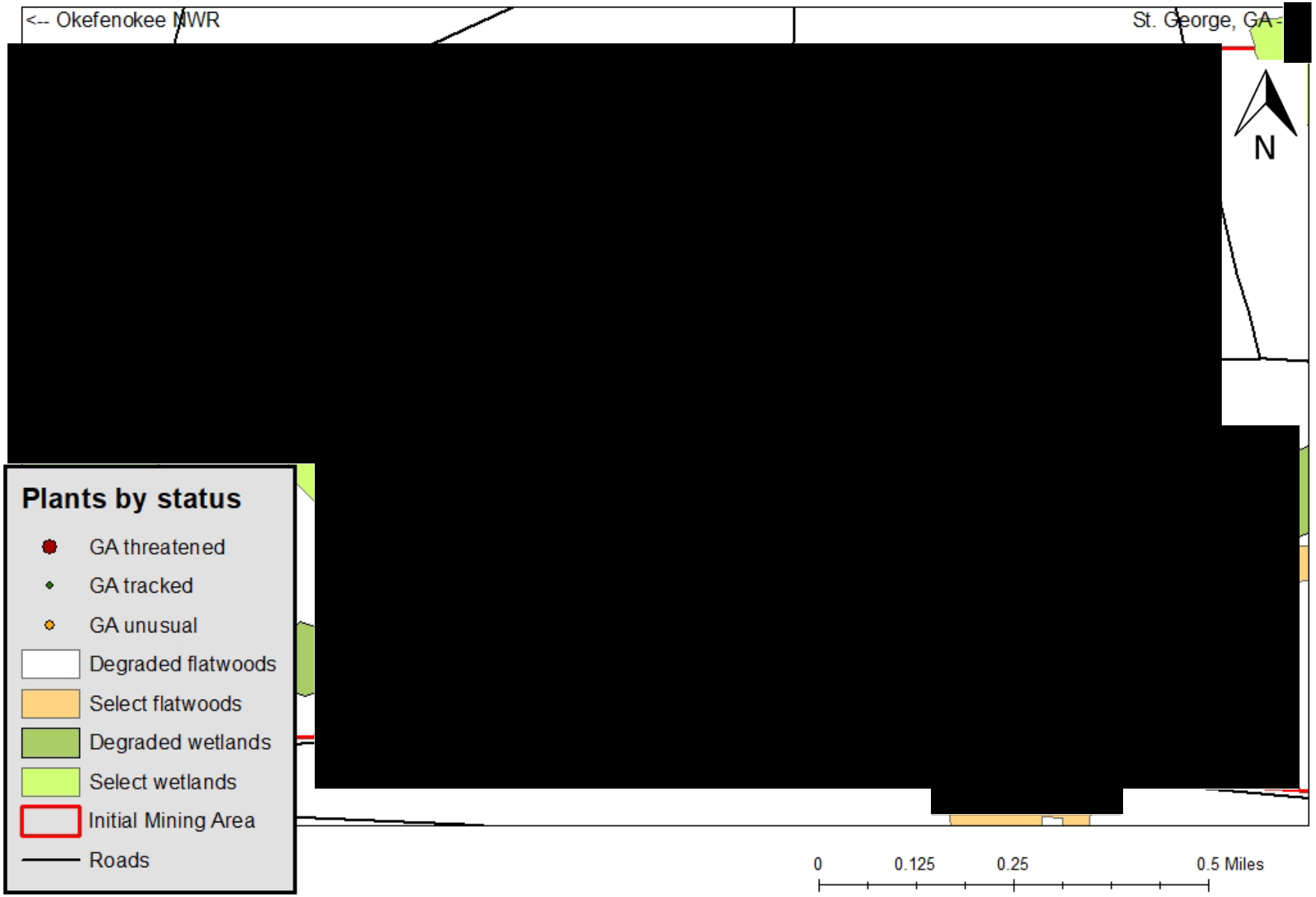

Figure 3. Twin Pines 2019 proposed mining project area central section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

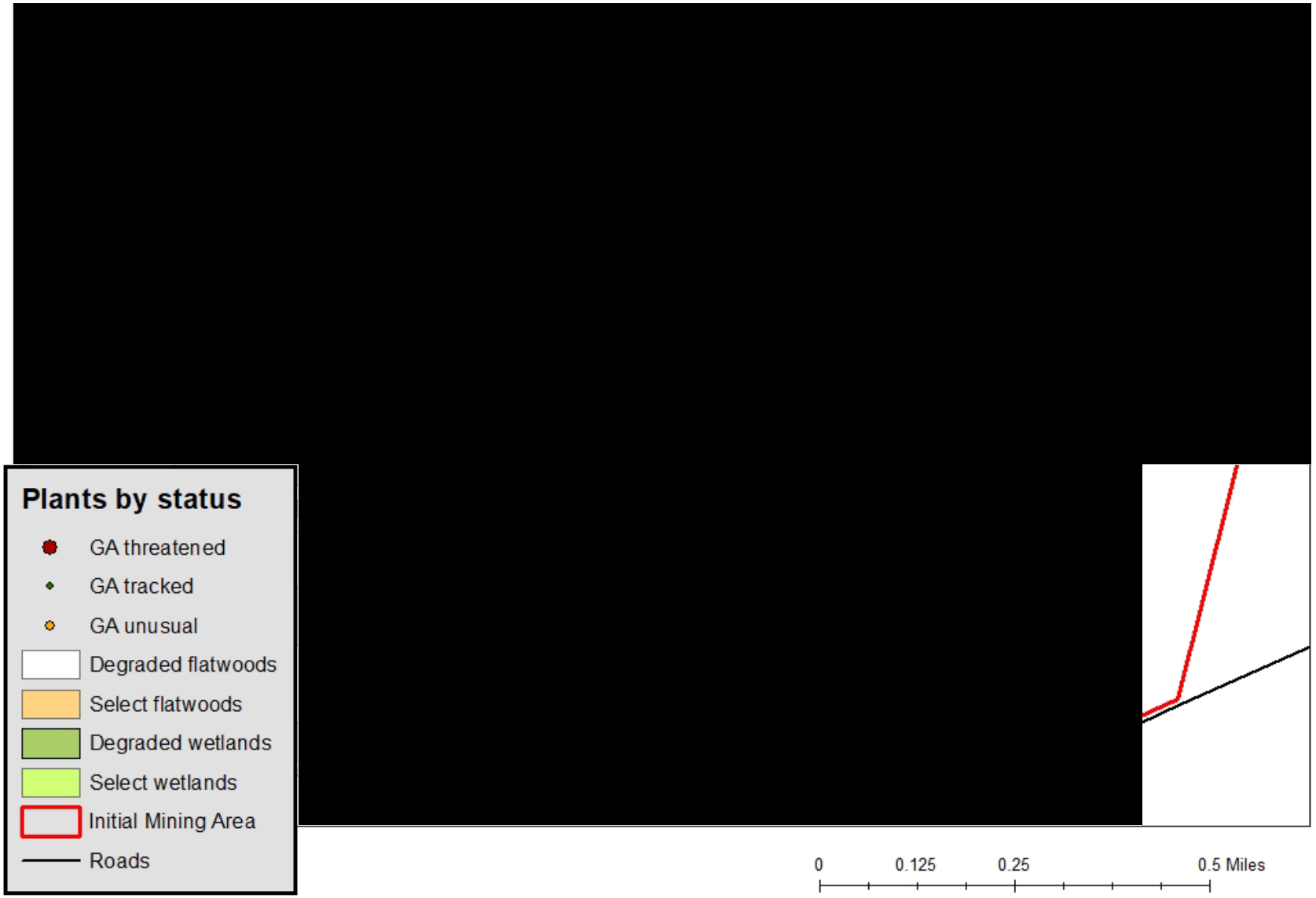

Figure 4. Twin Pines 2019 proposed mining project area eastern section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

Figure 5. Typical post-wildfire salvage-logged upland habitat. Dominant groundcover is dense *Andropogon virginicus*, a species common on agricultural sites (i.e. 'old fields') and a symptom of past intensive silvicultural activity.

Figure 6. Typical upland habitat that escaped wildfire and has not been recently logged. This was likely the condition of most of the proposed project site before the 2017 wildfire. The dominant midstory/groundcover is *Serenoa repens*, a symptom of long-term fire suppression and intense herbicide use. This density of midstory structure precludes establishment or persistence of herbaceous species.

Figure 7. Fresh mechanical site preparation showing disturbance to soil and groundcover.

Figure 8. Young planted *Pinus elliotii* and rank *Andropogon sp.* in uplands/flatwoods precludes establishment or persistence of other herbaceous groundcover.

Figure 9. Typical degraded wetland habitat impacted by silviculture and wildfire, and dominated by dense shrubs, especially *Lyonia sp.* and *Cyrilla racemifolora*, with few herbaceous areas.

Figure 10. Many of the more herbaceous wetlands were impacted by feral swine. This image is typical of the damage caused by these pests that are abundant in the project area.

Figure 11. Every wetland in the proposed project area was impacted by intensive silvicultural activity. This is typical of the hydrologic impacts caused by mechanical site preparation (ditching and bedding) and planting pines. The area in the center is a planting bed and more open water areas on either side are ditches up to 0.5 m deep.

Table 2. Frosted Flatwoods Salamander Survey Data

Pond Code	Survey Dates	Personnel	Dipnet Hours	Trap-Nights	Vegetation Sampled[1]	Amphibians Observed[2]
KEYSTONE						
KE-02	2/28-3/1/2019	ds, jk, ct	1.5	16	1	RSPH (L), AGRY (A), POCU (A), HFEM (A), EQUA (L)
KE-05	2/26-2/27/2019	ds, jk, ct	1.5	16	1, 2, 3, 4, 5, 6	RSPH (L), AGRY (A), EQUA (L)
KE-07	2/26-2/27/2019	ds, jk, ct	1.5	16	1, 2, 3, 4, 5, 6	RSPH (A, L), AGRY (A), POCU (A), RGRY (A)
KE-09	2/27-2/28/2019	ds, jk, ct	1.5	24	1, 4, 5, 6	RSPH (L)
KE-11	2/27-2/28/2019	ds, jk, ct	2	12	1, 2, 3, 4, 5, 6	RSPH (L), AGRY (A), EQUA (L), ATER (A), AQUE (A)
KE-13	2/27/2019	ds, jk, ct	1.5	0	5	RSPH (L), POCU (L)
LONCALA						
LO-01	2/28-3/1/2019	ds, jk, ct	1	12	1, 5	RSPH (L), HFEM (A)
LO-02	2/28-3/1/2019	ds, jk, ct	1	12	1	RSPH (L), EQUA (L)
ADIROND						
AD-01	3/7-3/8/2019	ds, jk, cs	1.5	12	2, 4, 5, 6	RSPH (E, L), AGRY (A), EQUA (L)
AD-04	3/7-3/8/2019	ds, jk, cs	1.5	12	2, 3, 4, 5, 6	POCU (L)
AD-07	3/7-3/8/2019	ds, jk, cs	1.25	14	1, 2, 4, 5	RSPH (A, L), EQUA (L)
TIAA						
TI-09	3/8-3/9/2019	ds, jk, cs	1.5	29	1	RSPH (L), HCIN (A), EQUA (L), SINT (A)

[1]1=Carex; 2=Panicum; 3=Rhynchospora; 4=Eriocaulon; 5=Sphagnum; 6=Xyris

[2]E=Egg mass; L=Larva; A=Adult
AGRY (Acris gryllis); EQUA (Eurycea quadrigitata); HCIN (Hyla cinerea); HFEM (Hyla femoralis); POCU (Pseudacris ocularis); RGRY (Rana grylio); RSPH (Rana sphenocephala); SINT (Siren intermedia); ATER (Anaxyrus terrestris); AQUE (Anaxyrus quercicus)

Table 3: Amphibians, Reptiles and Fishes Observed at Frosted Flatwoods Salamander Survey Sites

Wetland Site Code	K-02	K-05	K-07	K-09	K-11	K-13	L-01	L-02	A-01	A-04	A-07	T-09
SALAMANDERS												
dwarf salamander (*Eurycea quadridigitata*)	L	L			L			L	L		L	L
lesser siren (*Siren intermedia*)												A
ANURANS[1]												
southern toad (*Anaxyrus terrestris*)					A							
oak toad (*Anaxyrus quercicus*)					A							
southern cricket frog (*Acris gryllus*)	A	A	A		A				A		A	
little grass frog (*Pseudacris ocularis*)	A		A			L				L		
pinewoods treefrog (*Hyla femoralis*)	A						A					
green treefrog (*Hyla cinerea*)												A
pig frog (*Rana grylio*)			A									
southern leopard frog (*Rana sphenocephala*)	L	L	A, L	L	L	L	L	L	E, L		A, L	L
SNAKES												
banded watersnake (*Nerodia fasciata*)									X			X
black swampsnake (*Liodytes pygaea*)							X					
eastern ribbonsnake (*Thamnophis sauritus*)				X					X			
cottonmouth (*Agkistrodon piscivorus*)											X	
FISHES												
eastern mudminnow (*Umbra pygmaea*)							X	X				
redfin pickerel (*Esox americanus*)	X		X	X			X					X
redface topminnow (*Fundulus rubrifrons*)	X	X			X							X
pygmy killifish (*Leptolucania ommata*)												X
eastern mosquitofish (*Gambusia holbrooki*)	X	X	X	X	X		X	X			X	X
warmouth (*Lepomis gulosus*)											X	

Table 3: Amphibians, Reptiles and Fishes Observed at Frosted Flatwoods Salamander Survey Sites (Continued)

banded sunfish (*Enneacanthus obesus*)	X	X	X		X	X	X	X
pygmy sunfish (*Elassoma* sp.)	X							X
mud sunfish (*Acantharcus pomotis*)								X

[1]E = Eggs; L = Larvae; A = Adult, X=Species observed

Table 4. Eastern Indigo Snake Survey Data: Twin Pines Site, Charlton County, Georgia

Site	Survey #	Date	Time	Tortoise Burrows Surveyed	Weather	Results
ADIROND						
Adirondack	1	3/6-3/7/2019	1000-1600	8	sunny, clear 70 F	no indigo snakes found
Adirondack	2	3/19/2019	1550-1630	8	very cloudy, 62 F	no indigo snakes found
KEYSTONE						
Keystone A	1	12/17/2018	1140-1255	5	calm, partly cloudy, 57-60 F	no indigo snakes found, pigmy rattlesnake, burrow 01
Keystone A	2	1/18/2019	1030-1055	5	calm, mostly sunny, 64 F	no indigo snakes found
Keystone A	3	2/26/2019	1130-1200	5	cloudy, warm 68 F	no indigo snakes found
Keystone B	1	12/17/2018	1415-1636	40	calm, mostly cloudy, 61-64 F	no indigo snakes found, gopher frog, burrow 03; e. coachwhip shed, burrow 04
Keystone B	2	1/18/2019	1130-1340	40	calm, mostly sunny, 70 F	no indigo snakes found
Keystone B	3	2/26/2019	1500-1630	40	cloudy, warm 74 F	no indigo snakes found, gopher frog, burrow 02
LONCALA						
Loncala A	1	12/18/2018	1022-1142	22	calm, mostly sunny, 62-64 F	no indigo snakes found
Loncala A	2	1/17/2019	1500-1600	22	calm, sunny, 67 F	no indigo snakes found
Loncala A	3	2/26/2019	1230-1300	22	cloudy, warm 70 F	no indigo snakes found
Loncala B	1	12/18/2018	1216-1408	19	calm, mostly sunny, 67 F	no indigo snakes found
Loncala B	2	1/17/2019	1145-1420	19	calm, mostly sunny, 63 F	no indigo snakes found
Loncala B	3	2/26/2019	1310-1340	19	cloudy, warm 70 F	no indigo snakes found
Loncala C	1	12/18/2018	1452-1503	3	calm, mostly sunny, 68 F	no indigo snakes found
Loncala C	2	1/17/2019	1430-1450	3	calm, mostly sunny, 65 F	no indigo snakes found
Loncala C	3	2/26/2019	1345-1400	3	cloudy, warm 72 F	no indigo snakes found
Loncala D	1	2/26/2019	1405-1435	21	cloudy, warm 72 F	no indigo snakes found
Loncala D	2	3/19/2019	1430-1530	21	very cloudy, 62 F	no indigo snakes found

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
ADIRON							
4/3/2019	A-01	[redacted]	INACTIVE	21	SUBADULT	No	
4/3/2019	A-02	[redacted]	ACTIVE	25	SUBADULT	Yes	pine snake
4/3/2019	A-03	[redacted]	INACTIVE	21	SUBADULT	Yes	
4/3/2019	A-04	[redacted]	INACTIVE	31.5	ADULT	No	
4/3/2019	A-05	[redacted]	ACTIVE	11.5	SUBADULT	Undet.	
4/3/2019	A-06	[redacted]	ACTIVE	33	ADULT	Yes	
4/3/2019	A-07	[redacted]	INACTIVE	27.5	ADULT	No	gopher frog
4/3/2019	A-08	[redacted]	INACTIVE	11	SUBADULT	Undet.	
KEYSTONE							
4/3/2019	K-A-01	[redacted]	ACTIVE	32.5	ADULT	No	
4/3/2019	K-A-02	[redacted]	ACTIVE	35	ADULT	No	
4/3/2019	K-A-03	[redacted]	ACTIVE	35.5	ADULT	Yes	
4/3/2019	K-A-04	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/3/2019	K-A-05	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-01	[redacted]	INACTIVE	30	ADULT	Yes	
4/4/2019	K-B-02	[redacted]	ACTIVE	19.5	SUBADULT	No	
4/4/2019	K-B-03	[redacted]	INACTIVE	9	SUBADULT	Undet.	
4/4/2019	K-B-04	[redacted]	INACTIVE	9	SUBADULT	Undet.	
4/4/2019	K-B-05	[redacted]	INACTIVE	26	ADULT	No	
4/4/2019	K-B-06	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-07	[redacted]	INACTIVE	26	ADULT	Yes	
4/4/2019	K-B-08	[redacted]	ACTIVE	13	SUBADULT	Yes	
4/4/2019	K-B-09	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-10	[redacted]	ABAN (ACT)	N/A	JUVENILE	No	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/4/2019	K-B-11	[redacted]	INACTIVE	22	SUBADULT	No	
4/4/2019	K-B-12	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-13a	[redacted]	INACTIVE	37	ADULT	Yes	
4/4/2019	K-B-13b	[redacted]	INACTIVE	22	SUBADULT	No	
4/4/2019	K-B-14	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-15	[redacted]	INACTIVE	13.5	SUBADULT	Yes	
4/4/2019	K-B-16	[redacted]	INACTIVE	24	SUBADULT	No	
4/4/2019	K-B-17	[redacted]	ACTIVE	33	ADULT	Yes	
4/4/2019	K-B-18	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-19	[redacted]	ACTIVE	31	ADULT	No	
4/4/2019	K-B-20	[redacted]	ACTIVE	30	ADULT	Yes	
4/4/2019	K-B-21	[redacted]	ACTIVE	13	SUBADULT	Yes	
4/4/2019	K-B-22	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/4/2019	K-B-23	[redacted]	INACTIVE	32	ADULT	No	
4/4/2019	K-B-24	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-25	[redacted]	ACTIVE	16.5	SUBADULT	Yes	
4/4/2019	K-B-26	[redacted]	ACTIVE	12	SUBADULT	Yes	
4/4/2019	K-B-27	[redacted]	ACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-28	[redacted]	ACTIVE	25.5	SUBADULT	Yes	
4/4/2019	K-B-35	[redacted]	INACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-36	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/4/2019	K-B-37	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/4/2019	K-B-38	[redacted]	ACTIVE	12	SUBADULT	Undet.	
4/4/2019	K-B-39	[redacted]	ACTIVE	12	SUBADULT	Undet.	
LONCALA							
4/2/2019	L-A-01	[redacted]	ACTIVE	36	ADULT	Yes	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/2/2019	L-A-02	[redacted]	INACTIVE	26	ADULT	No	
4/2/2019	L-A-03	[redacted]	INACTIVE	35	ADULT	No	
4/2/2019	L-A-04	[redacted]	INACTIVE	32	ADULT	No	
4/2/2019	L-A-05	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/2/2019	L-A-06	[redacted]	INACTIVE	29.5	ADULT	No	
4/2/2019	L-A-07	[redacted]	ACTIVE	11.2	SUBADULT	Undet.	
4/2/2019	L-A-08	[redacted]	INACTIVE	29.6	ADULT	No	
4/2/2019	L-A-09	[redacted]	INACTIVE	34	ADULT	No	
4/2/2019	L-A-10	[redacted]	ACTIVE	40.2	ADULT	Yes	gopher frog
4/2/2019	L-A-11	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/2/2019	L-A-12	[redacted]	ACTIVE	34.2	ADULT	Yes	
4/2/2019	L-A-13	[redacted]	ACTIVE	13	SUBADULT	Undet.	
4/2/2019	L-A-14	[redacted]	INACTIVE	22	SUBADULT	No	
4/2/2019	L-A-15	[redacted]	ACTIVE	33	ADULT	Yes	gopher frog
4/2/2019	L-A-16	[redacted]	INACTIVE	26.5	ADULT	No	
4/2/2019	L-A-17	[redacted]	INACTIVE	29.7	ADULT	No	
4/2/2019	L-A-18	[redacted]	INACTIVE	30.5	ADULT	No	
4/2/2019	L-A-19	[redacted]	ACTIVE	34	ADULT	Yes	
4/2/2019	L-A-20	[redacted]	ABAN (INA)	N/A	SUBADULT	No	
4/2/2019	L-A-21	[redacted]	INACTIVE	29.2	ADULT	No	
4/2/2019	L-A-22	[redacted]	ABAN (INA)	N/A	ADULT	No	
4/3/2019	L-B-01	[redacted]	INACTIVE	31.5	ADULT	No	
4/3/2019	L-B-02	[redacted]	INACTIVE	28	ADULT	No	
4/3/2019	L-B-03	[redacted]	INACTIVE	33	ADULT	No	
4/3/2019	L-B-04	[redacted]	INACTIVE	24	SUBADULT	No	
4/3/2019	L-B-05	[redacted]	INACTIVE	33.5	ADULT	No	
4/3/2019	L-B-06	[redacted]	INACTIVE	32	ADULT	No	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/3/2019	L-B-07	[redacted]	ACTIVE	34.5	ADULT	Yes	
4/3/2019	L-B-08	[redacted]	ACTIVE	35	ADULT	No	
4/3/2019	L-B-09	[redacted]	INACTIVE	37.5	ADULT	No	
4/3/2019	L-B-10	[redacted]	ACTIVE	13	SUBADULT	Undet.	
4/3/2019	L-B-11	[redacted]	ACTIVE	11	SUBADULT	Undet.	gopher frog
4/3/2019	L-B-12	[redacted]	INACTIVE	35	ADULT	No	
4/3/2019	L-B-13	[redacted]	ACTIVE	35	ADULT	Yes	
4/3/2019	L-B-14	[redacted]	ACTIVE	30.5	ADULT	Yes	
4/3/2019	L-B-15	[redacted]	INACTIVE	29.5	ADULT	No	
4/3/2019	L-B-16	[redacted]	INACTIVE	32	ADULT	No	
4/3/2019	L-B-17	[redacted]	INACTIVE	33	ADULT	No	
4/3/2019	L-B-18	[redacted]	ACTIVE	32	ADULT	Yes	
4/3/2019	L-B-19	[redacted]	INACTIVE	15.5	SUBADULT	Undet.	
4/3/2019	L-C-01	[redacted]	ABAN (INA)	N/A	JUVENILE	No	
4/3/2019	L-C-02	[redacted]	INACTIVE	29	ADULT	No	
4/3/2019	L-C-03	[redacted]	ACTIVE	38.5	ADULT	Yes	
4/2/2019	L-D-01	[redacted]	ACTIVE	30	ADULT	Yes	
4/2/2019	L-D-02	[redacted]	INACTIVE	28	ADULT	No	
4/2/2019	L-D-03	[redacted]	INACTIVE	43	ADULT	No	
4/2/2019	L-D-04	[redacted]	INACTIVE	28	ADULT	No	
4/2/2019	L-D-05	[redacted]	INACTIVE	24	SUBADULT	No	
4/2/2019	L-D-06	[redacted]	ACTIVE	32.5	ADULT	Yes	
4/2/2019	L-D-07	[redacted]	ACTIVE	23	SUBADULT	Yes	
4/2/2019	L-D-08	[redacted]	ACTIVE	29	ADULT	Yes	
4/2/2019	L-D-09	[redacted]	INACTIVE	20	SUBADULT	Undet.	
4/2/2019	L-D-10	[redacted]	ACTIVE	33.5	ADULT	Yes	
4/2/2019	L-D-11	[redacted]	ACTIVE	14	SUBADULT	Yes	

Table 5. Gopher Tortoise Survey Data, Twin Pines Site, Charlton Co., GA

Date	Site-No.	Latitude, Longitude	Activity Status Active/Inact/Ab[1]	Burrow Width (cm)	Size Class	Tortoise Observed (Yes/No/Undet.)	Commensal Species Observed
4/2/2019	L-D-12	[redacted]	ACTIVE	31	ADULT	Yes	
4/2/2019	L-D-13	[redacted]	INACTIVE	25	SUBADULT	Yes	
4/2/2019	L-D-14	[redacted]	ACTIVE	35.5	ADULT	No	
4/2/2019	L-D-15	[redacted]	INACTIVE	41.5	ADULT	No	
4/3/2019	L-D-16	[redacted]	INACTIVE	32.5	ADULT	No	
4/3/2019	L-D-17	[redacted]	INACTIVE	37.5	ADULT	Undet.	
4/3/2019	L-D-18	[redacted]	ACTIVE	6	JUVENILE	Yes	
4/3/2019	L-D-19	[redacted]	ACTIVE	6	JUVENILE	Undet.	
4/3/2019	L-D-20	[redacted]	ACTIVE	7.5	JUVENILE	Undet.	
4/3/2019	L-D-21	[redacted]	ACTIVE	43.5	ADULT	Yes	

[1]ABA (ACT) and ABA (INA) indicate burrows that were abandoned when visited in April 2019 but had been classifies as Active (ACT) or Inactive (INA) in November 2018.

Appendix 1: Amphibian/Reptile Species List for Twin Pines, Charlton County, Georgia
A= Adirondack, K = Keystone, L = Loncala, T = Tia Tract

Reptiles

American Alligator	*Alligator mississippiensis*	L, T
Gopher Tortoise	*Gopherus polyphemus*	A, K, L
Coastal Plain Cooter	*Pseudemys floridana*	L
Eastern Box Turtle	*Terrapene carolina*	A
Eastern Glass Lizard	*Ophisaurus ventralis*	T
Green Anole	*Anolis carolinensis*	A, K, L, T
Fence Lizard	*Sceloporus undulatus*	A, K
Southeastern Five-lined Skink	*Plestiodon inexpectatus*	K
Broadhead Skink	*Plestiodon laticeps*	K, L
Ground Skink	*Scincella lateralis*	K, L
Six-lined Racerunner	*Aspidoscelis sexlineata*	A, L
Eastern Garter Snake	*Thamnophis sirtalis*	K, L
Eastern Ribbon Snake	*Thamnophis sauritus*	A, K, T
Banded Watersnake	*Nerodia fasciata*	A, T
Black Swampsnake	*Liodytes pygaea*	L
Black Racer	*Coluber constrictor*	A, K, L, T
Eastern Coachwhip	*Coluber flagellum*	K
Rough Greensnake	*Opheodrys aestivus*	A, T
Florida Pine Snake	*Pituophis melanoleucus*	A, K
Corn Snake	*Pantherophis guttatus*	A, K
Scarlet Kingsnake	*Lampropeltis elapsoides*	K, L
Cottonmouth	*Agkistrodon piscivorous*	A, L, T
Pygmy Rattlesnake	*Sistrurus miliarius*	A, K, L, T
Timber Rattlesnake	*Crotalus horridus*	A

Amphibians

Dwarf Salamander	*Eurycea quadridigitata*	A, K, L, T
Lesser Siren	*Siren intermedia*	T
Two-toed Amphiuma	*Amphiuma means*	A
Southern Toad	*Anaxyrus terrestris*	A, K, L
Oak Toad	*Anaxyrus quercicus*	K, L
Southern Cricket Frog	*Acris gryllus*	A, K, L, T
Little Grass Frog	*Pseudacris ocularis*	A, K
Pinewoods Treefrog	*Hyla femoralis*	A, K, L, T
Green Treefrog	*Hyla cinerea*	K, T
Gopher Frog	*Rana capito*	A, K, L
Southern Leopard Frog	*Rana sphenocephala*	A, K, L, T
Bronze Frog	*Rana clamitans*	K
Bullfrog	*Rana catesbeiana*	K
Pig Frog	*Rana grylio*	K, L

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Results of Eastern Indigo Snake Surveys on the Twin Pines Site, Charlton County, Georgia: Year 2

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Results of Eastern Indigo Snake Surveys on the Twin Pines Site, Charlton County, Georgia: Year 2

In November-December 2019, I again conducted eastern indigo snake (*Drymarchon couperi*) surveys on the Twin Pines Site, Charlton County, Georgia.

Similar to my first round of indigo snake surveys (conducted December, 2018 – March, 2019 [see Stevenson, 2019]), these surveys followed the field methods described by Stevenson et al. (2003) and Bauder et al. (2017). Specifically, I conducted visual encounter surveys for indigo snakes overwintering in gopher tortoise colonies. I surveyed for basking indigo snakes, and for indigo snake shed skins, at/near all active/inactive gopher tortoise burrows on-site (*n* = 106 burrows) on three dates from 19 November – 18 December 2019. Approximately two weeks separated each survey event for each respective site. Maps of indigo snake survey areas and gopher tortoise burrow locations are provided.

On each indigo snake survey, each tortoise burrow was carefully examined for the presence of fresh snake tracks (if found, burrows with tracks are scoped with a gopher tortoise burrow camera in an effort to locate snakes resting deep inside the burrow). From 1-4 TTL biologists assisted me on these surveys.

No eastern indigo snakes or eastern indigo snake shed skins were found by my visual encounter surveys at the Twin Pines site, and no fresh snake tracks were located at burrows. A single pygmy rattlesnake (*Sistrurus miliarius*) and the shed skin of a Florida pinesnake (*Pituophis melanoleucus*) were observed (Table 1). No gopher frogs (*Rana capito*) were observed during these surveys.

A lack of indigo snake observations during focused surveys doesn't demonstrate that the species is never present or transient on the Twin Pines site (even if the species doesn't winter on-site it is possible that snakes from adjacent tracts, if present that is, may occasionally visit the Twins Pines site to forage). However, there are no recent credible sightings known for the property (i.e., from TTL and other staff who have spent considerable field time on-site) and my dedicated surveys during two consecutive years failed to locate the species.

Literature Cited

Bauder, J.M., D.J. Stevenson, C.S. Sutherland, and C.L. Jenkins. 2017. Occupancy of potential overwintering habitat on protected lands by two imperiled snake species in the Coastal Plain of the southeastern United States. Journal of Herpetology 51(1):73-88.

Stevenson, D.J. 2019. 2018−2019 Surveys for Protected Amphibians/Reptiles on the Twin Pines Site, Charlton County, Georgia. Unpubl. Report. 32 pp.

Stevenson, D.J., K.J. Dyer, and B.A. Willis-Stevenson. 2003. Survey and monitoring of the eastern indigo snake in Georgia. Southeastern Naturalist 2:393-408.

Education, Experience, Integrity in Applied Ecology and Conservation

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2019 Survey for Rare, Threatened and Endangered Plants

Twin Pines Mining Block 1

Charlton County, Georgia

FINAL REPORT

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2019 Survey for Rare, Threatened and Endangered Plants

Executive Summary

From January 2019 – December 2019 I conducted surveys for rare plants on approximately 2,424 acres of land in Charlton County, GA proposed for heavy mineral sands mining by Twin Pines Minerals, LLC (U.S. Army Corps of Engineers permit application # SAS-2018-00554). These surveys targeted plants listed or proposed to be listed under the federal Endangered Species Act as threatened or endangered, as well as plants listed under the Wildflower Preservation Act of Georgia as unusual, rare, threatened or endangered, and plants that are tracked by the state of GA Department of Natural Resources (GA DNR, Wildlife Resources Division, Wildlife Conservation Section). Uplands and wetlands on site were degraded by former silvicultural activity so I concentrated survey efforts in areas where habitat was most likely to harbor rare species (e.g. graminaceous wetlands, open sphagnum bogs, bayheads containing hardwood species, uplands where planting beds were eroded to some degree, uplands consisting of gopher tortoise-appropriate soils and uplands with minimal midstory density).

I detected six plant species that are tracked by GA DNR (*Asclepius pedicillata, Asimina pygmaea, Fuirena scirpoidea, Quercus chapmanii, Rhexia nuttallii, Tillandsia bartramii*), two species that are listed under the GA Wildflower Preservation Act (*Sarracenia minor, Sarracenia psitticina*), and no species that are federally listed or proposed to be listed under the Endangered Species Act. Of these, three tracked species (*Asimina pygmaea, Fuirena scirpoidea, Rhexia nuttallii*) were numerous and widespread where appropriate habitat was present.

Introduction

In 2018 Twin Pines Minerals LLC and TTL inc. (agent) consulted with federal and state agencies (U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Georgia Department of Natural Resources, and U.S. Environmental Protection Agency) as part of a preliminary planning process for a proposed 2,424 acre heavy mineral sands mining project on Trail Ridge east of Okefenokee National Wildlife Refuge in Charlton County, Georgia [U.S. Army Corps of Engineers permit application # SAS-2018-00554]. One outcome of the consultation was a request that threatened and endangered species surveys be conducted on the site prior to permit approvals. As an experienced botanist and ecologist with Terra-Ignea Enterprises LLC, I was subcontracted by TTL to conduct surveys for target plant species beginning January 2019 and concluding by December 2019.

Methods

U.S. Fish and Wildlife Service and Georgia Department of Natural Resources provided TTL with a list of target plant species with ranges overlapping the proposed mining tracts and for which habitat was likely to occur on the tracts. These included three candidate plant species proposed for listing under the Endangered Species Act (*Hartwrightia floridana, Coreopsis integrifolia, Balduina atropurpurea*). An additional 24 species of plants, either listed under the GA Wildflower Preservation Act or state-tracked, were added to the list by GA DNR botanists (Table 1), for a total of 27 target plant species that agencies requested be considered.

I assessed target plant species habitat availability and quality on the proposed mining area using satellite imagery, National Wetlands Inventory maps, topographic maps and soils maps followed by ground-truthing. Although the entire proposed project site has been severely impacted by prior silvicultural activity, I selected 450 acres of highest quality flatwoods available (uplands where planting beds were eroded to some degree, uplands consisting of gopher tortoise-appropriate soils and uplands with minimal midstory density, Figures 1-4) and surveyed all of that area despite habitat being marginal at best (pine planting beds up to 0.5 m high, obvious intensive prior herbicide treatment, severe 2017 wildfire effects and subsequent salvage logging, Figures 5-8). I walked on parallel transects that were approximately 50 m apart, with a TTL staff approximately 10 m to each side of me (three of us total), throughout the selected flatwoods

habitat during four separate survey periods to catch peak bloom time for all target plant species; survey periods were April 15-26, May 29-June 5, July 15-22 and October 7-14.

I identified 45 wetlands totaling approximately 472 acres for plant surveys using primarily satellite imagery. Three people (myself and two TTL staff) walked approximately 10 m apart around wetland ecotones to survey all 45 wetlands for target wetland plant species from April 15-26. Because many of the wetlands were in extremely degraded condition (mechanical site preparation for silviculture, planted with *Pinus elliotii*, disturbed by feral swine and severely impacted by wildfire as a result of long-term fire suppression, Figures 9-11), during the first survey I scored wetland characteristics (hydrology, fire, graminoids, midstory, canopy, surrounding upland) on a scale of 1-3, 1 being intact and 3 being severely degraded (Table 2). In subsequent survey periods, I only surveyed the 32 wetlands (329 acres) with a cumulative score < 12 and/or that had target species occurrences in the first survey. Subsequent survey periods for wetlands remaining in the survey were May 29-June 5, July 15-22 and October 7-14.

I recorded all plant locations using a Trimble R1 GNSS receiver with sub-meter accuracy and a Trimble Nomad 1050 handheld data collection device. If I could not identify species with 100% certainty in the field, I collected specimens and identified them with a dissecting microscope, using 'Flora of the Southern and Mid-Atlantic States' (Weakley 2015) as the authoritative reference.

I used geospatial software (ArcGIS) to map precise locations of all observed occurrences of target plant species (Figures 1-4) and summarized findings in an Excel database (Table 1). I shared all Excel database files, maps and GIS files with TTL staff.

Results

Within the proposed mining project boundary, as of August 2019, I documented a total of 1000 occurrences of target plants, with some of those occurrences representing single plants and some representing clusters of plants. I detected four target plant species that are tracked by GA DNR: *Asimina pygmaea, Fuirena scirpoidea, Quercus chapmanii* and *Tillandsia bartramii* (Table 1). Of these, *Asimina pygmaea* and *Fuirena scirpoidea* were abundant and widespread. I also encountered two additional species that are state-tracked that were not on the original target species list: *Asclepius pedicillata* and *Rhexia nuttallii* (Table 1), with *Rhexia nuttallii* being abundant and widespread. I documented two species that are listed and under the GA Wildflower Preservation Act: *Sarracenia minor* and *Sarracenia psitticina* (Table 1 and Figures 1-4). I failed to detect any plant species protected or proposed for protection under the federal Endangered Species Act. Because there were records of four other state-tracked species near to the proposed project site, I added them to the target species list: *Epidendrum magnolia*, *Platanthera chapmanii*, *Platanthera integra*, and *Platanthera nivea*. I did not observe any of those species within the proposed project area.

Although not exhaustive, I compiled a general list of plant species encountered on site as I opportunistically observed them (Table 3.) The list includes 104 species, mostly forbs that I was able to identify in the field or that I identified using a scope and 'Weakley's Flora.'

References

ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

Georgia Department of Natural Resources Wildlife Resources Division. Georgia Biodiversity Portal. <<https://georgiabiodiversity.org/>> *Accessed 29 October 2019.*

U.S. Army Corps of Engineers. Permit application # SAS-2018-000554.

U.S.D.A. Natural Resources Conservation Service. Web Soil Survey. <<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>> *Accessed 29 October 2019.*

U.S. Fish and Wildlife Service. Environmental Conservation Online System. << https://ecos.fws.gov/ecp/>> *Accessed 29 October 2019.*

U.S. Fish and Wildlife Service. National Wetlands Inventory. Wetlands Data. <<https://www.fws.gov/wetlands/data/Data-Download.html>> *Accessed 29 October 2019.*

Weakley, A.S. 2015. Flora of the Southern and Mid-Atlantic States.

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Table 1. Target plant species 2019. # occurrences = documented on proposed mine site. Protection status: GA tracked = not listed; U.S. petitioned/under review = candidate species for protection under U.S. Endangered Species Act; GA unusual, threatened or rare = listed under GA Wildflower Preservation Act. Added by (entity who added the species to the target species list): JMK = J.M. Klaus Conservation Services/Terra-Ignea Enterprises; GA DNR = Georgia Department of Natural Resources; US FWS = U.S. Fish and Wildlife Service.

Scientific name	Common name	# occurrences	Protection status	Flower/fruit time	Added by
Asclepias pedicellata	Savannah Milkweed	9	GA tracked	July-August	JMK
Asimina pygmaea	Dwarf Pawpaw	413	GA tracked	April-July	GA DNR
Balduina atropurpurea	Purple honeycomb-head	0	U.S. petitioned/under review	August-November	US FWS
Coreopsis integrifolia	Floodplain tickseed	0	U.S. petitioned/under review	August-November	US FWS
Ctenium floridanum	Florida Orange-grass	0	GA tracked	June-October	GA DNR
Epidendrum magnoliae	Green-fly orchid	0	GA unusual	June-July	JMK
Fuirena scirpoidea	Southern Umbrella-sedge	206	GA tracked	July-November	GA DNR
Galactia floridana	Florida Milk-pea	0	GA tracked	June-September	GA DNR
Gymnopogon chapmanianus	Chapman's Skeleton Grass	0	GA tracked	August-November	GA DNR
Hartwrightia floridana	Hartwrightia	0	U.S. petitioned/under review	July-December	US FWS
Justicia angusta	Narrowleaf Water-willow	0	GA tracked	March-November	GA DNR
Lachnocaulon beyrichianum	Southern Bog-button	0	GA tracked	May-October	GA DNR
Litsea aestivalis	Pond Spice	0	GA rare	March-May	GA DNR
Palafoxia integrifolia	Palafoxia	0	GA tracked	August-November	GA DNR
Peltandra sagittifolia	Arrow Arum	0	GA tracked	July-September	GA DNR
Piloblephis rigida	Pennyroyal	0	GA tracked	January-December	GA DNR
Platanthera chapmanii	Chapman's fringed orchid	0	GA tracked	July-September	JMK
Platanthera integra	Yellow fringeless orchid	0	GA tracked	July-September	JMK
Platanthera nivea	Snowy orchid	0	GA tracked	June	JMK
Pteroglossaspis ecristata	Wild Coco	0	GA threatened	June-October	GA DNR
Quercus chapmanii	Chapman Oak	4	GA tracked	September-December	GA DNR
Rhexia nuttallii	Nutall meadowbeauty	253	GA tracked	June	JMK
Rhynchospora fernaldii	Fernald's Beakrush	0	GA tracked	June-January	GA DNR
Sarracenia minor var. minor	Hooded Pitcherplant	78	GA unusual	April-June	GA DNR
Sarracenia psittacina	Parrot Pitcherplant	8	GA threatened	March-July	GA DNR
Schoenolirion albiflorum	White Sunnybell	0	GA tracked	May-June	GA DNR
Scutellaria arenicola	Sandhill Skullcap	0	GA tracked	May-September	GA DNR
Spiranthes floridana	Florida Ladies-tresses	0	GA tracked	April-June	GA DNR
Sporobolus teretifolius	Wireleaf dropseed	0	GA tracked	July-October	GA DNR
Stokesia laevis	Stokes Aster	0	GA tracked	June-September	GA DNR
Tephrosia chrysophylla	Sprawling Goats Rue	0	GA tracked	April-November	GA DNR
Tillandsia bartramii	Bartram's Air-plant	29	GA tracked	June-September	GA DNR
Verbesina heterophylla	Diverse-leaf Crownbeard	0	GA tracked	April-July	GA DNR

Table 2. Scoring system for wetlands.

	1	2	3
Hydrology	Intact	Some degradation, easily restored	Severely degraded, restoration difficult
Fire	Frequent	Evidence of some past fire suppression	Evidence of severe fire suppression
Graminoids	Abundant	Some	Sparse or none
Midstory	Sparse	Patchy	Dense throughout basin
Canopy	< 50% closed	> 50% closed	Complete closure
Upland	Intact	Ditched & bedded, low groundcover quality	Severely degraded, low groundcover quality

Table 3. All plants identified during 2019 surveys (not an exhaustive plant list).

Scientific name	**Scientific name**	**Scientific name**	**Scientific name**	**Scientific name**
Acer rubrum	*Crotalaria maritima*	*Lachnanthes caroliniana*	*Polygala lutea*	*Scutellaria integrifolia*
Aletris lutea	*Cyrilla racemosa*	*Lachnocaulon anceps*	*Polygala nana*	*Serenoa repens*
Anchistia virginica	*Eleocharis sp.*	*Leucothoe axillaris*	*Pteridium aquilinum*	*Seymeria cassoides*
Andropogon virginicus	*Erigeron philadelphicus*	*Liatris tennuifolia*	*Pterocaulon pycnostachyum*	*Smilax auriculata*
Aristida spiciformis	*Eryngium integrifolium*	*Lobelia glandulosa*	*Quercus chapmanii*	*Smilax bona-nox*
Asclepius cinerea	*Eupatorium capillifoloium*	*Lyonia ferruginea*	*Quercus laurifolia*	*Smilax glauca*
Asclepius connivens	*Euthamia caroliniana*	*Lyonia fruticosa*	*Quercus myrtifolia*	*Smilax laurifolia*
Asclepius pedicellata	*Fuirena scirpoidea*	*Lyonia lucida*	*Quercus virginiana*	*Solidago sp.*
Asimina incana	*Galactia regularis*	*Magnolia virginica*	*Rhexia nuttallii*	*Sophronanthe hispida*
Asimina pygmaea	*Gelsemium sempervirens*	*Mikania scandens*	*Rhexia sp.*	*Stipulicida setacea*
Baccharis halimifolia	*Gordonia lasianthus*	*Myrica caroliniensis*	*Rhododenron canescens*	*Tephrosia spicata*
Balduina angustifolia	*Helenium vernale*	*Nyssa biflora*	*Rhododenron viscosum*	*Tillandsia bartramii*
Balduina uniflora	*Hypericum brachyphyllum*	*Onoclea sensibilis*	*Rhus copellinum*	*Trichostema sp.*
Bejaria racemosa	*Hypericum sp.*	*Panicum hemitomon*	*Rhynchospora latifolia*	*Trilisa ordoratissima*
Bidens mitis	*Hypericum tetrapetalum*	*Persea palustris*	*Sabatia brachiata*	*Typha sp.*
Calopogon pallidus	*Hypoxis sp.*	*Physostegia virginiana*	*Sabatia dodecandra*	*Vaccinium arboreum*
Carphephorus corymbosus	*Ilex coriacea*	*Pinguicula cerulea*	*Sabatia macrophylla*	*Vaccinium myrsinites*
Cleistesiopsis divaricata	*Ilex glabra*	*Pinus elliotii*	*Sagittaria sp.*	*Vaccinium stamineum*
Clethra alnifolia	*Iris virginica*	*Pinus pallustris*	*Salix sp.*	*Vitis sp.*
Cliftonia monophylla	*Juncus polycephalos*	*Pluchea odorata*	*Sarracenia minor*	*Wisteria frutescens*
Acer rubrum	*Kalmia hirsuta*	*Polygala cruciata*	*Sarracenia psitticina*	

Figure 1. Twin Pines 2019 proposed mining project area with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

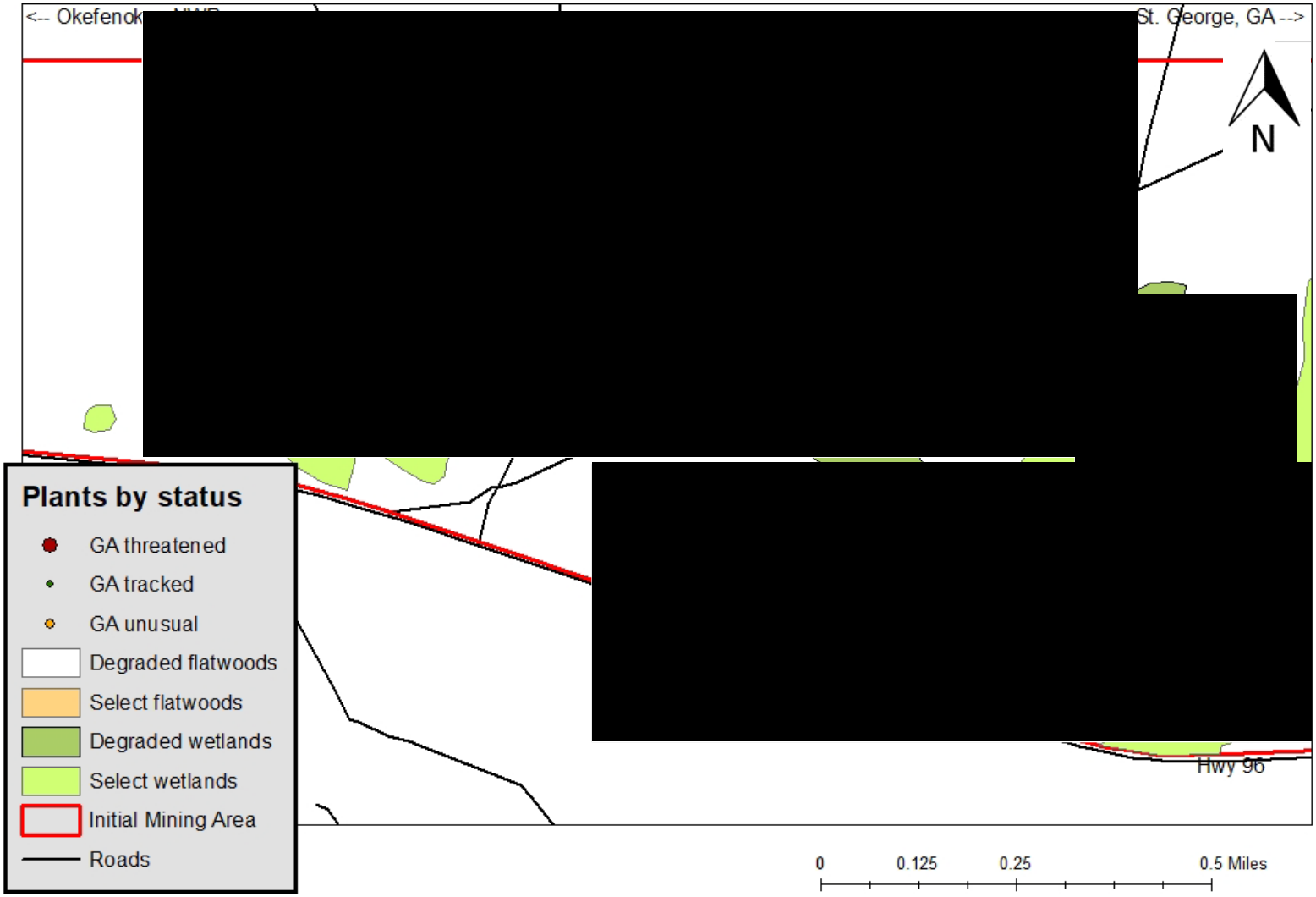

Figure 2. Twin Pines 2019 proposed mining project area, western section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

Figure 3. Twin Pines 2019 proposed mining project area central section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

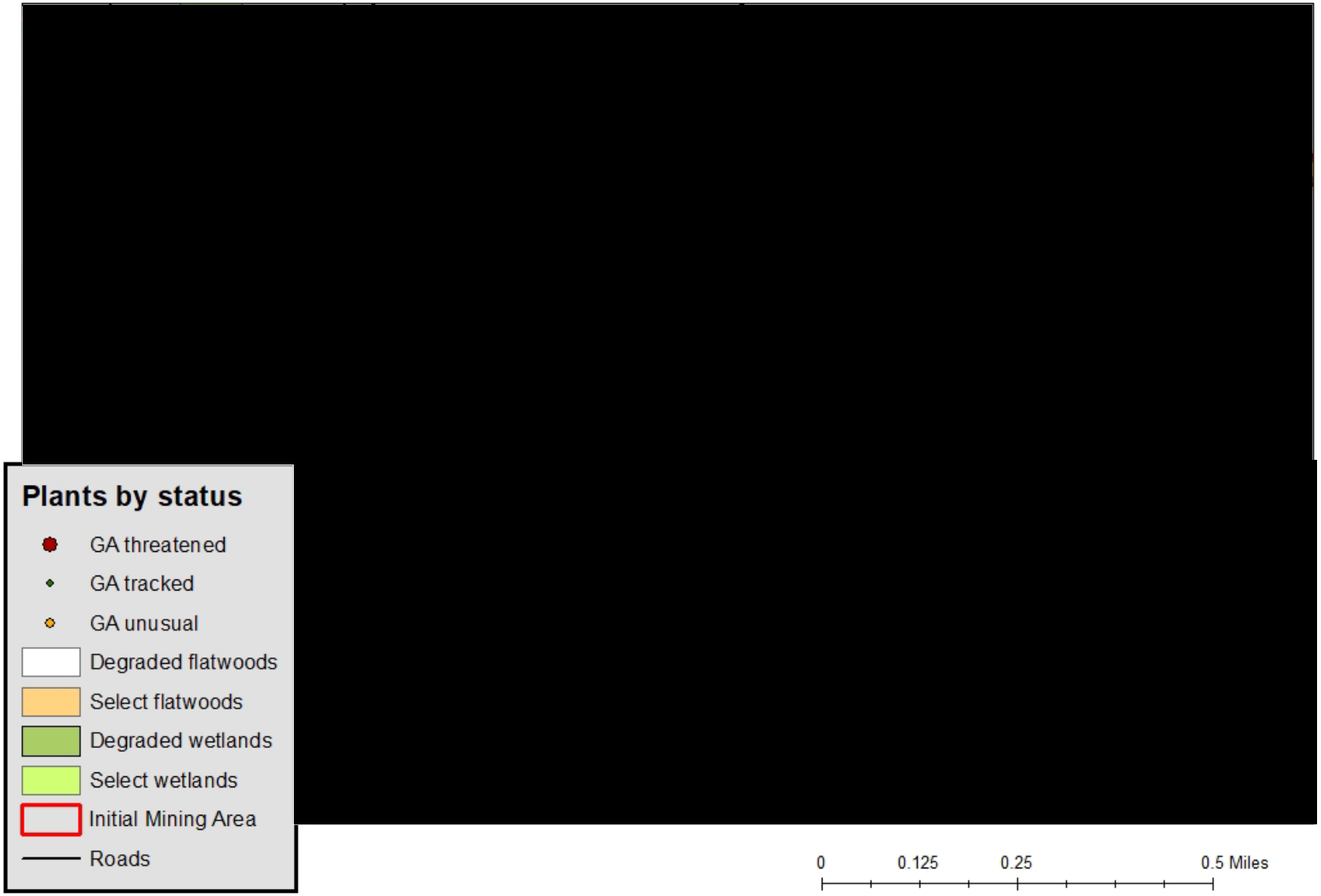

Figure 4. Twin Pines 2019 proposed mining project area eastern section with select flatwoods, wetlands and target plant locations. Degraded flatwoods areas were only surveyed opportunistically. Degraded wetlands are those that scored > 12 using the wetland scoring system (Table 2) and were not surveyed after the first survey period.

Figure 5. Typical post-wildfire salvage-logged upland habitat. Dominant groundcover is dense *Andropogon virginicus*, a species common on agricultural sites (i.e. 'old fields') and a symptom of past intensive silvicultural activity.

Figure 6. Typical upland habitat that escaped wildfire and has not been recently logged. This was likely the condition of most of the proposed project site before the 2017 wildfire. The dominant midstory/groundcover is *Serenoa repens*, a symptom of long-term fire suppression and intense herbicide use. This density of midstory structure precludes establishment or persistence of herbaceous species.

Figure 7. Fresh mechanical site preparation showing disturbance to soil and groundcover.

Figure 8. Young planted *Pinus elliotii* and rank *Andropogon sp.* in uplands/flatwoods precludes establishment or persistence of other herbaceous groundcover.

Figure 9. Typical degraded wetland habitat impacted by silviculture and wildfire, and dominated by dense shrubs, especially *Lyonia sp.* and *Cyrilla racemifolora*, with few herbaceous areas.

Figure 10. Many of the more herbaceous wetlands were impacted by feral swine. This image is typical of the damage caused by these pests that are abundant in the project area.

Figure 11. Every wetland in the proposed project area was impacted by intensive silvicultural activity. This is typical of the hydrologic impacts caused by mechanical site preparation (ditching and bedding) and planting pines. The area in the center is a planting bed and more open water areas on either side are ditches up to 0.5 m deep.