

Florida Bog Frog

Lithobates okaloosae



Photo by Kevin Enge, FWC

Species Overview

Status: Listed as state Threatened on Florida's Endangered and Threatened Species List.

Current Protections

- 68A-27.003(a), F.A.C. No person shall take, possess, or sell any of the endangered or threatened species included in this subsection, or parts thereof or their nests or eggs except as allowed by specific federal or state permit or authorization.
- 68A-27.001(4), F.A.C. Take – to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct. The term “harm” in the definition of take means an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. The term “harass” in the definition of take means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

Biological Background

This section describes the biological background for this species and provides context for the following sections. It focuses on the habitats that support essential behaviors for the Florida bog frog, threats faced by the species, and what constitutes significant disruption of essential behaviors.

The Florida bog frog (*Lithobates okaloosae*; formerly *Rana okaloosae*) is a small, 1.5 – 2.25 in (38.1 – 57.2 mm) yellow-green to brown frog that is restricted to Santa Rosa, Okaloosa, and Walton counties in the Florida Panhandle. Currently > 90% of known locations occur on Eglin Air Force Base (Jackson 2004). This species was first discovered in 1982 and formally described in 1985. The Florida bog frog is the smallest member of the “true” frog family (Family Ranidae) in the United States. The frog has a brown tympanum (eardrum), a light yellowish upper lip and throat, and a copper iris. There are two dorsal lateral ridges that extend about three quarters down the back, and the webbing on the hind feet is reduced (Bartlett and Bartlett 2011). Florida bog frogs and bronze frogs (*Rana clamitans clamitans*) overlap in range and appear similar as tadpoles. Florida bog frog tadpoles are olive brown in color and have many buff spots along the tail. There are well-defined silver-to-white spots on the belly (Moler 1985, 1992, Bishop 2005, Priestley et al. 2010).

Adult Florida bog frogs live in shallow, slow-flowing aquatic environments. These habitats include acidic seeps, backwaters, slow-moving stream bends, seepage stream banks, and pond edges. Sphagnum moss, grasses, herbs, and forbs are typically associated with bog frog habitat. St. John's wort (*Hypericum* spp.), pitcher plants (*Sarracenia* spp.), and sundews (*Drosera* spp.) are often found at bog frog sites (Jackson 2004). Woody vegetation around suitable habitats include black titi (*Cliftonia monophylla*), swamp titi (*Crylla racemiflora*), Atlantic white cedar (*Chamaecyparis thuyoides*), sweet bay magnolia (*Magnolia virginiana*), and

blackgum (*Nyssa sylvatica*; Moler 1992, Gorman 2009).

Florida bog frogs breed from March through July; however, males will continue calling through September (Moler 1992, Bishop 2005). The call is a series of mechanical sounding, guttural “chucks”. Unlike most frogs, heavy rains discourage male bog frogs from calling (Bishop 2004). A female may lay 150 – 350 eggs in a surface film, typically near (2 in; 50 mm) male calling sites (Moler 1992, Bishop 2005). Tadpoles may overwinter and metamorphose in the spring (Moler 1992). This species probably remains in close proximity to breeding grounds throughout the year. The mean home range size is 187.7 m² (0.05 acres; Bishop 2005), with daily movements typically less than 2 m (6.6 ft).



Florida bog frog eggs in a surface film. Photograph by Thomas Gorman, Virginia Polytechnic Institute and State University.

The Florida bog frog is closely related to the bronze frog and both species likely compete for the same resources (food, shelter; Moler 1992). (Gorman and Haas 2012). Hybridization between the two species is possible (Austin et al. 2011a), although risks for genetic swamping is minimal (Austin et al. 2011b).

Further background information pertaining to the Florida bog frog may be found in the [Florida Bog Frog Biological Status Review Report](#) (FWC 2011), [A Species Action Plan for the Florida Bog Frog](#) (FWC 2013), [Florida Bog Frog Management Guidelines for Species at Risk on Department of Defense Installations](#) (Jackson 2004), and citations within those documents.

Habitat Features that Support Essential Behavioral Patterns

Florida bog frogs are dependent on seepage streams and other slow-moving aquatic habitat that is maintained in early successional condition by fire (Jackson 2004, Gorman 2009, Gorman and Haas 2011). Gorman and Haas (2011) found that male bog frogs called from sites with 32% cover of emergent herbaceous vegetation, 18% cover of submerged 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 submerged vegetation, and 69% canopy cover (Gorman 2009). Anthropogenic habitat disturbance, such mowing along power line rights-of-way, can mimic naturally occurring disturbance and can provide habitat for this species, although fire regimes should be used wherever possible. See [Biological Background](#) above for a list of herbaceous and woody species commonly associated with this habitat and species.

Threats

Habitat loss and degradation within the relatively small range of the species is the primary threat to the Florida bog frog. As hardwoods encroach on suitable habitats, the amount of sunlight reaching the forest floor is decreased, in turn reducing plant diversity and shading out native grasses, herbs, and forbs. Furthermore, hardwood encroachment will alter the hydroperiod of wetlands through increased evapotranspiration that can inhibit the survival of tadpoles. Fire-intolerant woody growth prevents natural disturbance to habitat, and over time, will alter the landscape to habitat incompatible with this species (Jackson 2004, FWC 2013). Habitat restoration through chemical and mechanical means will be required, however the cost and manpower required to implement restoration regimes is high, which may limit the speed of chemical and mechanical restoration.

Adding to the challenges associated with proper management, most prescribed fires occur during the winter months. Historically, wildfires burned through the southeastern United States in the late spring and summer. The change of fire seasonality may affect the capability of the fire to restore habitat. While there is a recent

trend of burning more acres during the summer months, both wetland and summer burns present their own suite of challenges such as management of duff fires.

Another cause of habitat degradation is the placement of roads and development near suitable Florida bog frog habitats. Threats include siltation via erosion and flooding (Jackson 2004). Siltation is commonly associated with heavily-trafficked unimproved road crossings, (Jackson 2004), and flooding can greatly impact floating egg mats and tadpoles (Printiss and Hipes 1999).

The Florida bog frog is vulnerable to non-native invasive species impacts. Both invasive plants and animals can cause direct, negative outcomes to both bog frog habitat and individuals. Fire-tolerant plants have become established in bog frog habitat (Jackson 2004). The effects of plant invasions are similar to woody plant encroachment (see above). Animals such as wild hogs (*Sus scrofa*) can damage substrate, microhabitat, and frog eggs (Jackson 2004).

The Florida bog frog may be susceptible to several diseases, including chytrid fungus (*Batrachochytrium dendrobatidis*) and ranaviruses (*Ranavirus spp.*). Chytrid fungus is widely found in frogs across the southeastern United States, but most cases have been subclinical (Rothermel et al. 2008). Ranavirus can be a much more catastrophic amphibian disease in North America; mass mortality events have been recorded in more than 30 states and 5 Canadian provinces (Green et al. 2002, Gray et al. 2009a, 2009b).

Potential to Significantly Impair Essential Behavioral Patterns

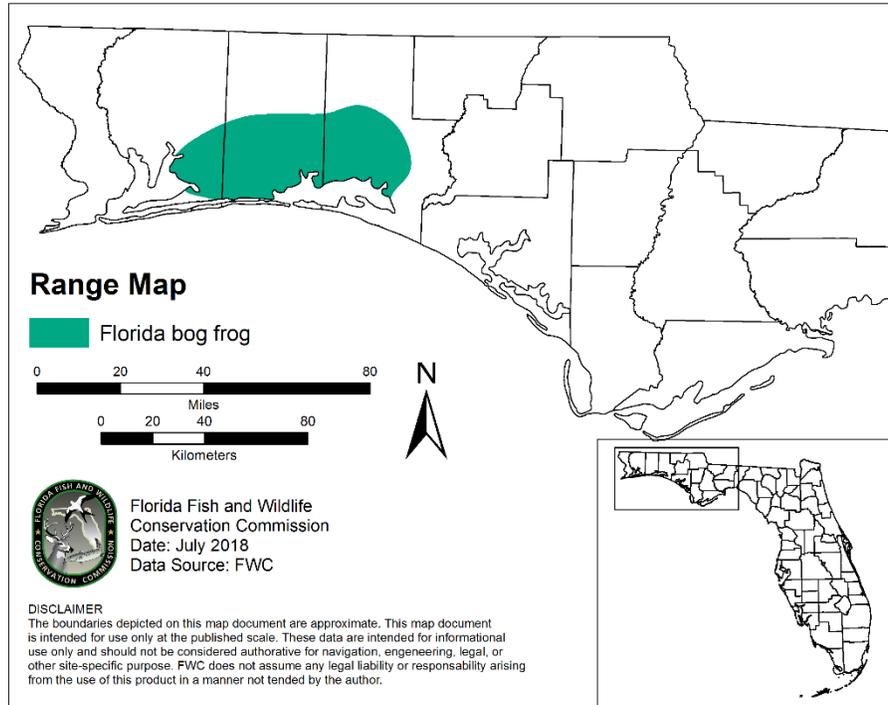
Florida bog frogs rely on early successional habitat associated with acidic seeps, streams, and boggy habitat. Fire exclusion promotes hardwood encroachment, which makes habitat unsuitable. Although this species primarily occurs on protected lands, nearby developments and infrastructure may preclude the use of prescribed fire. Activities that alter hydrology or cause siltation and pollution in streams inhabited by bog frogs will degrade habitat. Furthermore, this species may be susceptible to competition and displacement by bronze frogs as well as disease outbreaks, especially in areas with degraded habitat.



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

Distribution and Survey Methodology

Florida bog frogs are native to the tributaries of the East Bay River, Yellow River, and Titi Creek in Santa Rosa, Okaloosa and Walton counties (Moler 1992, Bishop 2004, Gorman 2009). In addition to Eglin Air Force Base, this species occurs on the Yellow River Wildlife Management Area and limited private lands. The map (right) represents the principle geographic range of this species, including intervening areas of unoccupied habitat. This map is for informational purposes only and not for regulatory use.



County List: Okaloosa, Santa Rosa, Walton.

Recommended Survey Methodology

The presence of Florida bog frogs is most easily determined by detecting calling males during the breeding season through late summer (March through mid-August). Calls can be detected by simple pedestrian surveys or by using electronic recording devices (e.g., frog call loggers). Given that the goal of surveys is to detect the species, the FWC recommends pedestrian surveys during appropriate weather conditions (see below) to determine presence. The objective of the surveys is to document the occurrence of the Florida bog frog; thus, if frogs are detected on the first survey date, there is no need to continue surveys. Call based detection surveys are typically not invasive, and under most circumstances do not require a permit from the FWC. However, surveys that require handling of the species (e.g., trapping, dip netting), will require a permit, and should be conducted in coordination with FWC. Suggested Florida bog frog survey protocol, including a sample data sheet, is included in Appendix 1 of [A Species Action Plan for the Florida Bog Frog](#) (FWC 2013).

- All surveys should follow standard amphibian disinfection protocol. A list of suitable procedures can be found at salamanderfungus.org.
- Surveys should be conducted:
 - Within earshot of suitable Florida bog frog habitat.
 - During peak breeding season (May through July) to maximize the chance of encountering calling males.
 - At least 30 minutes after sunset, and be completed by 2:00 a.m.
 - At least five days after heavy rains (Bishop 2004).
- Surveys should not be conducted:
 - During periods of rain, wind (> 12 mph), or cool temperatures (< 60° F).
 - During periods with prolonged or loud noises (e.g., low flying aircraft) which can cause frogs to momentarily stop calling.

Visual surveys for adults, tadpoles, and egg masses can also document presence. Surveys for actual frogs are typically performed in conjunction with scientific studies. If scientific studies are performed as a form of mitigation, surveys should be designed with input from FWC.

Recommended Conservation Practices

Recommendations are general measures that could benefit the Florida bog frog but are not required. No FWC permit is required to conduct these activities. To aid in the conservation of this species, Jackson (2004) prioritized parcels on public and private land into conservation management units (CMUs). The below recommendations should especially be considered in high-priority CMUs.

- Develop and implement a prescribed fire regime in suitable or occupied habitat during the growing season.
- Establish and manage conservation easements that maximize the conservation (i.e., high value CMUs) of suitable or occupied habitat on private lands, including an upland buffer around wetlands and seeps.
- Avoid installing impoundments in or immediately adjacent to suitable or occupied habitat.
- Avoid installing borrow pits upslope of suitable or occupied habitat. Existing borrow pits upslope of habitat they should be closed (Jackson 2004).
- Avoid building road crossings through Florida bog frog habitat.
- If road crossings are needed, bridges will reduce sedimentation entering habitat. Guidelines for minimizing erosion and runoff from roadways can be found in the State of Florida Best Management Practices (BMP's) for stormwater runoff, and within the Florida Department of Agriculture Consumer Services (FDACS) silviculture BMP's.
- Implement non-native invasive plant and/or animal control methods in and around suitable and occupied habitat.
- Prior to using herbicides in or around suitable or occupied habitat, review labels for potential effects on non-target organisms (Jackson 2004). Herbicides should be aquatic labeled, and adjuvants should be aquatic compatible.
- Maintain this species status as a conservation target in the [Eglin Air Force Base Integrated Natural Resources Management Plan](#) (U.S. Air Force 2017), and the [Blackwater River State Forest Management Plan](#) (FDACS and Florida Forest Service 2013).

Measures to Avoid Take

Avoidance Measures that Eliminate the Need for FWC Take Permitting

This section describes all measures that would avoid the need for an applicant to apply for an FWC take permit.

- Avoid conversion and degradation of suitable or occupied Florida bog frog habitat. This includes creating impoundments and use of adjacent uplands for activities that would affect water quality and quantity.

Examples of Activities Not Expected to Cause Take

This is not an exhaustive list of exempt actions. Please contact FWC if you are concerned that you could potentially cause take.

- Activities that occur in areas not consistent with Florida bog frog habitat.
- Activities consistent with the Eglin Air Force Base Integrated Natural Resources Plan, and the Blackwater River State Forest Management Plan.

Florida Forestry Wildlife BMP's and Florida Agricultural Wildlife BMP's

- Agriculture, as defined in Section 570.02, F.S., conducted in accordance with Chapter 5I-8, F.A.C., and the wildlife best management practices (BMPs) adopted in Rule 5I-8.001 and 5M-18.001, F.A.C., by the Department of Agriculture and Consumer Service pursuant to Section 570.94, F.S., is authorized and does not require a permit authorizing incidental take despite any other provision of Rule 68A-27.007 or 68A-27.005, F.A.C.
- Participation in the [Florida Forestry Wildlife BMP's and Florida Agricultural Wildlife BMP's](#) program and implementation of these BMP's provides a presumption of compliance for incidental take of Florida Bog frogs.
- The [Silviculture BMPs](#) (FDACS 2008) as they relate to SMZs, wetlands, stream crossings, timber harvesting, and pesticide and fertilizer application would benefit this species.

Other Authorizations for Take

- As described in 68A-27.007(2)(c) F.A.C., land management activities (e.g., aquatic habitat management, prescribed fire, mechanical removal of non-native invasive species, and herbicide application) that benefit wildlife and are not inconsistent with FWC Management Plans are authorized and do not require a permit authorizing incidental take.
- Water management actions for human health and safety, such as flood control.

Coordination with Other State and Federal Agencies

The FWC participates in other state and federal regulatory programs as a review agency. During review, FWC identifies and recommends measures to address fish and wildlife resources to be incorporated into other agencies' regulatory processes. For example, FWC assists Eglin Air Force Base Natural Resources Branch (U.S. Department of Defense) in the review and development of the Integrated Natural Resources Management Plan for Eglin Air Force Base, a document which addresses the needs of multiple state- and federally listed species and their habitats.

FWC provides recommendations for addressing potential impacts to state-listed species in permits issued by other agencies. If permits issued by other agencies adequately address all the requirements for issuing a state-Threatened species take permit, FWC will consider those regulatory processes to fulfill the requirements of Chapter 68A-27, F.A.C., with no additional application process. This may be accomplished by issuing a concurrent take permit from FWC, by a memorandum of understanding with the cooperating agency, or by a programmatic permit issued by another agency. These permits would be issued based on the understanding that the implementation of project commitments will satisfy the requirements of 68A-27.003 and 68A-27.007, F.A.C.

Review of Land and Water Conversion projects with State-Listed Species Conditions for Avoidance, Minimization and Mitigation of Take

- FWC, in coordination with other state agencies, provides comments to federal agencies (e.g., the Army Corps of Engineers) on federal actions, such as projects initiated by a federal agency or permits being approved by a federal agency.
- FWC works with landowners, local jurisdictions, and state agencies such as the Department of Economic Opportunity on large-scale land use decisions, including long-term planning projects like sector plans, projects in Areas of Critical State Concern, and large-scale comprehensive plan amendments.
- FWC coordinates with state agencies such as the Department of Environmental Protection (DEP) and the five Water Management Districts on the Environmental Resource Permitting (ERP) program, which regulates activities such as dredging and filling in wetlands, flood protection, stormwater

management, site grading, building dams and reservoirs, waste facilities, power plant development, power and natural gas transmission projects, oil and natural gas drilling projects, port facility expansion projects, some navigational dredging projects, some docking facilities, and single-family developments such as for homes, boat ramps, and artificial reefs.

FWC Permitting: Incidental Take

As defined in Rule 68A-27.001, F.A.C., incidental take is take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Activities that result in take of Florida bog frogs can require an Incidental Take Permit from the FWC (see above for actions that do not require a permit). Permits may be issued when there is a scientific or conservation benefit to the species and only upon showing by the applicant that the permitted activity will not have a negative impact on the survival potential of the species. Scientific benefit, conservation benefit, and negative impacts are evaluated by considering the factors listed in Rule 68A-27.007(2)(b), F.A.C. These conditions are usually accomplished through a combination of avoiding take when practicable, minimizing take that will occur, and mitigating for the permitted take. This section describes the minimization measures and mitigation options available as part of the Incidental Take Permit process for take of this species. This list is not an exhaustive list of options.

Minimization Measure Options

The options below are intended to address the evaluation factors required for consideration when issuing an incidental take permit. These options can lessen the impact of activities, and ultimately may reduce what is needed to achieve a Conservation or Scientific Benefit (see below).

Seasonal, Temporal, and Buffer Measures

- No seasonal or temporal minimization options have been identified.
- Establish a buffer zone of 200 ft (61 m) around slopes draining into suitable or occupied habitat to reduce the potential for runoff or pollution to enter habitats.
- Store hazardous chemicals, fertilizers, and petroleum products in safe, spill proof containers at a minimum of 300 ft (91.4 m) away from suitable or occupied habitat.

Design Modification

- Minimize loss and disturbance of suitable or occupied habitat.
- Minimize loss and disturbance of uplands and wetlands surrounding and upstream of suitable or occupied.
- Design projects that will not affect prescribed fire regimes or the ability to use fire in adjacent habitat.
- Minimize the number of stream crossings within suitable or occupied habitat and, where stream crossings are necessary, implement appropriate measures to reduce sedimentation and flooding (e.g., bridges, bank stabilization techniques).

Method Modification

- Use sediment screens, bales, or other methods to limit runoff from upland site activity.
- Report trespass and illegal dumping occurring around Florida bog frog habitat.
- Limit vehicle speeds at unimproved stream crossings.

Mitigation Options

Mitigation is scalable depending on the impact, with mitigation options for take that significantly impairs or disrupts essential behavioral patterns. The DEP's ERP process forms a basis of mitigation for loss or degradation of Florida bog frog breeding, feeding, and sheltering habitat. Following the ERP process, the FWC will review the resulting wetland mitigation to assess whether the mitigation meets the definition of

conservation benefit for the Florida bog frog. In most cases, wetland mitigation through the ERP process will satisfy the applicants' responsibilities under Chapter 68A-27, F.A.C., and associated rule enforcement policies. Under certain circumstances, the FWC may require additional measures to achieve scientific or conservation benefit specific for the take of Florida bog frog. Potential options for mitigation are described below. This list is not an exhaustive list of options.

Scientific Benefit

This section describes research and monitoring activities that provide scientific benefit, per 68A-27.007, F.A.C. Conducting or funding these activities can be the sole form of mitigation for a project. As new information becomes available the options below are subject to change.

- Occupancy and population surveys that monitor current populations, suitable habitat, and restoration sites will provide scientific benefit to the species (Actions 4, 11).
- Regular monitoring of current populations combined with genetic and disease sampling will help assess the threats of genetic swamping and disease (Actions 5, 11).

Habitat

- Removal and treatment of non-native invasive and successional (i.e., titi) plant species and replacement with native plant species may be a mitigation option (Action 2).
- Removal and control of non-native invasive animal species and restoration of impacted habitat may be mitigation options (Action 2).

Funding

- No funding option has been identified at this time. Funding options as part of mitigation will be considered on a case by case basis.

Information

- Providing dead specimens to FWC for disease and genetic screening may be an information option, depending on current research needs (Action 5). Arrangements for the transport or shipping of specimens may be arranged by contacting Imperiled@MyFWC.com.

Programmatic Options

- FWC's Landowner Assistance Program is a voluntary program that can offer financial assistance to landowners who implement conservation plans. This program allows for the FWC to gather information on private lands slated for development and provide assistance by evaluating development practices to create suitable avoidance, minimization and mitigation options for specific properties (Actions 1, 8).
- Enrollment and implementation of appropriate BMPs may be a mitigation option (Actions 1, 9).

Multispecies Options

- No multispecies permitting options have been identified at this time.

FWC Permitting: Intentional Take

Intentional take is not incidental to otherwise lawful activities. Per Rule 68A-27, F.A.C., intentional take is prohibited and requires a permit. For state-Threatened species, intentional take permits may only be considered for scientific or conservation purposes (defined as activities that further the conservation or survival of the species taken). Permits are issued for state-Threatened species following the guidance in Rule 68-A27.007(2)(a), F.A.C.

Risks to Property or People

Intentional Take for Human Safety

- There are no circumstances for which Florida bog frogs may be taken for human safety.
- Permits will be issued only under limited and specific circumstances, in cases where there is an immediate danger to the public's health and/or safety, including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local government entity. Applications submitted for this permit must include all information that is required from any other applicant seeking a permit, along with a copy of the official declaration of a state of emergency, if any. This permit process may be handled after the fact or at least after construction activities have already started. An intentional take permit may be issued for such purposes.

Aversive Conditioning

- Not applicable for the Florida bog frog.

Permits Issued for Harassment

- Not applicable for the Florida bog frog.

Scientific Collecting and Conservation Permits

- Scientific collecting permits may be issued for the Florida bog frog using guidance found in Rule 68A-27.007(2)(a), F.A.C. Activities requiring a permit include any research that involves capturing, handling, or marking wildlife; conducting biological sampling; or other research that may cause take. Florida bog frogs that are used for education and outreach events should have a scientific collecting permit. A scientific collecting permit will not be issued for the sole purpose of removing a frog from the wild to use as an educational or outreach animal. Florida bog frogs permitted for educational and outreach purposes should be used for a minimum of 12 educational engagements equating to a minimum of 48 hours of contact time.

Considerations for Issuing a Scientific Collecting Permit

- 1) Is the purpose adequate to justify removing the species (if the project requires this)?
 - Permits will be issued if the identified project is consistent with the goal of the Species Action Plan (i.e., improvement in status that leads to removal from Florida's Endangered and Threatened Species List) or addresses an identified data gap important for the conservation of the species.
- 2) Is there a direct or indirect effect of issuing the permit on the wild population?
- 3) Will the permit conflict with program intended to enhance survival of species?
- 4) Will purpose of permit reduce likelihood of extinction?
 - Projects consistent with the goal of the Species Action Plan or that fill identified data gaps in species life history or management may reduce the likelihood of extinction. Applications should clearly explain how the proposed research will provide a scientific or conservation benefit for the species.
- 5) Have the opinions or views of other scientists or other persons or organizations having expertise concerning the species been sought?
- 6) Is applicant expertise sufficient?
 - Applicants must have prior documented experience with this or similar species; applicants should have met all conditions of previously issued permits; and applicants should have a letter of reference that supports their ability to handle the species.

Relevant to all Scientific Collecting Permits for Florida bog frogs

- Visual encounter surveys that do not involve handling animals do not require a permit.
- Any activity that requires trapping or handling a Florida bog frog requires a permit. For example, these activities include collecting blood or genetic material for taxonomic analyses.
- Applications must include a proposal that clearly states the objectives and scope of work of the project, including a justification of how the project will result in a conservation benefit to the species. The proposal should also include a thorough description of the project's methods, timeframe and final disposition of all individuals. Permit amendment and renewal applications must be "stand alone" (i.e., include all relevant information on objectives and methods).
- Permits may be issued to display a specimen if the specimen was obtained via rehabilitation facility or was encountered dead.
- Permits may be issued for captive possession (removal from the wild) if the individual is deemed non-releasable.
- Capturing and handling protocols, and a justification of methods, must be included in the permit application and should identify measures to lessen stress for captured frogs.
- Methodologies for any procedures should be clearly described, including measures taken to reduce stress and injury to frogs.
- Methodologies for any collection of tissues such as blood and should be clearly spelled out, including measures taken to reduce stress and injury to the frogs.
- Disposition involving captive possession for any period of time must include a full explanation of whether the facility has appropriate resources for accomplishing the project objectives and for maintaining the animals in a safe and humane manner.
- Any mortality should be reported immediately to the FWC at the contact information below. The FWC will provide guidance on proper disposition of specimens.
- Geographical or visual data gathered must be provided to FWC in the specified format.
- A final report should be provided to the FWC in the format specified in the permit conditions.

Additional information

Information on Economic Assessment of this guideline can be found at <http://myfwc.com/wildlifehabitats/imperiled/management-plans/>

Contact

For more species-specific information or related permitting questions, contact the FWC at (850) 921-5990 or WildlifePermits@myfwc.com. For regional information, visit <http://myfwc.com/contact/>.

Literature Cited

- Austin, J. D., T. A. Gorman, D. C. Bishop, and P. E. Moler. 2011*a*. Genetic evidence of contemporary hybridization in one of North America's rarest anurans, the Florida bog frog. *Animal Conservation* 2011:1-9.
- Austin, J. D., T. A. Gorman, and D. C. Bishop. 2011*b*. Assessing fine-scale genetic structure and relatedness in the micro-endemic Florida bog frog. *Conservation Genetics* 12:533-538.
- Bartlett, R. D. and P. P. Bartlett. 2011. *Florida's Frogs, Toads, and Other Amphibians A Guide to Their Identification and Habits*. University Press of Florida, Gainesville, Florida.

- Bishop D. C. 2004. Summary of surveys for Florida bog frogs and flatwoods salamanders on Eglin Air Force Base through 2004. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
- Bishop D. C. 2005. Ecology and distribution of the Florida bog frog and flatwoods salamander on Eglin air Force Base. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
- Florida Fish and Wildlife Conservation Commission. 2011. Biological Status Review of the Bog Frog. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Florida Fish and Wildlife Conservation Commission. 2013. A Species Action Plan for the Florida Bog Frog *Lithobates okaloosae*. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Gorman, T. A. 2009. Spatial interactions between two species of frogs: *Rana okaloosae* and *R. clamitans clamitans*. *Copeia* 2009:138-141.
- Gorman, T. A., and C. A. Haas. 2011. Seasonal microhabitat use and selection of syntopic populations of *Lithobates okaloosae* and *Lithobates clamitans clamitans*. *Journal of Herpetology* 45:313-318.
- Gorman, T. A., and C. A. Haas. 2012. Tadpole competition: the influence of a common tadpole on the growth of a congener. *Florida Scientist* 75:11-24.
- Gray, M. J., J. T. Hoverman, and D. L. Miller. 2009a. Amphibian ranaviruses in the southeastern United States. Southeastern Partners in Amphibian and Reptile Conservation, Disease, Pathogens and Parasites Task Team, Information Sheet #1.
- Gary, M. J., D. L. Miller, and J. T. Hoverman. 2009b. Ecology and pathology of amphibian ranaviruses. *Diseases of Aquatic Organisms* 87:243-266.
- Green, D. E., K. A. Converse, and A. K. Schrader. 2002. Epizootiology of sixty-four amphibian morbidity and mortality events in the USA, 1996-2001. *Annals of the New York Academy of Sciences* 969-323-339.
- Jackson, D. R. 2004. Florida bog frog: management guidelines for a species at risk on Department of Defense installations. NatureServe, Arlington, Virginia.
- Moler, P. E. 1985. A new species of frog (Ranidae: *Rana*) from northwestern Florida. *Copeia* 1985:379-383.
- Moler, P. E. 1992. Florida bog frog, *Rana okaloosae*. Pages 30-33 in P. E. Moler, editor. Rare and endangered biota of Florida. Volume III: Reptiles and Amphibians. University Press of Florida, Gainesville, Florida.
- Priestley, A. S., T. A. Gorman, C. A. Haas. 2010. Comparative morphology and identification of Florida bog frog and bronze frog tadpoles. *Florida Scientist* 73:20-26.
- Printiss, D. and D. Hipes. 1999. Rare amphibian and reptile survey of Eglin Air Force Base, Florida. Final Report. Florida Natural Areas Inventory, Tallahassee, FL.
- Rothermel, B. B., S. C. Walls, J. C. Mitchell, C. K. Dodd, Jr., L. K. Irwin, D. E. Green, V. M. Vazquez, J. W. Petranka, and D. J. Stevenson. 2008. Widespread occurrence of the amphibian chytrid fungus *Brachychytrium dendrobatidis* in the southeastern U.S.A. *Diseases of Aquatic Organisms* 82:3-18.