

Georgia Blind Salamander

Eurycea wallacei



Photograph by Nathanael Herrera, Florida State University.

Species Overview

Status: Listed as 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.
- Florida Statutes XLVI, Chapter 810.13(1)(a), “cave” means any void, cavity, recess, or system of interconnecting passages which naturally occurs between the surface of the earth or within a cliff or ledge, including natural subsurface water and drainage systems but not including any mine, tunnel, aqueduct, or other manmade excavation, and which is large enough to permit a person to enter. The word “cave” includes any cavern, natural pit, or sinkhole which is an extension of an entrance to a cave.
- Florida Statutes XLVI, Chapter 810.13(3), defines cave life as any life form indigenous to a cave or cave ecosystem. 810.13(3) It is unlawful to remove, kill, harm, or otherwise disturb any naturally occurring organism within a cave, except for safety or health reasons. The provisions of this subsection do not prohibit minimal disturbance or removal of organisms for scientific inquiry.
- Florida Statutes XLVI, Chapter 810.13 (4), Pollution and Littering. – It is unlawful to store in a cave any chemical or other material which may be detrimental or hazardous to the cave, the mineral deposits therein, to the cave life therein, to the waters of the state, or to persons using such cave for any purposes. It is also unlawful to dump, litter, dispose of, or otherwise place any refuse, garbage, dead animal, sewage, trash, or other similar waste materials in a cave. This subsection shall not apply to activity which is regulated pursuant to s. 373.106, regarding the intentional introduction of water into an underground formation, or chapter 377, regarding the injection of fluids into subsurface formations in connection with oil or gas operations.

Cryptic Species

Cryptic species are those that may be difficult to detect due to behavior, habitat, or physical features, even when using standardized survey techniques in occupied habitat. Interpretation of when harm or harassment may occur is difficult without a clear understanding of essential behavioral patterns of the species or habitat features that may support those behavioral patterns. The documented difficulties in detecting cryptic species and the lack of a reliable detection methodology leads to different considerations for take due to harm.

- Florida's [Imperiled Species Management Plan](#) identifies the Georgia blind salamander as a cryptic species. Due to low detectability, little is known about the range wide distribution or life history of this species.
- Permitting standards for the Georgia blind salamander will focus on stakeholder cooperation and information acquisition, with the understanding that as additional information is gained, these permitting standards may change.
- Surveys for the Georgia blind salamander are only recommended for [scientific benefit](#). Even if surveys are conducted, detection is difficult because of the subterranean nature of this animal, therefore, surveys should be performed in coordination with FWC.

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 Georgia blind salamander, threats faced by the species, and what constitutes significant disruption of essential behaviors.

The Georgia blind salamander (*Eurycea wallacei*; formerly *Haideotriton wallacei*) is a stygobitic (associated with groundwater systems) salamander that lives in underground aquatic caves. The species is restricted to the Marianna Lowlands-Dougherty Karst Plain physiographic region of the Floridan Aquifer (Means 1992, Petranka 1998, Hammerson 2004; see [Habitat Features that Support Essential Behavior Patterns](#) below). In Florida this species has been found in two river basins, the Chipola and Choctawhatchee, and its Florida range is restricted to three counties: Calhoun, Jackson and Washington (Florida Natural Areas Inventory, unpublished data; see [map](#)). The suspected range of this species extends to the Flint River basin in Georgia where the species has been observed in Decatur and Dougherty counties.

Juvenile Georgia blind salamanders are translucent white to pink, are heavily spotted, have a tail fin, and have visible eye spots. Adult Georgia blind salamanders are white in color and lack eye spots and tail fins. Typically 1-2 in (25-50 mm) in length, adults can reach over 3 in (75 mm; Means 1992). Larger salamanders are found in deeper water (Means 1992). Neoteny, the retention of juvenile characteristics, is an adaptation that allows for this species to survive in cave environments. Another adaptation, the vestigial (remnant) eyes, are a result of the perpetual darkness found in underground environments.

The life history of the Georgia blind salamander is largely unknown, including both lifespan and population size in the wild (Hammerson 2004). Georgia blind salamanders rely on tactile cues to capture aquatic invertebrate prey, including small crustaceans and insects (Carr 1939, Means 1977). Predators include cave crayfish, eels, and fish (Means 1992, Fenolio et al. 2013). Gravid females have been observed in May and November (Carr 1939, Means 1977), which does not indicate seasonal breeding. Known populations seem secure and stable (P. Moler, personal communication 2018), however at least two sites historically had heavy collection (Hammerson 2004, Means 2005).

Further background information pertaining to the Georgia blind salamander may be found in the [Georgia Blind Salamander Biological Review Report](#) (FWC 2011), and [A Species Action Plan for the Georgia Blind Salamander](#) (FWC 2013).

Habitat Features that Support Essential Behavioral Patterns

Caves, underground streams, pools, and aquifers that support the Georgia blind salamander are clear and cool, generally 64-70° F (18-21° C). These habitats are carved from soluble rocks, typically limestone, by flowing water and are covered by fine red clays or silt (Pylka and Warren 1958, Petranka 1998, Means 2005). Aside from concentrations of known locations in Jackson County, Florida, little is known about the distribution of this species, thus knowledge of essential habitat features is based on limited observations.

This species is likely found in many other cave environments within the Floridan Aquifer, yet may remain undetected due to exceeding difficulty to survey in these environments. Georgia blind salamanders are often found in association with Dougherty Plain cave crayfish (*Cambarus cryptodytes*; Means 2005).

Threats

The Georgia blind salamander is adapted to live in a subterranean environment, and therefore susceptible to environmental and anthropogenic changes that impact caves. Because of connectivity between surface waters and caves threats are applicable to both surface and underground waters. Potential threats to the species include pollution, water-level changes, climate change, disease, and habitat disturbance. Many types of pollution can readily enter karst systems, including septic tank effluent, fertilizers, pesticides, various types of hazardous waste, runoff from impervious surfaces, farm waste, oils, and sediments originating from siltation and erosion (Brandt and Jackson 2003, Fenolio et al. 2013). Both publicly and privately-owned sites are vulnerable to illegal dumping. Pumping from wells for residential and agricultural use could negatively impact the species by altering water levels.

Amphibian diseases could significantly harm Georgia blind salamanders. Because of the small distribution of Georgia blind salamanders, an introduction of *Batrachochytrium salamandrivorans* (Bsal) has the potential to kill large portions of the population. Additionally, other animals inhabiting caves are susceptible to unintentionally transferred diseases and pathogens. For example, bats cohabiting in caves are vulnerable to the introduction of the fungus that causes white-nose syndrome, *Pseudogymnoascus destructans*.

Potential to Significantly Impair Essential Behavioral Patterns

Georgia blind salamanders rely on stable conditions to persist in a troglodytic environment. Therefore, changes to occupied or potential Georgia blind salamander habitat may significantly impair essential behavioral patterns. Activities that have the potential to cause excess runoff, siltation, or pollution to enter caves through either surface openings or percolation will negatively affect populations of Georgia blind salamanders. Any activities that affect water quality or water levels, such as excessive water drawdowns, may affect both known and unrecorded populations. Recreational or professional cave divers have the capability to unknowingly or unintentionally introduce diseases that can harm populations of salamanders and other cave life.

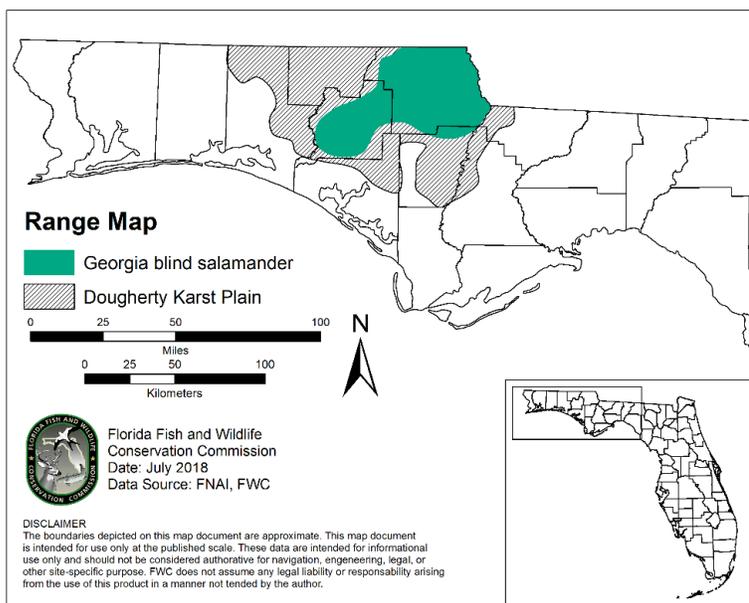
Distribution and Survey Methodology

The map (right) represents the geographic range of the Georgia blind salamander, including intervening areas of unoccupied habitat, and the approximate boundary of the Marianna Lowlands-Dougherty Karst Plain in Florida. This map is for informational purposes only and not for regulatory use.

County List: Calhoun, Jackson and Washington.

Recommended Survey Methodology

FWC does not recommend Georgia blind salamander surveys for most activities unless as a component of [scientific benefit](#). Any surveys



performed during the project planning phase should be coordinated with FWC. Because this is a cryptic species, surveys should be conducted in accordance with the methodology described below but may not detect this species. Surveys are not required. Any activity that requires handling a Georgia blind salamander in any capacity requires a permit. Opportunistic encounters of this animal are unlikely since they are restricted to subterranean environments. There are no other species that may be confused with the Georgia blind salamanders.

- Trained cave divers can visually encounter Georgia blind salamanders (see methods in Morris 2006).
- A geographic information system (GIS) review of recent (post-2000) Georgia blind salamander sightings and known sinkholes and caves may help determine presence of this species. However, because of the species cryptic nature, GIS and/or crowd-sourced databases should not be solely relied on if there are no documented occurrences near a project. Sinkholes and caves may connect to occupied habitat, even if there are no records of the species nearby. GIS data may be available upon request from FWC.

Recommended Conservation Practices

Recommendations are general measures that could benefit the Georgia blind salamander but are not required. No FWC permit is required to conduct these activities.

- Establish conservation easements that maximize the conservation of habitat around cave openings and karst recharge zones within the Georgia blind salamander range.
- Secure sinkholes and cave openings with fencing and/or signage to prevent vandalism, dumping, and damage to the habitat.
- Avoid degradation of aquatic habitats by avoiding activities that create pollution or runoff that could enter karst environments. This includes surface waters that drain into the Floridan aquifer. Guidelines for minimizing erosion and runoff can be found in the State of Florida Best Management Practices (BMP's) for [stormwater runoff](#), within the Florida Department of Agriculture Consumer Services (FDACS) [silviculture BMPs](#), and within the BMPs listed [below](#).
- Avoid activities that would artificially remove excess water from the aquifer, especially during times of drought.
- Create conservation buffers around sinkholes and caves based on karst recharge zones. These buffers help retain water and soil on site and reduce pollutants in surface water (See [Agriculture Wildlife BMPs for State Imperiled Species](#); FDACS 2015).
- Avoid application of herbicides or pesticides within 61m (200 ft) of sinkholes and caves and karst recharge zones containing Georgia blind salamanders (USFWS 2001).
- To prevent disease introduction, use standard cleaning techniques equipment after exiting the cave. Disinfection procedures are provided by the [Bsal Task Force](#).

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 activities that degrade Georgia blind salamander habitat, specifically, those that could cause pollution (including septic-tank effluent, fertilizers, pesticides, hazardous waste, farm waste, and oils) and surface runoff (i.e., siltation) to enter cave environments, and avoid activities that could cause rapid fluctuation in underground water levels.
- Avoid activities that would physically disturb Georgia blind salamander habitat. Specifically, avoid activities that require physically entering the cave environment by a person or machine.

Examples of Activities Not Expected to Cause Take

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

- Activities that occur in watersheds or on lands not adjacent to Georgia blind salamander habitat.
- Surface activities that do not create runoff or a pathway for pollution to enter occupied or potentially suitable caves.
- Silvicultural or agricultural activities that follow the [Agricultural BMP's](#) for streamside management zones in the Marianna Lowlands-Dougherty Karst Plain physiographic region of the Floridan Aquifer.

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 Georgia blind salamanders.
- The FDACS Agriculture Wildlife BMP's for [State Imperiled Species](#) (FDACS 2015) include the Georgia blind salamander, and require the implementation of the FDACS BMPs for Water Quality as a condition of program enrolment.
- The [Silviculture](#) BMP's (FDACS 2008) as they relate to sinkholes would benefit the Georgia blind salamander.
- The FDACS BMPs for Water Quality/Quantity for specific operations ([Cow/Calf](#), [Dairy](#), [Equine](#), [Nurseries](#), [Poultry](#), [Sod](#), [Specialty Fruit and Nut Crops](#), [Vegetable and Agronomic Crops](#)), as they relate to waste management, water resource protection, irrigation, erosion control, sediment control, stormwater management, etc. would benefit the Georgia blind salamander.

Other Authorizations for Take

- As described in Rule 68A-27.007(2)(c) F.A.C., land management activities (e.g., aquatic habitat management, prescribed fire, mechanical removal of 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.
- Emergency 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, the FWC commented on the Florida Caverns State Park Advisory Group Draft Unit Management Plan (DEP 2017).

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 of the requirements for issuing a state-Threatened species take permit, FWC will evaluate if those regulatory processes 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, provide 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 in 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 impacts to Georgia blind salamanders 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). The FWC does not recommend surveys to determine the presence of Georgia blind salamanders unless as a component of Scientific Benefit.

Seasonal, Temporal, and Buffer Measures

- Maintain a buffer zone of 61 m (200 ft) around the sinkhole or cave openings in karst recharge zones to reduce the potential for runoff or pollution to enter underground environments.
- Store hazardous chemicals, fertilizers, and petroleum products in safe, spill proof containers a minimum of 91.4 m (300 ft) away from sinkholes or cave openings in karst recharge zones.
- Because little is known about Georgia blind salamander life history, there are no seasonal or temporal minimization measures for this species.

Design Modification

- Minimize the amount of agriculture and construction that occurs near sinkholes or cave openings.

- Avoid intrusive activities into the karst system, such as the installation of underground columns for support pilings.
- Place roads at least 61 m (200 ft) away from caves and sinkholes in karst recharge zones and have specific stormwater treatment systems for any potential runoff into the system.
- Do not install new underground storage tanks in the cave watershed and when possible, remove any current underground storage tanks already in place.
- Install leak sensors for any petroleum, fertilizer, or fuel storage tanks located inside watersheds with Georgia blind salamanders.

Method Modification

- When activities must occur in areas connected to Georgia blind salamander habitat, refer to [Recommended Conservation Practices](#) to reduce take.
- Store hazardous chemicals, fertilizers, and petroleum products in safe, spill proof containers a minimum of 300 ft (91.4 m) away from sinkholes or cave openings in karst recharge zones.
- Use sediment screens, bales, or other methods to limit sedimentation from upland site activity.
- Provide maps of known sinkhole and cave openings to project personnel.
- Report trespassing and illegal dumping occurring around sinkholes and cave openings.

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 Georgia blind salamander breeding, feeding, and sheltering habitat. Following the ERP process, the FWC will review the resulting mitigation to assess whether the mitigation meets the definition of conservation benefit for Georgia blind salamanders. In most cases, 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 Georgia blind salamanders. Potential options for mitigation are described below. References to specific actions within the Species Action Plan (SAP) for the Georgia Blind Salamander (FWC 2013) are provided. This list is not an exhaustive list of options.

Scientific Benefit

This section describes research and monitoring activities that provide scientific benefit, per Rule 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.

- Following established survey methods, implement projects that monitor Georgia blind salamander presence at occupied locations, and use those data to fill data gaps related to information on extents of occupancy in occupied caves, and population sizes and demography (SAP actions 1, 4).
- Scientific studies (e.g., mark and recapture) can help address life history questions. Mark and recapture surveys can provide data on habitat requirements, dispersal distances, and demographic assessments. They can explain how the species reacts to environmental changes, such as water level fluctuation. These projects should be conducted with input from the FWC to achieve results in concert with ongoing management actions.

Habitat

- Habitat acquisition may be a mitigation option. Acquiring Georgia blind salamander habitat will provide suitable areas for the species Essential Behavioral Patterns. Land should be managed in accordance with the guidelines provided in the BMPs (SAP actions 7,8).

- Enhanced management of Special Management Zones around sinkholes and cave openings can qualify as habitat restoration. This management option must include methods of limiting artificial runoff from entering subterranean caves (SAP action 8).
- Periodic or scheduled habitat and environmental monitoring can be performed during survey efforts as a method to identify suitable habitat and focus conservation efforts (SAP action 1).
- Cave habitat restoration may be a future species need. Therefore, research and collaboration with partners (i.e., Northwest Florida Water Management district will help determine the potential for minimum water flow levels in areas of Georgia blind salamander occurrence (Action 3).

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. (SAP actions 5, 9).

Information

- Access to private property to perform surveys for would benefit the species (SAP actions 4, 7).
- Obtaining Georgia blind salamander sightings from recreational cave divers and scientists would help fill data gaps in the species Florida distribution (SAP actions 4, 9).

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 the FWC to gather information on private lands slated for development, and provide assistance in evaluating development practices to create suitable avoidance, minimization, and mitigation options for specific properties.

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 Georgia blind salamanders 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 Georgia blind salamander.

Permits Issued for Harassment

- Not applicable for the Georgia blind salamander.

Scientific Collecting and Conservation Permits

- Scientific collecting permits may be issued for the Georgia blind salamander 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. Georgia blind salamanders 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 salamander from the wild to use as an educational or outreach animal. Georgia blind salamanders 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 the purpose of the 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 Georgia Blind Salamanders

- Visual encounter surveys that do not involve handling animals do not require a permit.
- Any activity that requires trapping or handling a Georgia blind salamander requires a permit. For example, these activities include collecting 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.
- Methodologies for any procedures should be clearly described.
- Methodologies for any collection of tissues should be clearly spelled out.
- 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/regional-offices>.

Literature Cited

- Brandt, K., and D. R. Jackson. 2003. Protecting the habitat of the Florida cave salamander in Jackson County's spring caves. Final Report to Florida Department of Environmental Protection, Research Grant Agreement, Tallahassee, FL.
- Carr, A., Jr. 1939. *Haideotriton wallacei*, a new subterranean salamander from Georgia. Occasional Papers of the Boston Society of Natural History 8:333-336.
- Fenolio, D. B., M. L. Niemiller, M. G. Levy, and B. Martinez. Conservation status of the Georgia blind salamander (*Eurycea wallacei*) from the Floridan Aquifer of Florida and Georgia. International Reptile Conservation Foundation Reptiles & Amphibians 20:97-111.
- Florida Department of Environmental Protection [DEP]. 2017. Florida Caverns State Park Advisory Group Draft Unit Management Plan. State of Florida Department of Environmental Protection, Tallahassee, Florida.
- Florida Fish and Wildlife Conservation Commission [FWC]. 2011. Georgia blind salamander biological review report. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Florida Fish and Wildlife Conservation Commission [FWC]. 2013. A species action plan for the Georgia blind salamander. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Hammerson, G. 2004. *Eurycea wallacei*. The IUCN red list of threatened species 2004. www.IUCNredlist.org. Accessed 11 June 2018.
- Means, D. B. 1977. Aspects of the significance to terrestrial vertebrates of the Apalachicola River drainage basin, Florida. Pages 37-67 in R. J. Livingston and E. A. Joyce, eds. Proceedings of the conference on the Apalachicola drainage system. Florida Marine Research Publication Number 26, Tallahassee, Florida.
- Means, D. B. 1992. Georgia blind salamander, *Haideotriton wallacei* Carr. Pages 29-53 in P. E. Moler, ed. Rare and Endangered Biota of Florida. Volume III. Amphibians and Reptiles. University Press of Florida, Gainesville, Florida.
- Means, D. B. 2005. *Haideotriton wallacei* Carr, 1939, Georgia blind salamander. Pages 779-780 in M. Lannoo, ed. Amphibian Declines. University of California Press, Berkeley, California.
- Morris, T. L. 2006. A biological inventory of aquifer caves in Florida with a special emphasis on troglobitic crustaceans and salamanders. Final Report to Florida Department of Environmental Regulation, Research Grant Agreement S0057, Tallahassee, Florida.
- Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C.
- Pylka, J. M., and R. D. Warren. 1958. A population of *Haideotriton* in Florida. Copeia 1958:334-336.