

**A Species Action Plan for the  
Florida Bog Frog  
*Lithobates okaloosae***

**Final Draft  
November 1, 2013**



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## EXECUTIVE SUMMARY

The Florida bog frog (*Lithobates okaloosae*) has a range that is limited to Santa Rosa, Okaloosa, and Walton counties in the Florida Panhandle. This species has been documented at 149 sites on Eglin Air Force Base, 2 on Yellow River Wildlife Management Area within Blackwater River State Forest, and 2 on private lands. Adult bog frogs inhabit shallow, slow-flowing, acidic seeps and boggy overflows of large seepage streams that support a diversity of herbs, forbs, grasses, mosses, and lichens. Degradation of seepage-stream habitat is the main threat to bog frogs. Fire exclusion at many sites with bog frogs has resulted in ecological succession towards hardwood-dominated thickets that constitute poor-quality bog frog habitat.

In 2010, the Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate the status of all species listed as Endangered, Threatened, or Species of Special Concern that had not undergone a status review in the past decade. To address this charge, staff conducted a literature review and solicited information from the public on the status of the bog frog. FWC staff subsequently developed a [Biological Status Review](#) report, which included the findings from the biological review group (BRG) of experts and a recommendation for state listing. The BRG concluded that of the 5 criteria developed by the International Union for Conservation of Nature to evaluate the conservation status of a species, the bog frog met Criterion D(2), a population with a very restricted area of occupancy (<20 km<sup>2</sup> [7.7 mi<sup>2</sup>]). As a result, the BRG recommended that the bog frog be listed as Threatened on the Florida Endangered and Threatened Species List.

Due to its restricted range, the Florida bog frog will always meet Criterion D(2). Therefore, the goal of this plan is to address and mitigate the threats to bog frogs and their habitat, which in turn should prevent further population declines (or enhance populations where practical) and enhance the size and quality of bog frog habitat. To achieve this goal, this plan identifies the following objectives: maintain or improve existing or potential habitat for the bog frog; monitor and survey for populations of bog frogs at documented and undocumented sites; protect bog frogs against unauthorized possession or take; and promote education, outreach, and collaboration among stakeholder groups.

This plan details the actions necessary to improve the conservation status of the Florida bog frog. A summary of this plan will be included in the Imperiled Species Management Plan (ISMP), in satisfaction of the management plan requirements in Chapter 68A-27, Florida Administrative Code (F.A.C.), Rules Relating to Endangered or Threatened Species. The ISMP will address comprehensive management needs for 60 of Florida's imperiled species and will include an implementation plan; rule recommendations; permitting standards and exempt activities; anticipated economic, ecological, and social impacts; projected costs of implementation and identification of funding sources; and a revision schedule. The imperiled species management planning process relies heavily on stakeholder input and partner support. This level of involvement and support is also critical to the successful implementation of the ISMP. Any significant changes to this plan will be made with the continued involvement of stakeholders.

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**GLOSSARY OF TERMS AND ACRONYMS**

**Area of Occupancy:** The area within its extent of occurrence (see Extent of Occurrence), which is occupied by a taxon, excluding cases of vagrancy. This reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (as defined by the International Union for Conservation of Nature).

**Biological Score:** Millsap et al. (1990) devised a biological ranking system to prioritize vertebrate conservation efforts in Florida with respect to biological vulnerability, current knowledge of population status, and management needs. Biological scores were the sum of individual scores for variables pertaining to distribution, abundance, and life history. Higher scores indicate greater vulnerability to extinction.

**BRG:** Biological Review Group, a group of taxa experts convened to assess the biological status of taxa using criteria specified in Rule 68A-27.001, Florida Administrative Code, and following the protocols in the Guidelines for Application of the International Union for Conservation of Nature (IUCN) Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1).

**BRSF:** Blackwater River State Forest, a 77,000-ha (190,000-ac) state forest located in the Florida Panhandle, northeast of Pensacola, in Santa Rosa and Okaloosa counties. BRSF borders Conecuh National Forest to the south and extends southward toward Eglin Air Force Base.

**BSR:** Biological status review report, the summary of the biological review group's findings. Includes a Florida Fish and Wildlife Conservation Commission (FWC) staff recommendation on whether or not the species status meets the listing criteria in Rule 68A-27.001, F.A.C. These criteria, based on the International Union for Conservation of Nature criteria and guidelines, are used to help decide if a species should be added or removed from the Florida Endangered and Threatened Species List. In addition, FWC staff may provide within the report a biologically justified opinion that differs from the criteria-based finding.

**DEP:** Florida Department of Environmental Protection.

**DOACS:** Florida Department of Agriculture and Consumer Services

**DOD:** Department of Defense

**EAFB:** Eglin Air Force Base, a United States Air Force base located in southern Santa Rosa, Okaloosa, and Walton counties. EAFB is responsible for the development, acquisition, testing, deployment, and sustainment of air-delivered weapons.

**Extent of Occurrence:** The geographic area encompassing all observations of individuals of a species, including intervening areas of unoccupied habitat. Synonymous with range. See also Area of Occupancy (as defined by IUCN).

## GLOSSARY OF TERMS AND ACRONYMS

**F.A.C.:** Florida Administrative Code. The Department of State's Administrative Code, Register and Laws Section is the filing point for rules promulgated by state regulatory agencies. Agency rulemaking is governed by Chapter 120, Florida Statutes, the Administrative Procedures Act. Rules are published in the Florida Administrative Code.

**FFS:** Florida Forest Service, formerly the Florida Division of Forestry.

**Florida Bog Frog Site:** A documented occurrence that is separated from another documented occurrence by more than 250 m (275 yd), a distance that ensures discontinuous occupancy for the Florida bog frog.

**FNAI:** The Florida Natural Areas Inventory, a non-profit organization administered by Florida State University dedicated to gathering, interpreting, and disseminating information critical to the conservation of Florida's biological diversity.

**FWC:** Florida Fish and Wildlife Conservation Commission, the state agency constitutionally mandated to protect and manage Florida's native fish and wildlife resources.

**FWC-LE:** Florida Fish and Wildlife Conservation Commission's Division of Law Enforcement.

**FWCG:** Florida Wildlife Conservation Guide, developed by the Florida Fish and Wildlife Conservation Commission in partnership with the United States Fish and Wildlife Service and the Florida Natural Areas Inventory, its purpose is to provide an easily accessible repository of wildlife life history, habitat management, and conservation options.

**Genetic Swamping:** The homogenization or replacement of local genotypes as a result of either a numerical and/or fitness advantage of introduced species or populations.

**HUC:** Hydrologic Unit Code. HUCs are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (regions) to smallest (sub-basin) units.

**ISMP:** Imperiled Species Management Plan

**IUCN:** International Union for Conservation of Nature, a professional global conservation network.

**IUCN Red List:** International Union for Conservation of Nature Red List of Threatened Species, an objective, global approach for evaluating the conservation status of plant and animal species, the goals of which are to: identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and provide a global index of the state of change of biodiversity.

**National Hydrography Dataset:** A comprehensive set of digital spatial data that represents the surface water of the United States using common features such as lakes, ponds, streams, rivers, canals, stream gauges, and dams.

## GLOSSARY OF TERMS AND ACRONYMS

**NRCS:** Natural Resource Conservation Service, a branch of the United States Department of Agriculture.

**NFWFMD:** Northwest Florida Water Management District

**PVA:** Population Viability Analysis

**ROW:** Right-of-way. A strip of land over which facilities such as highways, railroads, or power lines are built.

**SAIC:** Science Application International Corporation

**Snout–Vent:** The standard distance measured for calculating body length of frogs, from the anterior tip of the snout to the posterior edge of the vent (thereby excluding appendages in measurement calculations).

**USFWS:** United States Fish and Wildlife Service, the federal agency mandated to protect and manage the nation’s native wildlife and freshwater fish resources.

**Yellow River Wildlife Management Area:** An area managed by the Northwest Florida Water Management District and the Florida Forest Service in cooperation with the Florida Fish and Wildlife Conservation Commission. The Yellow River Wildlife Management Area covers more than 11, 300 ha (28,000 ac) in Santa Rosa and Okaloosa counties, extending more than 32 km (20 mi) along the Yellow River, including a section of the Shoal River.

## INTRODUCTION

### Biological Background

The Florida bog frog (*Lithobates okaloosae*; [Figure 1](#)) was discovered in July 1982 in Okaloosa County, Florida (Moler 1985). Taxonomists recently placed this species, along with all other eastern North American members of the genus *Rana*, into the newly erected genus *Lithobates* by Frost et al. (2006).

#### *Life History and Habitat Requirements*

The Florida bog frog is a relatively small, yellow-green to brown frog that has a light-colored ridge on each side of its back, a brown eardrum, a yellowish upper lip and throat, and a coppery iris. This species is the smallest "true" frog (Family Ranidae) in North America, with a mean snout-vent length of 40.2 mm (1.58 in), maximum 56.9 mm (2.24 in) for males; and 41.5 mm (1.63 in), maximum 48.8 mm (1.9 in) for females (Moler 1985, Bishop 2005). Adults of this species live in shallow, slow-flowing, acidic seeps, boggy overflows of large seepage streams, sluggish stream bends, and pond edges, often in association with grasses, herbs, forbs, lichens, sphagnum moss, and emergent and submergent non-woody vegetation (Moler 1992, Bishop 2005, Gorman and Haas 2011). The dominant woody vegetation at most sites includes modest quantities of black titi (*Cliftonia monophylla*), sweet bay magnolia (*Magnolia virginiana*), Atlantic white cedar (*Chamaecyparis thyoides*), swamp titi (*Cyrilla racemiflora*), and blackgum (*Nyssa sylvatica*) (Moler 1992, Gorman 2009).



Figure 2. Florida bog frog (*Lithobates okaloosae*; left) and bronze frog (*Lithobates clamitans clamitans*; right). Photograph by Tom Gorman, Virginia Polytechnic Institute and State University.



Figure 1. Florida bog frog (*Lithobates okaloosae*). Photograph by John Himes.

The dominant woody vegetation at most sites includes modest quantities of black titi (*Cliftonia monophylla*), sweet bay magnolia (*Magnolia virginiana*), Atlantic white cedar (*Chamaecyparis thyoides*), swamp titi (*Cyrilla racemiflora*), and blackgum (*Nyssa sylvatica*) (Moler 1992, Gorman 2009).

Individual Florida bog frogs occupy a mean home range size of 187.7 m<sup>2</sup> (0.05 acres) (Bishop 2005), and mean daily movements average < 2 m (6.6 ft) per day (Gorman et al. 2009). Bog frogs presumably remain close to their breeding areas year-round. Male bog frogs call from March to September by producing a series of guttural "chucks" (Moler 1992, Bishop 2005). On occasion, bog frogs hybridize with the closely-related bronze frog (*Lithobates clamitans clamitans*) (Austin et al. 2011a; [Figure 2](#)). Female bog frogs lay floating masses of 150 to 350 eggs from March to July in non-flowing, shallow water, around 3.5 cm (1.4 in) deep,

occasionally attached to the bank or emergent vegetation and usually within 5 cm (2 in) of male calling sites (Moler 1992, Bishop 2005; C. Haas, Virginia Polytechnic Institute and State University, personal communication). Tadpoles occur in shallow, still water, often in thick algae mats and silty or mucky areas (Bishop 2005; C. Haas, personal communication). Tadpoles are thought to overwinter and metamorphose the following spring (Moler 1992). Bog frog tadpoles have more pronounced dark blotching on the tail muscle and fin and a greater amount of ventral spotting when compared with bronze frog tadpoles (Priestley et al. 2010). Additional information on life history and habitat requirements of bog frogs is provided by Moler (1992, 2005), Bishop (2005), Gorman (2009), Gorman et al. (2009), Gorman and Haas (2011, 2012), and Bishop et al. (2012).

#### *Geographic Range and Distribution*

Florida bog frogs are only known from tributaries of East Bay River, Yellow River, and Titi Creek in Santa Rosa, Okaloosa, and Walton counties in the western Florida Panhandle (Moler 1992, Bishop 2004, Gorman 2009; [Figure 3](#)). The Titi Creek sites are separated by > 30 km (18.6 mi) from the more westerly sites (Moler 1992, Gorman 2009). The Titi Creek, East Bay River, and lower Yellow River drainages contain 3 separate demographic populations based on the likely dispersal capability of the species (Bishop 2005, Gorman 2009). Overall, 149 Florida bog frog sites have been documented on Eglin Air Force Base (EAFB), 2 on Yellow River Wildlife Management Area of Blackwater River State Forest (BRSF), and 2 on nearby private lands north of the BRSF sites.

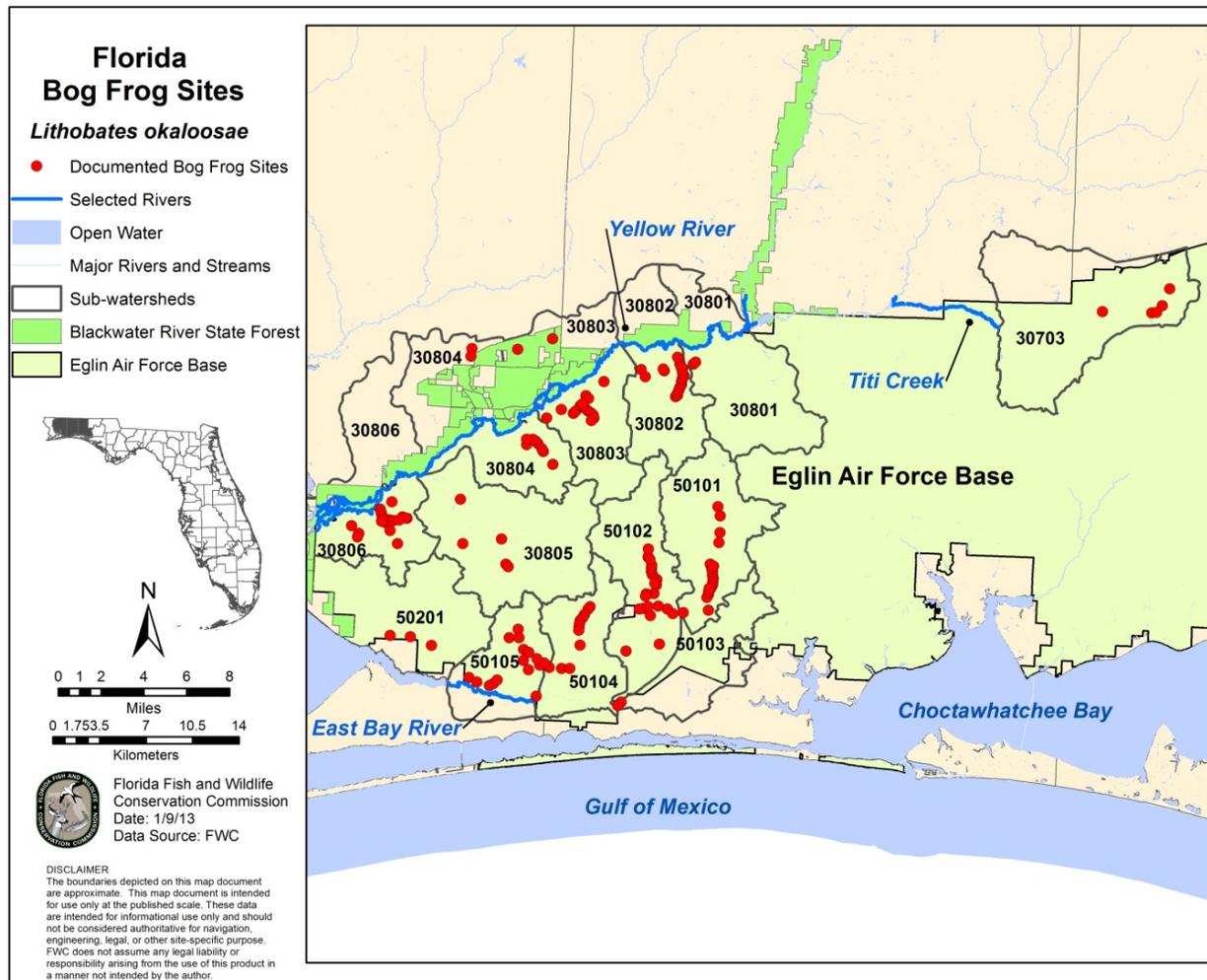


Figure 3. Documented Florida bog frog sites on Eglin Air Force Base (EAFB;  $n = 149$ ), Blackwater River State Forest (BRSF;  $n = 2$ ), and private lands ( $n = 2$ ). Sub-watersheds ( $n = 13$ ) are labeled with the last 5 numbers of an individual Hydrologic Unit Code (HUC), an internal reference number in the National Hydrography Dataset. All HUC codes on the map begin with 0314010. See [Figure 7](#) for an enhanced view of BRSF and the surrounding vicinity.

### Conservation History

The Florida bog frog was discovered in 1982 in Okaloosa County, Florida and was described in 1985. It was listed by the Florida Fish and Wildlife Conservation Commission (FWC) as a Species of Special Concern in 1986 due to its rare status and limited distribution and as a Species of Greatest Conservation Need by Florida's Wildlife Legacy Initiative (FWC 2005). Millsap et al. 1990 developed a system for prioritizing vertebrate conservation efforts in Florida according to biological vulnerability, extent of current knowledge of population status, and management needs. Bog frogs were assigned the second highest biological score (26) of all native Florida amphibians (Millsap et al. 1990).

Endries et al. (2009) evaluated the conservation status of rare and imperiled species in Florida relative to their distribution, habitat needs, and the amount and distribution of protected habitats. This examination determined how habitat protection needs had changed since a previous examination conducted by Cox et al. (1994), and where protection efforts should be focused to ensure the long-term conservation of Florida's wildlife. Specifically, Endries et al. (2009) generated a potential habitat map for the Florida bog frog and conducted a population viability analysis (PVA) using 74 documented sites, each surrounded by a 90-m (295-ft) buffer (Figure 4). Two PVA models were run: 1) all potential habitat and 2) potential habitat on managed (e.g., public) lands. The models calculated approximately 79% of potential bog frog habitat on managed lands; however, this does not include managed lands on Yellow River Wildlife Management Area where bog frog habitat has been identified in recent years. Nonetheless, in both PVA models, the probability of extinction or decline of bog frogs over the next 100 years was 0%, assuming no changes in demographic parameters. However, due to gaps in demographic knowledge (e.g., fecundity, survival rate, and dispersal rate), research is necessary to develop a more accurate understanding of population projections and potential habitat needs of the bog frog.



Figure 4. Modeled potential habitat (colored in black) of the Florida bog frog (*Lithobates okaloosae*). Green shading indicates managed lands (not shown: Yellow River Wildlife Management Area) (Endries et al. 2009).

In April 2010, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service (USFWS) to list the Florida bog frog under the Endangered Species Act. However, in October 2011, a 90-day finding concluded that there was insubstantial scientific or commercial information to warrant federal listing of this species (USFWS 2011).

In 2010, the FWC directed a biological review group (BRG) to evaluate the status of all species listed as Endangered, Threatened, or Species of Special Concern that had not undergone a status review in the past decade. Available data on Florida bog frogs were evaluated relative to each of the 5 criteria used to assess the conservation status of a species according to protocols developed

by the International Union for Conservation of Nature (IUCN). The BRG concluded that the Florida bog frog met Criterion D(2), as a population with a very restricted area of occupancy of < 20 km<sup>2</sup> (7.72 mi<sup>2</sup>) (FWC 2011). FWC staff developed an initial draft of a Biological Status Review report (BSR), which included the BRG's findings and a preliminary listing recommendation from staff. FWC distributed the draft BSR to species experts for review and incorporated input into the [final report](#).

### Threats and Recommended Listing Status

Habitat degradation is the main threat to the Florida bog frog. This species inhabits seepage streams that are maintained in early successional condition (Jackson 2004, Gorman 2009, Gorman and Haas 2011). However, in many areas, available habitat is the result of anthropogenic changes to the landscape, such as along power line right-of-ways (ROWs) maintained by utility companies ([Figure 5](#)). Fire (either naturally occurring or prescribed) has been excluded from many sites with bog frogs, resulting in habitat succession into hardwood-dominated thickets, and ultimately leading to a reduction of overall plant diversity, an increase in fire-intolerant woody growth, and hydrologic conditions that inhibit long-term survival of bog frogs. Moreover, invasions of non-native plants and animals, which frequently occur as natural habitat is altered from its historic condition, may potentially lead to further degradation of bog frog habitat.



Figure 5. Power line right-of-way in Blackwater River State Forest inhabited by Florida bog frogs (*Lithobates okaloosae*). Photographs by Caitlin Snyder, FWC (formerly).

The closely related bronze frog ([Figure 2](#)) is likely the principal competitor of the Florida bog frog (Moler 1992). Although resource partitioning does occur between calling males of the 2

species (Gorman and Haas 2011), and bronze frog tadpoles do not appear to have a large effect on growth or survival rates of bog frog tadpoles in the laboratory (Gorman and Haas 2012), habitat degradation may facilitate an increase in the competitive advantage of bronze frogs. As a result, this could lead to greater competition for potentially limited and vital resources such as food and calling sites. Moreover, bog frogs occasionally hybridize with bronze frogs (Austin et al. 2011a). While there does not currently appear to be a major risk of genetic swamping (Austin et al. 2011b), additional research is needed on this subject to better understand the potential long-term impacts of hybridization on the population dynamics between these species.

Pathogens and parasites may threaten Florida bog frogs. Rothermel et al. 2008 sampled >1,200 aquatic amphibians across the southeastern United States for the presence of chytrid fungus, *Batrachochytrium dendrobatidis*. Their results suggest a pattern of widespread and subclinical infections, specifically among anurans (Rothermel et al. 2008). However, ranaviruses (*Ranavirus* spp.) may pose an even greater threat to amphibians than chytrid fungus (Gray et al. 2009a). Catastrophic die-offs of amphibian populations from ranaviruses have occurred in more than 30 states and 5 Canadian provinces (Green et al. 2002, Gray et al. 2009b). Although ranaviruses are pathogenic to both adult and larval amphibians, mortality rates tend to be higher for larvae (Gray et al. 2009b). Fortunately, amphibian die-offs attributable to these pathogens or parasitoids have yet to be documented or confirmed from areas occupied by bog frogs (K. Enge, FWC, personal communication).

In addition to habitat degradation, hybridization, and disease, Florida bog frogs face other potential threats. Climate change could impact bog frog habitat by lengthening drought periods, thereby reducing seepage. Conversely, sea level rise could result in the inundation of bog frog habitat with salt water, thereby making it unsuitable for this species (Field et al. 2008). Jackson (2004) expressed concern that herbicides used in right-of-way maintenance may affect Florida bog frogs. Moreover, bog frogs may be impacted by habitat loss due to additional highway systems (e.g., Eglin Bypass Corridor) and housing (e.g., 3,000 to 5,000 units to be built on EAFB within the next 2 to 3 years; Science Application International Corporation [SAIC] 2012).

In 2011, based on BRG findings, a literature review of current threats to Florida bog frogs and their habitat, information received from independent reviewers, and staff approval, the FWC supported the recommendation to list the Florida bog frog, upon completion of the Imperiled Species Management Plan, as Threatened on the Florida Endangered and Threatened Species List (FWC 2011).

## CONSERVATION GOALS AND OBJECTIVES

### Goal

The conservation status of the Florida bog frog is improved to the point that the species is secure within its historical range.

The Florida bog frog will always meet listing Criterion D(2) due to its restricted range (FWC 2011). Therefore, the goal of this plan is to address and mitigate the threats to bog frogs and their habitat, which should lead to an overall population increase and habitat improvement.

### Objectives

I. Maintain or improve existing or potential habitat for the Florida bog frog.

#### *Rationale*

Habitat restoration and maintenance (including minimizing impacts of non-native species) of sites known to historically support Florida bog frogs are essential for the long-term survival of this species. These efforts should be coordinated with natural resources staff on EAFB and BRSF.

II. Monitor and survey for Florida bog frogs.

#### *Rationale*

Monitoring documented sites and surveying undocumented sites for Florida bog frogs are necessary to determine the overall effectiveness of the management actions outlined in this plan. Monitoring on BRSF is necessary to determine if restoration efforts result in bog frog population increases, and monitoring also is crucial on EAFB, where 97% of all known bog frog sites have been documented. In addition, because bog frogs are highly secretive and easily overlooked, surveys of undocumented sites are needed to accurately determine the total area of occupancy and extent of occurrence for this species.

III. Protect Florida bog frogs against unauthorized possession and take.

#### *Rationale*

Because this species is a rarity and restricted to a small geographical area, collection poses a potential threat. Protections against unauthorized possession and take must be ensured to minimize impacts of this potential threat.

IV. Promote education, outreach, and collaboration among stakeholder groups.

#### *Rationale*

Effective implementation of this plan will be facilitated through education of law enforcement personnel and the public about the identification, biology, management requirements, and threats to Florida bog frogs. Similarly, outreach efforts with private landowners, state and federal land management and wildlife agencies, and local governments are essential for accomplishing the objectives outlined above.

## CONSERVATION ACTIONS

The following sections describe the conservation actions that will make the greatest contribution toward achieving the conservation objectives. Actions are grouped by category (e.g., Habitat Conservation and Management, Population Management). The Conservation Action Table ([Table 1](#)) provides information on action priority, urgency, potential funding sources, likely effectiveness, identified partners, and leads for implementation.

### Habitat Conservation and Management

Florida bog frogs inhabit hilly topography with acidic, nutrient-deficient, and permanently saturated soils; the Comprehensive Wildlife Conservation Strategy (FWC 2005) categorizes this habitat as *seepage/steephead stream*, and the Florida Natural Areas Inventory (FNAI) categorizes this habitat as *seepage stream* and *seepage slope* (FNAI 2010). The streams in this habitat have deep, sandy bottoms, are relatively narrow and shallow, and have a slow, constant inflow of clear, cool, clean groundwater that percolates onto the surface. Where the land adjacent to streams slopes down to the water table, seepage depressions form bogs. Fire exclusion in most of this habitat has led to an unnaturally high density and biomass of woody vegetation, further leading to suppressed growth of herbaceous vegetation.

**Action 1** Implement management practices that maintain or improve existing or potential habitat for the Florida bog frog.

The best indicator of high-quality seepage stream and slope habitat is a diverse and abundant groundcover of herbaceous plants, typically associated with a more open, woody canopy and midstory. Gorman and Haas (2011) found that male Florida bog frogs called from sites with 32% cover of emergent herbaceous vegetation, 18% cover of submergent vegetation (including algae mats), and 62% canopy cover. At the macrohabitat scale, sections of creek known to support bog frogs had 29% cover of emergent herbaceous vegetation, 4% cover of submergent vegetation, and 69% canopy cover (Gorman 2009). A combination of habitat and maintenance activities ([Figure 6](#)), including woody vegetation removal, application of appropriate herbicides, and prescribed fire should be used to create or maintain these conditions. Herbicides that kill algae or emergent herbaceous vegetation should be avoided.



Figure 6. Florida bog frog (*Lithobates okaloosae*) habitat restoration (e.g., woody vegetation removal followed by herbicide treatment) along Garnier Creek, Blackwater River State Forest. Photographs by Amy Raybuck, FWC (left) and Caitlin Snyder, FWC (formerly) (right).

On EAFB, Florida bog frogs occupy sites that have been burned within the last 3 to 5 years (T. Gorman and C. Haas, Virginia Polytechnic Institute and State University, unpublished manuscript). Summer burns at this frequency may be important for maintaining high-quality bog frog habitat. In fact, the nutrient pulse from prescribed fire may be as important as opening the midstory or canopy, especially on algae mats (an important component of bog frog habitat). Subsequent maintenance of restored habitats (e.g., herbicide re-application and repeated prescribed burns) is essential for enhancing the long-term survival of bog frogs. Land managers, property owners, and agencies should be encouraged to follow wildlife conservation guidelines while conducting restoration or conservation activities, especially in riparian areas (see [Incentives and Influencing, Action 9](#))

Collaboration with agencies that manage habitat where Florida bog frogs occur is essential. Potential partners may include the Department of Defense (DOD), Florida Department of Agriculture and Consumer Services (DOACS), Florida Department of Environmental Protection (DEP), Florida Forest Service (FFS), and Northwest Florida Water Management District (NFWFMD; see [Coordination with Other Entities, Action 11](#)).

For example, the FWC, in cooperation with the FFS, is currently conducting habitat conservation and management efforts for Florida bog frogs on BRSF. Sand pine (*Pinus clausa*) plantations in the uplands surrounding the seepage streams and slopes were recently harvested, and the FFS plans to replant the area with longleaf pine (*Pinus palustris*). Current habitat restoration of the seepage stream and slope habitat will complement the FFS activities in the surrounding uplands, ultimately resulting in improved habitat quality and quantity at the landscape level. In addition to benefitting the bog frog, restoration towards early successional habitat should benefit at least 16 invertebrate species that are obligate associates of pitcher plants, and 12 amphibian species (in

addition to bog frogs) that inhabit seepage streams and slopes on BRSF. The latter group includes several highly vulnerable, potentially undescribed species of salamander (*Desmognathus* cf. *conanti*, *Eurycea* cf. *chamberlaini*, and *Siren* cf. *intermedia*) that receive no formal protection, but have only been found in seepage streams, slopes, and associated swampy areas in the western Florida Panhandle (Enge 2005). These habitat restoration practices should also benefit several state-listed plant species that are known or expected to occur on BRSF (FNAI 2010), including the bog button (*Lachnocaulon digynum*; Threatened), Chapman's butterwort (*Pinguicula planifolia*; Threatened), hummingbird flower (*Macranthera flammea*; Endangered), Panhandle lily (*Lilium iridollae*; Endangered), red pitcher plant (*Sarracenia rubra*; Threatened), rosebud orchid (*Cleistes divaricata*; Threatened), spoonleaf sundew (*Drosera intermedia*; Threatened), white-topped pitcher plant (*Sarracenia leucophylla*; Endangered), yellow butterwort (*Pinguicula lutea*; Threatened), yellow-fringed orchid (*Platanthera ciliaris*; Threatened), and yellow fringeless orchid (*Platanthera integra*; Threatened). Hence, long-term survival of these species on BRSF and securing this species within its historic range will likely depend on effective management of these unique and rare habitats through interagency collaboration between the FFS and FWC.

**Action 2** Implement measures to reduce impacts caused by invasive species within known or potential habitat for the Florida bog frog.

Non-native plants, particularly the Chinese tallow tree (*Triadica sebifera* [L.] Small), and feral hogs (*Sus scrofa*), have the potential to further degrade Florida bog frog habitat (Jackson 2004). Therefore, collaboration with landowners, land managers, and other governmental agencies, particularly on EAFB, to implement measures to control invasive species within the historical range of the bog frog may become important to ensure our conservation goals and objectives (see [Coordination with Other Entities, Action 11](#)).

Feral hogs are present on EAFB and BRSF, and are known to root in seepage slopes and ravines inhabited by Florida bog frogs (Printiss and Hipes 1999). EAFB has a Feral Hog Management Plan that aims to control this species ([SAIC](#) 2012). On BRSF, hogs can be hunted from October through February with no size or bag limit. Additionally, the FFS and the NFWFMD can be issued hog trapping permits as needed.

### **Population Management**

No actions for this category have been identified.

### **Monitoring and Research**

**Action 3** Implement and evaluate Florida bog frog habitat restoration practices on BRSF riparian areas.

During the winter of 2012–2013, the FWC, in cooperation with the FFS, established 5 experimental restoration units along Garnier Creek in Santa Rosa County. Woody vegetation was cut, removed, and stump-treated with an herbicide ([Figure 6](#)). There are tentative plans to apply similar restoration practices along nearby Julian Mill Creek ([Figure 7](#)) during 2014 and 2015. Following treatment, ideally the FFS will incorporate the restoration units into their burn plan, which will include a 3-year burning regime. This burn regime will inhibit re-growth of woody

vegetation and foster additional growth of herbaceous vegetation (see [Habitat and Conservation Management, Action 1](#)). Follow-up treatments with herbicide may be necessary until burning is feasible. A standardized protocol by Brower et al. (1990) is being used to measure the percentage of ground that is covered by herbs, forbs, grasses, shrubs, and vines to track plant re-growth patterns.

Observations of Florida bog frog movements suggest that this species has a small home range and does not typically move long distances, particularly across low-quality habitat (Gorman et al. 2009). Therefore, by restoring the habitat along Garnier Creek and Julian Mill Creek, the existing local populations of bog frogs along these tributaries should be able to increase and occupy larger areas. Increasing the amount of high-quality habitat should increase reproductive output and result in an increasing population trend. While managers will use vegetation monitoring to evaluate the efficacy of habitat restoration, bog frog call surveys will be used to evaluate population response ([Action 4](#)). Restoring habitat off of EAFB will help ensure stable or increasing populations, which in turn will help ensure the species is secure within its historic range.

**Action 4** Conduct population surveys as necessary to provide data that will allow for future biological assessments of Florida bog frogs.

Call surveys are the primary method of monitoring frog populations. A recommended Florida bog frog call-survey protocol is provided in [Appendix 1](#). This protocol is modeled after the United States Geological Survey’s North American Amphibian Monitoring Program and bog frog surveys currently conducted on EAFB and BRSF. The number of bog frogs heard calling may be used as an indirect index of abundance, and to further determine the long-term population trends of this species. Thus, the call-survey protocol includes the basic data necessary to help achieve the objectives of this plan. The specific methodologies used to conduct call surveys, and the specific data collected (e.g., habitat variables), may vary depending on surveyor goals, experience, preferences, and other factors.

On EAFB, call surveys have located calling Florida bog frogs within 13 sub-watersheds at 149 sites (records from Moler 1985; Printiss and Hipes 1999, Bishop 2004, Enge 2005, Gorman 2009; T. Gorman and C. Haas, unpublished data; [Figure 3](#)), accounting for 97% of all documented bog frog sites. Therefore, this plan recommends that nocturnal call surveys for bog frogs be conducted every 2 years from May through July at historical sites on EAFB. Currently, EAFB contracts with Virginia Polytechnic Institute and State University to survey for bog frogs on EAFB. In addition to call surveys that determine presence or absence, more in-depth research should be conducted on EAFB focusing on gaps in demographic data (e.g., fecundity, survival rates, and dispersal rates) of bog frogs. Results will enable researchers to develop more accurate PVAs and potential habitat maps (see [Conservation History](#)).

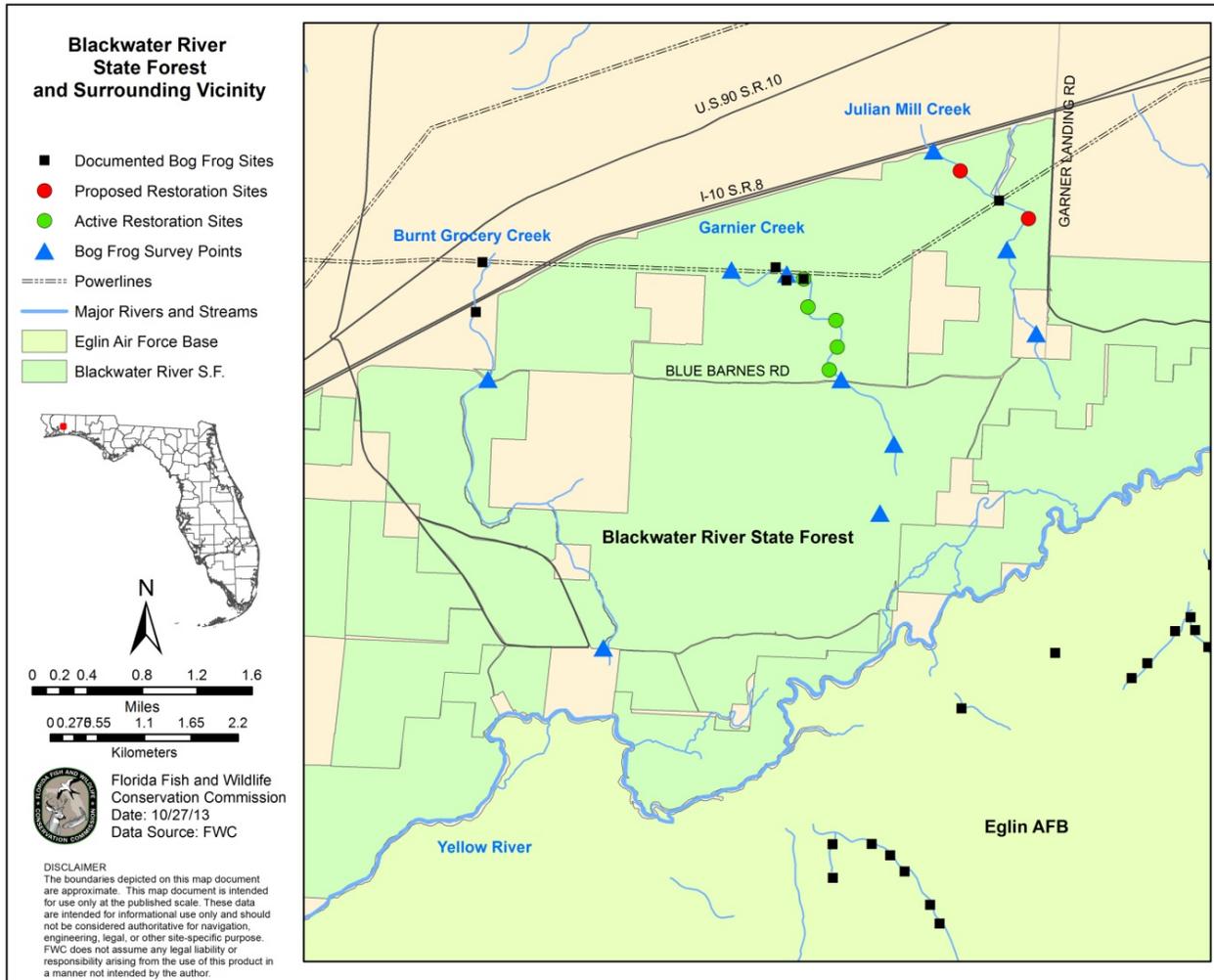


Figure 7. Florida bog frog (*Lithobates okaloosae*) habitat restoration sites (green and red circles), survey points (blue triangles), and documented bog frog sites (black squares) on Blackwater River State Forest ( $n = 2$ ) and surrounding private lands ( $n = 2$ ). Sites identified with a green circle indicate active restoration sites, whereas red circles indicate proposed restoration sites.

On BRSF, monitoring will enable researchers to evaluate if bog frogs are responding to habitat restoration (Action 3). Prior to habitat restoration, monthly call surveys were conducted at 10 sites on BRSF from May through July (Figure 7). The population consisted of a small number of adults (call surveys detected a maximum of 3 individual bog frogs per survey) restricted to Garnier Creek in the vicinity of a power line right-of-way (approximately 45 m [150 ft] wide) and surrounding areas. The remainder of Garnier Creek (except the portion that was within the right-of-way) flowed through thickets of fire-excluded hardwood shrubs that constituted poor habitat for bog frogs. Following habitat restoration practices, it is expected that bog frog numbers will increase, and their area of occupancy will expand in response to the availability of high-quality habitat. To monitor this response, nocturnal call surveys for Florida bog frogs are being conducted annually from May through July on all experimental plots. In fact, the first observation of a calling bog frog occurred in the northernmost experimental plot in June 2013.

To ensure an accurate assessment of locations and population, we recommend that call surveys for Florida bog frogs be conducted at previously undocumented sites in drainage basins along tributaries of the Yellow River, Shoal River, and Titi Creek. Should these surveys detect Florida bog frogs in these sites, this would potentially increase the known area of occupancy for the species. The number and location of sites to be surveyed, and the frequency with which they are surveyed, will depend on the availability of time, personnel, and other resources. The FWC can provide assistance with prioritizing sites for monitoring bog frogs.

**Action 5** Monitor populations of Florida bog frogs to assess the threat of genetic swamping and disease.

We recommend that diurnal and nocturnal surveys for Florida bog frog egg masses, tadpoles, and adults be conducted. In areas where bog frogs and bronze frogs are known or suspected of hybridizing, authorized persons should collect specimens for genetic testing. Opportunistic surveys will increase the potential for researchers to document amphibian die-offs within the range of the bog frog. If documented, confirmation of pathogens or parasites such as chytrid fungus or ranaviruses may be possible, depending on the availability of time, personnel, and resources. Additionally, reports of amphibian die-offs from the public and organizations or societies devoted to amphibians and reptiles may provide useful information and are encouraged (see [Education and Outreach, Action 10](#)). Population monitoring will enable researchers and managers to maintain stable or increasing populations within their historic range and allow conservation goals and objectives to be met.

### **Rule and Permitting Intent**

**Action 6** Protect Florida bog frogs against unauthorized possession and take.

As a state-listed species, the Florida bog frog is protected under Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species. This species may be desirable as a pet due to its rarity. Commercialization of a species gives an economic incentive for collecting, which leads to increased collection pressure. Because this species is rare, even limited collection at some sites could cause population collapse, which would be contrary to achieving our conservation goal.

#### *Protections*

The Florida bog frog is provided protection in accordance with Rule 68A-27.003, F.A.C, in which it is illegal to take, possess, or sell bog frogs without an authorized permit or Commission rule, where the definition of *take* (Chapter 68A-27.001, F.A.C.) means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct.”

#### *Permitting*

Rule 68A-27.007, F.A.C., Permits and Authorizations for the Take of Florida Endangered and Threatened Species, provides the provisions for permits and authorizations for the take of Florida bog frogs. This rule provides guidance for issuance of permits that authorize intentional take of Threatened Species for “scientific or conservation purposes which will benefit the survival potential of the species.”

Requirements for permit requests must include an assessment of the following:

- Adequate justification for taking Florida bog frogs from the wild
- Probable direct or indirect effects on wild Florida bog frog populations
- Potential conflicts with other activities or programs intended to enhance the survival of Florida bog frogs in the wild
- Ability of the proposed work to reduce the threat of extinction to Florida bog frogs in the wild
- Input from subject matter experts on Florida bog frogs
- Whether the expertise, facilities, or other resources available to the applicant are adequate to successfully accomplish the objective(s) stated in the permit application

Criteria for granting permit requests include considerations of the following:

- Extent of injury, harm, or loss to Florida bog frogs
- Ability to collect tissue samples of voucher specimens for genetic analysis and disease studies (see [Monitoring and Research, Action 5](#))
- Reasonable steps taken to avoid, minimize, or mitigate incidental take of bog frogs (see [Incentives and Influencing, Action 9](#))
- Public safety during emergencies
- Other factors relevant to the conservation and management of Florida bog frogs
- Concurrence and cooperation of appropriate land manager(s) or owner(s)

### **Law Enforcement**

**Action 7** Educate FWC Law Enforcement (FWC-LE) and EAFB Range Patrol officers on the identification, distribution, biology, and threats to Florida bog frogs.

FWC-LE and EAFB Range Patrol officers are responsible for enforcing Florida's wildlife and fisheries laws within their respective jurisdictions. FWC biologists and other subject matter experts can educate officers through the development, circulation, and interpretation of Florida bog frog distribution maps. FWC-LE officers should be properly educated on the basic biology of and threats to bog frogs, as well as be familiar with all applicable wildlife laws to be able to enforce violations caused by the unauthorized take of bog frogs. In turn, one of the most important components of the enforcement strategy is ensuring compliance through public education and outreach (see [Education and Outreach, Action 10](#)).

FWC-LE officers understand the importance of explaining wildlife laws to the public to avoid unintentional violations. However, FWC-LE officers actively pursue and recommend prosecution for those who intentionally violate wildlife laws, as well as educate the public on how to identify and report violations. FWC-LE administers the Wildlife Alert program, which the public can call about potential wildlife violations via a toll-free number (1-888-404-3922) that is answered 24 hours a day, 7 days a week. Cash rewards are offered to callers who provide information about any illegal activity resulting in an arrest. Callers may remain anonymous and are not required to testify in court.

## Incentives and Influencing

**Action 8** Provide assistance to landowners, businesses, and agencies to conserve or enhance Florida bog frog habitat.

Of the 153 documented Florida bog frog sites, only 2 (1%) are located on private lands ([Figures 4 and 7](#)), so incentive programs and conservation easements, which typically apply to private lands, will play a relatively minor role in the overall management and protection of bog frogs. Nonetheless, owners of private lands where bog frogs may occur are encouraged to contact FWC's [Landowner Assistance Program](#) for guidance on how to participate in federal cost-share programs administered by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and USFWS. The [Environmental Quality Incentives Program](#) and [Wildlife Habitat Incentive Program](#), both offered through the NRCS, provide technical and financial assistance to help plan and implement conservation practices that address natural resource concerns and improve fish and wildlife habitat. Similarly, [Partners for Fish and Wildlife](#) (administered by the USFWS) can provide technical and financial assistance on natural resource issues. Cost-share programs will help landowners reach their management goals and may, in turn, enhance bog frog conservation efforts.

Landowners, businesses, and governmental agencies can also utilize the [Florida Wildlife Conservation Guide](#) (FWCG), an online resource that facilitates effective land use planning, project design, and the management of biological communities, with a focus on wildlife conservation. The FWCG aims to provide a repository of wildlife conservation information based on the best available scientific information. As a dynamic resource, it is maintained with current guidelines and recommendations for wildlife management and protection, and includes numerous links to relevant external sources of information. The FWCG has specific information related to the Florida bog frog, and is developing applicable conservation measures. Collaboration with federal (e.g., DOD, USFWS) and state (e.g., DEP, FFS, and NFWFMD) agencies through technical assistance and financial aid, when possible, should improve bog frog conservation efforts (see [Coordination with Other Entities, Action 11](#)).

**Action 9** Encourage the use of Best Management Practices in areas known to support Florida bog frogs.

To protect Florida bog frogs and their habitat, residential and commercial landowners are encouraged to follow [Best Management Practices](#) adopted by the DOACS Office of Agricultural Water Policy (DOACS 2011). These voluntary measures address water quality and quantity on agricultural lands and can benefit state-listed species. Such measures are not intended to provide a means of recovering listed species populations, but rather to serve as a strategy for reducing further declines. Improving water quality within and adjacent to bog frog habitat will help ensure stable or increasing populations, which in turn will help ensure the species is secure within its historic range.

## Education and Outreach

**Action 10** Educate the public on the identification, distribution, biology, threats, conservation value, and management requirements of Florida bog frogs.

Florida bog frogs are seldom encountered and little known by most people. Therefore, a biological species profile on the FWC’s imperiled species webpage will be updated with photographs, improved distribution maps, and links to other important bog frog information.

FWC’s Office of Community Relations can broaden outreach efforts using websites, social media, field trips, and workshops. In addition, the FWC will develop exhibits of this species for presentations, activities, and special events. Staffs at BRSF, EAFB, and the [E. O. Wilson Biophilia Center](#) regularly conduct education and outreach activities with various user groups (e.g., students, hunters, campers, and visitors of events such as Blackwater Heritage Day). Such activities should include discussions emphasizing Florida bog frogs. Herpetological enthusiast and professional organizations (e.g., [American Society of Ichthyologists and Herpetologists](#), [The Herpetologists’ League](#), [Society for the Study of Amphibians and Reptiles](#), [League of Florida Herp Societies](#), and [Southeast Partners in Amphibian and Reptile Conservation](#)) can help improve the conservation status of bog frogs by reporting amphibian die-offs and assisting with opportunistic monitoring and research efforts (see [Monitoring and Research, Action 5](#)). Additionally, information booths could be erected on EAFB and BRSF to help teach residents, visitors, and staff about the bog frog.

Potential partners for education and outreach include Defenders of Wildlife, East Gulf Coastal Plain Joint Venture, DEP, Gulf Coastal Plain Ecosystem Partnership, The Nature Conservancy, and The Wildlife Society.

## Coordination with Other Entities

**Action 11** Collaborate with state and federal agencies, local governments, and universities to conserve, restore, and manage Florida bog frog habitat and to expand research on the ecological requirements and population dynamics of bog frogs.

Any proposed project or activity that is anticipated to “take” (as defined in Rule 68A-27.001, F.A.C.) Florida bog frogs either through direct take of bog frogs or through indirect take (e.g., degradation of bog frog habitat) would require FWC authorization see [Rules and Permitting, Action 6](#)). Therefore, collaboration between the FWC and landowners or managers is necessary before such projects or activities are initiated to ensure that all legal obligations are met.

As noted previously, the vast majority (97%) of Florida bog frog sites are on EAFB ([Figure 3](#)). EAFB staff conducts activities to manage for overall ecosystem health and federally listed species ([SAIC 2012](#)), which incidentally include and benefit the Florida bog frog. The FWC should continue to coordinate with EAFB staff to encourage practices to control invasive species, as well as to preserve, manage, and restore plant communities that characterize high-quality seepage stream and slope habitats (see [Habitat and Conservation Management](#)). FWC coordination with the DOD, Virginia Polytechnic Institute and State University, and BRSF on

bog frog monitoring and research will enable more comprehensive surveys to be conducted. Additionally, it will help to further determine bog frog ecological requirements, obtain baseline demographic data, identify and characterize habitat in need of restoration, and facilitate subsequent habitat restoration efforts (see [Monitoring and Research](#)).

Land development is governed by a variety of federal, state, and local government growth management and permitting processes or requirements. The FWC offers conservation planning services to these regulatory agencies and encourages early meetings and coordination efforts to determine presence or absence of state-listed species on proposed development sites and other important wildlife and habitat issues. Moreover, opportunities exist to educate local officials, such as municipal and county planners, through workshop presentations. If necessary, regional FWC staff can become further educated on existing conservation land management practices to enable them to work more effectively with local governments and other stakeholders.

Chapter 163.3177, Florida Statutes, requires that county comprehensive growth management plans include a conservation element. The conservation element must include the identification of areas within the county that are locations of important wildlife or habitat resources, including state-listed species. This element must contain principles, guidelines, and standards for conservation that restrict activities known to adversely affect the survival of these species. The FWC is identified as a state agency authorized to review county growth management plans and, including any amendments, to ensure important state fish, wildlife, and habitat resources are adequately considered. In addition, local government land-development regulations require conditions that specify how land and water uses will be administered to be consistent with the conservation element of the county growth management plans. Therefore, interagency collaboration on the review and development of the conservation element of these plans is essential for ensuring that they consider wildlife habitat within the county.

**Table 1. Florida Bog Frog (*Lithobates okaloosae*) Conservation Action Table**

NOTE: An explanation of acronyms used is below the table.

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1	1	1	Implement management practices that maintain or improve existing or potential habitat for the Florida bog frog.	Habitat Conservation & Mgmt	EXPANDED	NO	NO	\$50-100k	Existing budget, Grant, Federal	WHM, SCP	FFS, NFWFMD, DOD, landowners	Very likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. However, this action is <b>critical</b> for long-term survival.
1	4	2	Implement measures to reduce impacts caused by invasive species within known or potential habitat for the Florida bog frog.	Habitat Conservation & Mgmt	EXPANDED	NO	NO	\$25-50k	Existing budget, Grant, Federal	WHM, SCP	FFS, NFWFMD, DOD, landowners	Moderately likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. May be completed following successful implementation of all higher priority actions, and availability of adequate resources.
1	1	3	Implement and evaluate Florida bog frog habitat restoration practices on BRSF riparian areas.	Monitoring & Research, Habitat Conservation & Mgmt	EXPANDED	NO	NO	\$25-50k	Existing budget, Grant	WHM, SCP	FFS, NFWFMD	Very likely	Highly feasible and practical; practices ongoing in some areas	NO; Immediate survival is not under threat. However, this action is <b>critical</b> for long-term survival.
2	2	4	Conduct population surveys as necessary to provide data that will allow for future biological assessments of Florida bog frogs.	Monitoring & Research	EXPANDED	NO	NO	\$0-25k	Existing, Grant, Federal	FWRI, WHM, SCP	DOD, Virginia Tech, FFS, NFWFMD	Very likely	Highly feasible and practical; practices ongoing in some areas	NO; Immediate survival is not under threat. However, this action is <b>critical</b> for long-term survival.
2	5	5	Monitor populations of Florida bog frogs to assess the threat of genetic swamping and disease.	Monitoring & Research	NEW	NO	NO	\$0-25k	Existing budget, Grant, Federal	SCP	DOD, Virginia Tech	Moderately likely	Practical, but not as feasible; highly contingent upon availability of necessary resources and relationships	NO; Immediate survival is not under threat. However, this action is beneficial for long-term survival.
3	3	6	Protect Florida bog frogs against unauthorized possession and take.	Protections & Permitting, Law Enforcement, Education & Outreach	ONGOING	YES	YES	TBD	Existing budget	LE	N/A	Likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. However, this action is beneficial for long-term survival.
3, 4	3	7	Educate FWC Law Enforcement and EAFB Range Patrol officers on the identification, distribution, biology, and threats to Florida bog frogs.	Law Enforcement, Education & Outreach	NEW	YES	YES	\$0-25k	Existing budget, Grant	SCP	N/A	Likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. However, this action is beneficial for long-term survival.
4	2	8	Provide assistance to landowners, businesses, and agencies to conserve or enhance Florida bog frog habitat.	Incentives & Influencing, Coordination with Other Entities, Habitat Conservation & Mgmt	NEW	YES	YES	TBD	Existing budget	CPS	Universities, USFWS, DOACS	Likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. However, this action is beneficial for long-term survival.
4	3	9	Encourage the use of Best Management Practices in areas known to support Florida bog frogs.	Incentives & Influencing, Coordination with Other Entities, Habitat Conservation & Mgmt	EXPANDED	YES	YES	TBD	Existing budget	CPS	Universities, USFWS, DOACS	Likely	Highly feasible and practical; practices ongoing in some areas	NO; Immediate survival is not under threat. However, this action is beneficial for long-term survival.
3, 4	4	10	Educate the public on the identification, distribution, biology, threats, conservation value, and management requirements of Florida bog frogs.	Education & Outreach	NEW	YES	YES	\$25-50k	Existing budget, Grant	SCP	Agencies, universities	Moderately likely	Feasible and practical with the proper resources and relationships.	NO; Immediate survival is not under threat. May be completed following successful implementation of all higher priority actions, and availability of adequate resources.

**Table 1. Florida Bog Frog (*Lithobates okaloosae*) Conservation Action Table**

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
3, 4	1	11	Collaborate with state and federal agencies, local governments, and universities to conserve, restore, and manage Florida bog frog habitat and to expand research on the ecological requirements and population dynamics of bog frogs.	Coordination with Other Entities, Education & Outreach, Monitoring & Research, Habitat Conservation & Mgmt	EXPANDED	YES	YES	TBD	Existing budget	CPS, SCP	FFS, DOD, NFWFMD, universities	Very likely	Highly feasible and practical; practices ongoing in some areas	NO: Immediate survival is not under threat. However, this action is <u>critical</u> for long-term survival.

**Acronyms used in this table:**

- AHRE: Aquatic Habitat Restoration and Enhancement
- BRSF: Blackwater River State Forest
- CPS: Conservation Planning Services, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation
- DOACS: Florida Department of Agricultural and Consumer Services
- DOD: Department of Defense
- EAFB: Eglin Air Force Base
- FFS: Florida Forest Service
- FWC: Florida Fish and Wildlife Conservation Commission
- FWRI: Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission
- LE: Law enforcement
- NFWFMD: Northwest Florida Water Management District
- SCP: Species Conservation Planning, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation
- TBD: To be determined
- WHM: Wildlife and Habitat Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation

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## APPENDICES

### Appendix 1. Suggested Florida Bog Frog Call Survey Protocol and Datasheet

#### *Purpose*

The purpose of this monitoring protocol is to document the presence of bog frogs at historical and potential breeding sites. Monitoring is necessary to determine trends over time and gauge the effectiveness of the Florida Bog Frog Species Action Plan.

#### *Seasonality*

Surveys should be conducted from May through July.

#### *Repetition*

Surveys conducted every 2 years are sufficient for the purposes of the Species Action Plan. Annual surveys may be conducted, depending on time and resources available and specific goals of the surveyors.

#### *Surveys*

This protocol is modeled after the United States Geological Survey's North American Amphibian Monitoring Program (<http://www.pwrc.usgs.gov/NAAMP/>). The brief narrative below outlines data that should be collected to achieve objectives in the Species Action Plan, followed by tables of Florida bog frog call index, light code, wind code, and sky code rankings. Lastly, a call survey datasheet is provided. Surveyors may choose to record additional data not outlined in this protocol depending on their own monitoring goals.

- A. Sites: Preference should be given to monitoring historical sites that either already support high-quality Florida bog frog habitat or are being enhanced through active management efforts. Sites on the periphery of the known range are important to monitor in order to document any range contraction or expansion. To lessen the probability of inadvertently sampling the same population of bog frogs multiple times on the same night, monitored sites should be at least 250 m apart (Gorman 2009).

- B. Nightly Surveying:

*Survey Conditions* — Surveys should begin 30 minutes after sunset or later, and be completed prior to 2:00 A.M. Acceptable sampling conditions are based on wind and sky conditions. Surveys should be conducted at least 1 week after heavy rains. Surveys should not occur during wind speeds over 12 mph, rainfall, or at temperatures below 60°F.

*Surveying Procedure Data Collection* — There is no initial waiting period prior to beginning the 5-minute survey period. At each site, listen for a total of 5 minutes and then record the estimated number of individuals and calling index for bog frogs heard. Record the call frequency as the minutes a frog was heard versus not heard (e.g., 1 0 1 0 1, where 1 indicates a frog heard calling). Data may also be collected for other frog species heard. Use the notes section to record other pertinent information such as the number of cars that passed by the site during the listening period or other background noise during the survey. If a major noise disturbance occurs that lasts 1 minute or longer, the surveyor can

temporarily break the listening period to avoid sampling during this time. If this occurs, make note of it on the datasheet. Resume listening for the total time remaining after the noise passes.

*Data Submission:* Call survey data should be submitted at <http://www.fnai.org/>

<b>Florida Bog Frog Calling Index</b>	
0	No individuals are heard
1	Individuals can be counted; there is space between calls
2	Calls of individuals can be distinguished but there is some overlapping of calls
3	Full chorus, calls are constant, continuous and overlapping
<b>Light Codes</b>	
0	New moon, very dark
1	Quarter moon, dark, but there is some light
2	Intermediate phase moon with moderate light conditions
3	Full moon, with partly cloudy skies, fair light conditions
4	Full moon, with clear skies, very light out
<b>Beaufort Wind Codes</b>	
0	Calm (<1mph) - smoke rises vertically
1	Light Air (1 to 3 mph) - smoke drifts, weather vane inactive
2	Light Breeze (4 to 7 mph) - leaves rustle, can feel wind on face
3	Gentle Breeze (8 to 12 mph) - leaves and twigs move around, small flags extend
4*	Moderate Breeze (13 to 18 mph) - moves thin branches, raises loose papers
5*	Fresh Breeze ( $\geq 19$ mph) - small trees begin to sway
<b>Sky Codes (numbers 3 and 6 are not used)</b>	
0	Few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy or overcast
4	Fog or smoke
5*	Drizzle or light rain (avoid surveying)
8*	Showers (affecting hearing ability)

**\*Do not conduct survey**

**Florida Bog Frog Survey Data Sheet**

Site ID: \_\_\_\_\_ Observer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Start Time: \_\_\_\_\_ Finish Time: \_\_\_\_\_  
 Air Temp: \_\_\_\_\_ °C Relative Humidity: \_\_\_\_\_% Light Conditions: 0 1 2 3 4  
 Wind Scale: 0 1 2 3 4 5 Sky Condition: 0 1 2 4 5 8 Precipitation: Y N

	Present	Est. # of Individ.	Call Index	Call Frequency and Notes
FL Bog Frog:	Y N	1 2 3 4	≥5 1 2	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Florida Bog Frog Survey Data Sheet**

Site ID: \_\_\_\_\_ Observer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Start Time: \_\_\_\_\_ Finish Time: \_\_\_\_\_  
 Air Temp: \_\_\_\_\_ °C Relative Humidity: \_\_\_\_\_% Light Conditions: 0 1 2 3 4  
 Wind Scale: 0 1 2 3 4 5 Sky Condition: 0 1 2 4 5 8 Precipitation: Y N

	Present	Est. # of Individ.	Call Index	Call Frequency and Notes
FL Bog Frog:	Y N	1 2 3 4	≥5 1 2	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____
Other _____:		1 2 3 4	≥5 1 2 3	_____

Notes: \_\_\_\_\_  
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