

## Peninsular Florida Species Conservation and Consultation Guide

### **Sand Skink and Blue-tailed (Bluetail) Mole Skink**

This guide for sand skink (*Neoseps reynoldsi*) and blue-tailed mole skink (*Eumeces egregius lividus*) conservation and Endangered Species Act (ESA) consultation is intended to assist project proponents to determine if or how a proposed action may affect sand skinks or blue-tailed mole skinks.

The sand skink and blue-tailed mole skink are listed as threatened pursuant to the ESA. The ESA prohibits the unauthorized “take”<sup>a</sup> of threatened and endangered species. Individuals and entities intending to conduct projects that may affect listed species may lawfully incidentally take those species after consulting with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 or 10 of the ESA. When a project is conducted, funded, or authorized by a Federal agency, listed species consultation occurs through section 7 of the ESA. When there is no Federal nexus (*e.g.*, Federal authorization or funding), a non-Federal entity who wishes to conduct an activity may legally “take” listed species after obtaining an Incidental Take<sup>b</sup> Permit (ITP) from the Service in accordance with section 10 of the ESA.

In this guide, we first summarize sand skink and blue-tailed mole skink status, life history, distribution, habitat, and threats. Then we discuss the consultation steps, including: assessing the effects of the proposed action, making effect determinations, and incorporating conservation measures into proposed actions to maximize beneficial effects and to avoid or minimize negative effects to listed skinks and their habitat. Appendix A provides a recommended skink survey protocol and Appendix B provides a variety of possible Conservation Measures, including conservation, compensation, and mitigation guidance. The current guide will be updated as new information becomes available and will be posted on the Service’s South Florida website at <http://www.fws.gov/verobeach/>.

For more information on sand skink and blue-tailed mole skink biology, habitat needs, threats, taxonomy, and recovery criteria and goals, see the Bluetail Mole Skink and Sand Skink 5-Year Status Review (Service 2007) and the South Florida Multi-Species Recovery Plan (Service 1999). Published literature as well as unpublished reports, information, and data referenced in the skink conservation and consultation guide are available at the Service’s South Florida

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<sup>a</sup> “Take” is defined as harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. The term “harm” includes any act which actually kills or injures fish or wildlife, and emphasizes that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish and wildlife. The term “harass” is defined as any act that creates the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include but may not be limited to breeding, feeding, or sheltering.

<sup>b</sup> “Incidental Take” is defined as take that results from, but is not the purpose of, carrying out an otherwise lawful activity.

Ecological Services Office (SFESO) in Vero Beach, Florida (by phone at 772-562-3909 or by mail at 1339 20<sup>th</sup> Street, Vero Beach, Florida 32960-3559).

## **Status**

The Service listed the sand skink and the blue-tailed mole skink as threatened under the ESA in 1987 primarily due to modification and destruction of xeric upland communities in central Florida. Habitat loss, habitat fragmentation, and changes in land use still threaten sand skinks and blue-tailed mole skinks. In addition, lack of habitat management, competition from non-native and invasive plant species, and loss of genetic diversity threaten sand skink and blue-tailed mole skink existence (Service 1999; 2007).

## **Life History**

Little is known about sand skink and blue-tailed mole skink population or reproduction ecology. Both sand skinks and blue-tailed mole skinks are difficult to detect and study due to their small size and semi-fossorial to fossorial habits. Sand skinks and blue-tailed mole skinks generally partition rather than compete with one another for resources. Sand skinks are primarily fossorial; they move or “swim” below the surface of the ground in sandy soils and take prey below the surface. Blue-tailed mole skinks are semi-fossorial; they hunt at the soil surface and consume mostly terrestrial arthropods (Smith 1977).

No data are available on sand skink or blue-tailed mole skink home ranges, or blue-tailed mole skink dispersal. Information on sand skink dispersal and movement patterns is limited. Sand skinks can move more than 3,280 feet (ft) (1 kilometer [km]) at appropriate elevations where suitable soils are contiguous and there are no natural or manmade barriers to movement (Mushinsky et al. 2011a).

Sand skink studies in the early 2000s documented dispersal distances of more than 460 ft (140 meters [m]) (Mushinsky et al. 2001, Penney 2001, Penney et al. 2001) to more than 780 ft (240 m) (Penney 2001). Evidence suggested smaller sand skinks might move greater distances than larger individuals. Researchers believed these documented sand skink dispersal distances likely underestimated dispersal capability. More recent studies documented the longest sand skink movement at 26,250 ft (8 km) and an average movement of 5,250 ft (1.6 km) in naturally fragmented scrubby flatwoods at the Archbold Biological Station (Mushinsky et al. 2011a).

Sand skink dispersal distances documented in field studies are supported by sand skink genetic research. Genetic relatedness of sand skinks was similar between individuals captured as far as 3,280 to 6,560 ft (1 to 2 km) from one another (Schrey et al. 2010). Sand skink genetic relatedness tended to decline beyond the 1 km distance, although it appeared to be influenced by the time since fire (Schrey et al. 2010, Mushinsky et al. 2011b). Fires that occur too frequently could negatively decrease sand skink genetic diversity. Although dispersal data is not available for blue-tailed mole skinks, research suggests that they likely disperse shorter distances than sand skinks (Schrey et al. in press).

### *Distribution*

Reptile research and incidental observations to date indicate blue-tailed mole skinks typically occur with sand skinks. Only sand skinks leave visible signs, or tracks, on sandy soil surfaces. Therefore, sand skink occurrence is used as an indicator of blue-tailed mole skink occurrence where the two species overlap in distribution. Blue-tailed mole skink genetic studies indicate that conservation actions for sand skinks will also likely benefit blue-tailed mole skinks (Schrey et al. in press).

Both sand skinks and blue-tailed mole skinks are endemic to, which means they occur only on, the sandy ridges of central Florida. Skink distribution is defined by three factors: county, elevation, and soil types. Primary populations of sand skinks occur on the Lake Wales, Winter Haven, and Mt. Dora Ridges in Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam Counties. Blue-tailed mole skinks seem to be restricted to the Lake Wales Ridge in Highlands, Polk, and Osceola Counties.

Skinks are generally found at elevations 82 ft above sea level and higher (Florida Natural Areas Inventory 2007). Recent skink occurrences documented at 70 ft above sea level indicate skinks occur at lower elevations where suitable soil conditions for skinks continue down slope (Service unpubl. data).

Skinks occur in excessively drained, well-drained, and moderately well-drained sandy soils that include the Apopka, Arredondo, Archbold, Astatula, Candler, Daytona, Duette, Florahome, Gainesville, Hague, Kendrick, Lake, Millhopper, Orsino, Paola, Pomello, Satellite, St. Lucie, Tavares, and Zuber soil series, referred to as “skink soils” in this guide. Soil series maps are available online (<http://soildatamart.nrcs.usda.gov/>) and through county extension offices.

### *Habitat*

Skink habitat identified in this guide includes skink soils at and above 82 ft above sea level. Skink searches or surveys following a standardized protocol (Appendix A) should be conducted in all skink soils above 82 ft elevation to determine skink occupancy before project-related soil or vegetation disturbance. Additional skink surveys, monitoring, and observations will likely improve knowledge of skink occurrence and distribution, as well as understanding of skink habitat use.

Skink soils typically support scrub, sandhill, or xeric hammock natural ecological communities, such as oak-dominated scrub, turkey oak (*Quercus laevis*) barrens, high pine, and xeric hammocks. Typical upland habitat for both sand skinks and blue-tailed mole skinks consists of sand pine (*Pinus clausa*)-rosemary (*Ceratiola ericoides*) scrub or longleaf pine (*Pinus palustris*)-turkey oak association. Sand skinks have also been documented in skink soils where natural vegetative cover has been altered for human uses such as pine plantations, active or inactive citrus groves, pastures, and residential developments, as well as neglected vegetative cover like old fields and overgrown scrub (Pike et al. 2008). Blue-tailed mole skinks occur in habitat

similar to that used by sand skinks. Habitat condition or vegetative cover alone cannot be used to exclude areas that might be used by sand skinks or blue-tailed mole skinks.

Both sand skinks and blue-tailed mole skinks typically occur in areas that contain a mosaic of open sandy patches interspersed with forbs, shrubs, and trees. Sand skink tracks are usually observed in open sandy areas, yet both skink species use a variety of micro-habitats within xeric vegetative communities. Sand skink tracks appear most abundant in the ecotone, or edges, between areas with abundant leaf litter and vegetative cover and adjacent open sands. Blue-tailed mole skinks are typically found under leaf litter, logs, palmetto fronds, and other ground debris (Christman 1992).

Specific physical structures of habitat that sustain sand skink populations, and likely blue-tailed mole skink populations as well, include a well-defined leaf litter layer on the ground surface and shade from either a tree canopy or a shrub layer, but not both. Leaf litter likely provides important skink foraging opportunities. Shade provided by a tree canopy or a shrub layer likely helps skinks regulate body temperature to prevent overheating. However, having both a tree canopy and a shrub layer appears to be detrimental to skinks (McCoy 2011, University of South Florida, pers. comm.).

Either natural fires started by lightning or prescribed burns are necessary to maintain habitat in natural scrub ecosystems. However, if fire occurs too frequently, leaf litter might not build up sufficiently to support skink populations. At Archbold Biological Station, sand skinks appear to be most abundant after 10 years of leaf litter development. The ideal fire frequency to maintain optimal leaf litter development for skinks likely varies by site and other environmental conditions (Mushinsky 2011, University of South Florida, pers. comm.).

### *Threats*

Habitat loss, fragmentation, and changes in land use continue to threaten sand skinks and blue-tailed mole skinks. Development and agricultural conversion have resulted in the loss of approximately 85 percent of the scrub and sandhill habitats on the Lake Wales Ridge (Turner et al. 2006). Habitat degradation and fragmentation also continue to affect populations, even on protected lands. Active management is necessary to maintain suitable habitat for skinks. Much of the remaining habitat occurs in small, isolated patches surrounded by residential areas or citrus groves, making the suitable habitat patches and connections between patches difficult to protect and manage. Many habitat patches are overgrown and in need of restoration, but vegetation restoration and management programs are costly and depend upon availability of funding. Privately-owned sites remain at risk of being developed, and destruction or habitat modification due to improper or lack of management remains a concern. Conversion of rural lands to urban use in central Florida where skinks occur is projected to continue over the next 50 years. In addition, fire suppression, improper stand management, competition from invasive plant species, and loss of genetic diversity continue to threaten the existence of the sand skink and blue-tailed mole skink.

## **Critical Habitat**

Critical habitat has not been designated for either sand skinks or blue-tailed mole skinks.

## **Consultation Area**

The Service delineated a consultation area (Figure 1) to assist project proponents to determine if a proposed action might affect sand skinks or blue-tailed mole skinks. The consultation area is intended to guide project proponents of both Federal and non-Federal actions. The consultation area includes: (1) known sand skink and blue-tailed mole skink locations, (2) skink soils at appropriate elevations defined as skink habitat, and (3) natural and developed ecosystems that are known to support sand skinks or blue-tailed mole skinks. Experts cannot determine the location of each sand skink and blue-tailed mole skink throughout the year, or the exact areas that support sand skink and blue-tailed mole skink feeding, breeding, and sheltering, even if extensive continuous year-long research is conducted in south Florida. Therefore, the consultation area outlines a geographic landscape with a higher likelihood of skink occupancy than the landscape outside of the consultation area.

In general, proposed actions inside the consultation area are more likely to affect sand skinks and blue-tailed mole skinks, and proposed actions outside the consultation area are less likely to affect skinks. Though the consultation area provides an initial analysis tool, users evaluating a proposed action should not consider the consultation area as the only factor in deciding whether or not consultation is required. The consultation area is based on best available information to date. We expect that more information will improve and refine our knowledge of skink occurrence in the future. Consultation is required if proposed actions outside the delineated consultation area may affect sand skinks or blue-tailed mole skinks. Similarly, consultation may not be required if proposed actions inside the consultation area will not affect sand skinks or blue-tailed mole skinks (*e.g.*, if the project location is not within the appropriate elevation or does not contain suitable skink soils).

## **Consultation**

Federal and non-Federal project proponents have different responsibilities for conducting consultations to ensure compliance with the ESA. All project proponents should follow Steps 1 and 2 regardless of whether they are consulting on Federal actions through section 7 or seeking technical assistance through section 10. Federal project proponents should continue with Steps 3 and 4. Non-Federal project proponents seeking incidental take authorization through section 10 of the ESA should contact the Service at 772-562-3909 in South Florida or 904-731-3336 in North Florida for additional information.

### *Federal Action Agencies*

In addition to this guide, the ESA section 7 Consultation Handbook (Services 1998) and the Species Conservation Guidance Introduction (Service 2004a) provide information on consultation for Federal actions. The Guide to a Complete Initiation Package (Service 2004b) provides details on how to prepare a complete consultation initiation package. The Species

Conservation and Consultation Guide flowchart (Figure 2) can help the user evaluate the potential effects of a proposed Federal action on sand skinks and blue-tailed mole skinks.

### *Non-Federal Entities*

When an action, such as clearing vegetation, conducting development activities, or permitting of such activities, is proposed within the Skink Consultation Area and there is no Federal nexus, we recommend that non-Federal entities (*i.e.*; private land owners; businesses; state, county, or local municipalities) request technical assistance from the Service under section 10 of the ESA prior to initiating or authorizing the proposed activity. The Service will review the information provided to assess if the action has the potential to result in take of sand skinks or blue-tailed mole skinks or other listed animal or plant species. If the proposed action is likely to take listed species, the Service recommends that the non-Federal entity apply for an Incidental Take Permit (ITP) to ensure compliance with the ESA and to minimize the risk of third party law suits. As part of the ITP application, applicants develop a Habitat Conservation Plan (HCP). Among other things, the HCP describes the actions that the applicant will implement to minimize and mitigate negative impacts to listed species, demonstrates that there will be no appreciable reduction in the survival of the species, and demonstrates that there is adequate funding and other assurances to ensure the plan will be fully implemented. For more information, contact the Service at 772-562-3909 in South Florida or 904-731-3336 in North Florida. Additional information on section 10 consultation can be found on the Service's national website (<http://www.fws.gov/endangered/what-we-do/hcp-overview.html>) and the South Florida Ecological Services (SFESO) website (<http://www.fws.gov/verobeach/>).

### Step 1: Describe the Proposed Action

Fully describe all features and activities related to the proposed action, such as: proposed project purpose; all aspects of proposed construction, including road access, staging areas, and any associated land clearing and filling; information on surveys and monitoring; and anticipated post-project operations, maintenance, and management. Describe the project location, habitat, soil types, and elevations affected. Develop and provide maps of all project locations, boundaries, county lines, soil types, elevation, and habitat. On the maps, delineate project boundaries, map suitable soils and elevations, and quantify the acreage of proposed impact.

Interrelated and interdependent activities should be considered and described as part of the proposed action. Interrelated activities are part of a larger action and depend on the larger action for their justification. An example is constructing a road to access a proposed action site. The access road would not be necessary but for the proposed action. Interdependent activities have no independent utility apart from the proposed action. An example is annual maintenance of the access road. Maintenance would not be necessary but for continued need for access to the proposed action.

More information on complete proposed action descriptions can be found in the Species Conservation Guidance Introduction. Early coordination with the Service can reduce requests for additional information and reduce consultation time frames.

**Step 2: Determine and Describe Species, Habitat, or Critical Habitat that May Be Affected.**

- 2a: Species Location by County. Check to determine if the proposed action is in a county where sand skinks or blue-tailed mole skinks occur. Skink habitat typically supports federally listed plants and other species that should be consulted on, as well (See Figure 1, the species-county matrix, or the Service's website at <http://ecos.fws.gov/ipac/>).
- 2b: Consultation Area. If the proposed action is in a county where sand skinks or blue-tailed mole skinks generally occur, check the skink consultation area map (Figure 1) to see if the proposed action is in or close to the delineated consultation area. Keep in mind that a proposed action may affect skinks whether or not it is within the consultation area boundary (*e.g.*, where skink soils are found or skinks or skink sign are detected outside of the boundary). Additional analysis may be needed.
- 2c: Species Occurrence by Habitat. If the proposed action is in the consultation area or otherwise might affect skinks, determine if skink habitat may be affected. Potential skink habitat includes all areas with skink soils (Apopka, Arredondo, Archbold, Astatula, Candler, Daytona, Duette, Florahome, Gainesville, Hague, Kendrick, Lake, Millhopper, Orsino, Paola, Pomello, Satellite, St. Lucie, Tavares, and Zuber soil series) at or above 82 ft elevations on ridges in Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam Counties. Skink habitat consists of natural xeric vegetative cover and areas altered for human uses, including but not limited to: pine plantations, active or inactive citrus groves, pastures, residential developments, and neglected vegetative cover like old fields and overgrown scrub.

Check the species-community matrix to determine if the proposed action is in or might affect natural ecological communities that traditionally indicated skink habitat. Because of the cumulative conversion of natural xeric communities for human uses, remaining natural xeric scrub is particularly important to maintain and support remaining skink populations.

A proposed action's potential to affect skinks is not dependent on the action's location relative to natural, managed, or altered skink habitat. Additional analysis may be needed. Site-specific assessments of parcels proposed for modification are necessary to determine if the proposed action may affect potential skink habitat.

- 2d: Survey or Opt to Assume Presence. Because skinks spend most of their time below ground, they are difficult to detect. Therefore, if it is determined that skink habitat is present or may be affected following the evaluation of 2a through 2c (above), a project proponent may choose to assume skink presence in all suitable areas and proceed directly to step 3. If occupancy is verified on all or most of the proposed site through observation of skinks or skink sign (such as "S"-shaped tracks), the project proponent should also proceed directly to step 3.

Otherwise, a project proponent may choose to conduct skink surveys for proposed actions in potential skink habitat to provide additional information regarding skink occupancy. See Appendix A for the Service's recommended survey protocol. Survey procedures should be followed closely and surveyors should have qualifications that include prior skink survey experience to increase the probability of detecting listed skinks where they occur. As stated in the protocol, the Service strongly recommends that project proponents contact us prior to initiating surveys.

If the project proponent opts to assume skink presence or skinks are confirmed to occur within all or part of a proposed action area, whether inside or outside of the consultation area (Figure 1), the site where skinks occur is considered occupied. The proposed action must be evaluated to determine if it may affect skinks.

Because skinks spend most of their time below ground and are difficult to detect, it is important to note that failure to find skinks with a coverboard survey does not necessarily mean that the site is not occupied. If skinks or skink sign, are detected at any time after surveys are completed, including during project construction, the site is considered occupied. See Reinitiation of Consultation section below.

The risk of a proposed action affecting occupied skink habitat does not depend solely on whether or not the action is located within known occupied skink habitat. Additional analysis (as described in Step 3a-b below) is needed to determine if project activities might affect skinks. A project may be so benign as to not affect skinks. If an analysis indicates a project presents only insignificant (small in size) or discountable (extremely unlikely to occur) negative risks to skinks, the applicant may consider incorporating conservation measures (see Step 3c and Appendix B), as appropriate, into the project design to further avoid or minimize direct or indirect negative effects to skinks. If a project will adversely affect skinks, it may be necessary to incorporate compensation or mitigation into the project design (Appendix B) to help offset anticipated incidental take.

Contact the Service or other sources early in the project planning and development process for more information on sand skinks and blue-tailed mole skinks and their habitat that may be affected by a proposed action.

### Step 3: Evaluate Effects of the Proposed Action and Incorporate Conservation Measures.

- 3a: Describe potential effects of the proposed action, as well as interrelated and interdependent activities, which may affect sand skinks or blue-tailed mole skinks. Proposed actions that would alter sites occupied by listed skinks that contain preferred soil types above 82 ft elevation in the consultation area could potentially affect sand skinks or blue-tailed mole skinks (*e.g.*, ground-disturbing or soil-compacting activities; clearing; construction, access, and staging activities; operation and maintenance activities; chemical applications; etc.)(Figure 1).

- 3b: Describe potential cumulative effects which are the effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur within the action area of the Federal action subject to consultation. These include effects that result in abiotic disturbances like chemical, radiation, or temperature changes and biotic disturbances like water quality, soil condition, vegetation cover, or topographic changes.
- 3c: Describe conservation measures incorporated into the project plan to avoid or minimize negative effects, in particular avoidance or minimization of adverse effects to sand skinks and blue-tailed mole skinks or their habitat. Describe conservation measures applied to compensate for anticipated incidental take. See more on Conservation Measures in Appendix B.

Contact the Service early in the consultation process for assistance in evaluating effects of the proposed action on sand skinks and blue-tailed mole skinks.

- Step 4: Document methods, evidence, analyses, and reasoning and make a determination; prepare and submit a complete consultation initiation package, which includes:
- 4a. A complete description of the proposed action.
  - 4b. A complete description of federally listed resources (listed species and, if applicable, designated critical habitats) that may be affected.
  - 4c. A complete description of potential direct (caused by the action, likely to affect listed resources, reasonably certain to occur), indirect (similar to direct effects but occur later in time), and cumulative (non-Federal actions reasonably certain to occur in the action area) effects and conservation measures incorporated to avoid, minimize, or compensate for negative and adverse effects. Also, provide a complete description of conservation measures applied to compensate for adverse effects anticipated to result in incidental take.
  - 4d. Reasoning or logic statements that connect the proposed action, affected listed resources, potential effects, and conservation measures; the reasoning should provide logical support and justification for the effect determinations.
  - 4e. (An) effect determination(s), or a conclusion(s), and further coordination with the Service. Three effect determinations are possible:
    - i. “No effect” - If the proposed action is outside the consultation area or inside the consultation area but contains no suitable habitat and will not affect sand skinks or blue-tailed mole skinks, the proposed action determination might be “no effect.” To reach this determination, one should document surveys and their results, effects analysis, and reasoning. You may obtain optional written concurrence from the Service, if desired. If evidence of sand skink or blue-tailed mole skink use is detected, a “no effect”

determination is not warranted, and you should contact the Service to develop or implement conservation measures and initiate consultation.

ii. “May affect, not likely to adversely affect” - If the proposed action is in the consultation area and contains suitable habitat, the project proponent may assume sand skinks and blue-tailed mole skinks are present or conduct a survey (see Step 2). If sand skinks, blue-tailed mole skinks, or sign are not detected or presumed to be present or the proposed action will have only beneficial, insignificant, or discountable effects on sand skinks or blue-tailed mole skinks, the proposed action determination might be “not likely to adversely affect.” Contact the Service early to help develop conservation measures and clearly document surveys and their results, effects analysis, and reasoning. Written concurrence from the Service is required for a “not likely to adversely affect” determination.

iii. “May affect, likely to adversely affect” - Whether or not the proposed action is within or outside of the consultation area, if sand skinks or blue-tailed mole skinks are known, detected, or assumed to be present and the proposed action will adversely affect sand skinks or blue-tailed mole skinks, contact the Service early to help determine conservation measures. If the proposed action will have any adverse effects on skinks that are not insignificant or discountable, the proposed project may be “likely to adversely affect” sand skinks or blue-tailed mole skinks. If so, request formal consultation with the Service.

### **Reinitiation of Consultation**

While the issuance of the Service’s biological opinion or concurrence letter concludes consultation, reinitiation of consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals the action may affect listed species or critical habitat in a manner or to an extent not considered; (3) the action is modified which causes an effect not previously considered; or (4) a new species is listed or critical habitat designated that may be affected by the action. Any operation causing incidental take which exceeds the amount or extent anticipated must cease, and the Service must be contacted immediately.

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**GIS Data**

Skinks\_CA\_20110920 Consultation Area for sand skinks and blue-tailed mole skinks

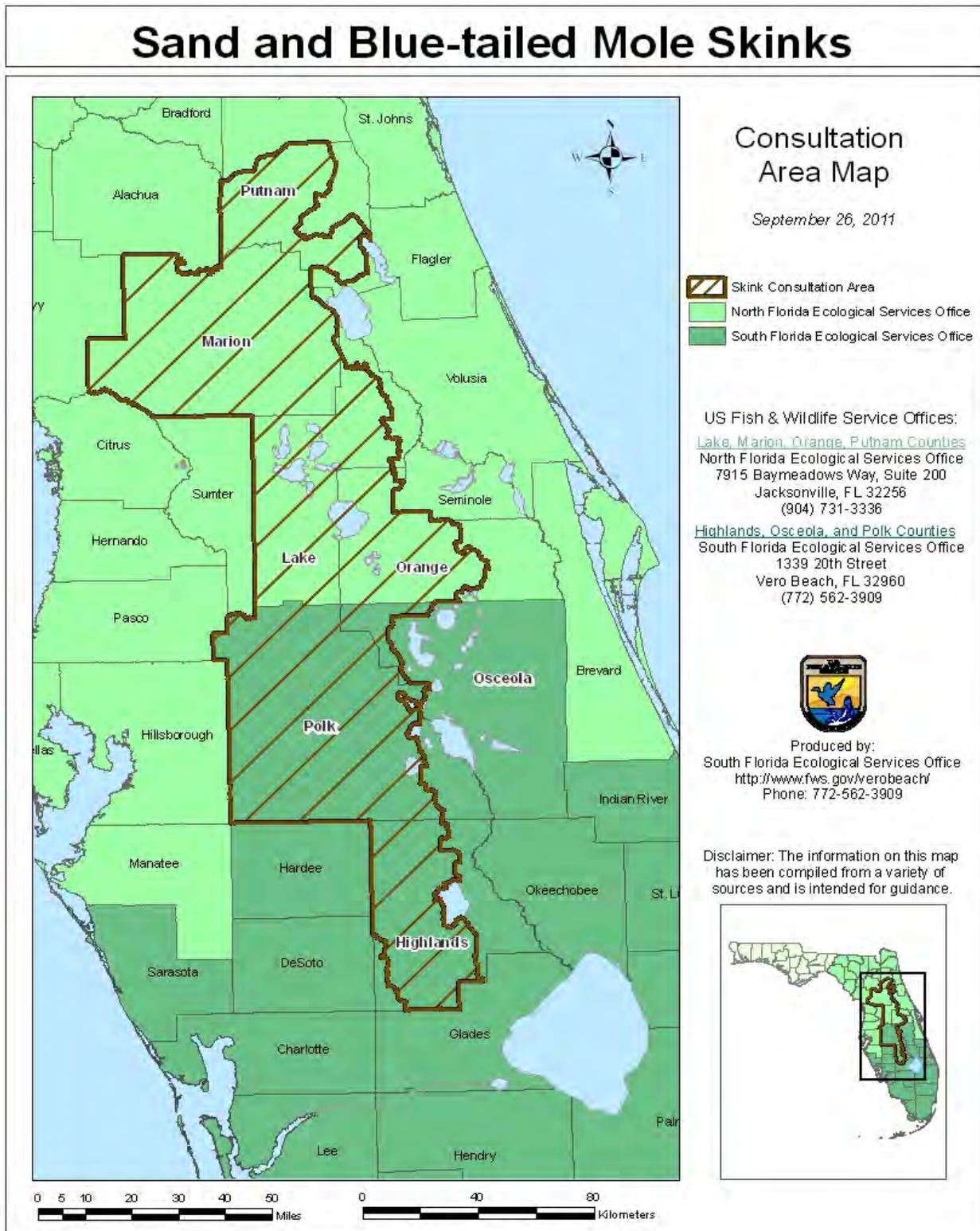


Figure 1. Sand skink and blue-tailed mole skink consultation area. County names depicted in shadowed bold text indicate the counties where skinks are known to occur.

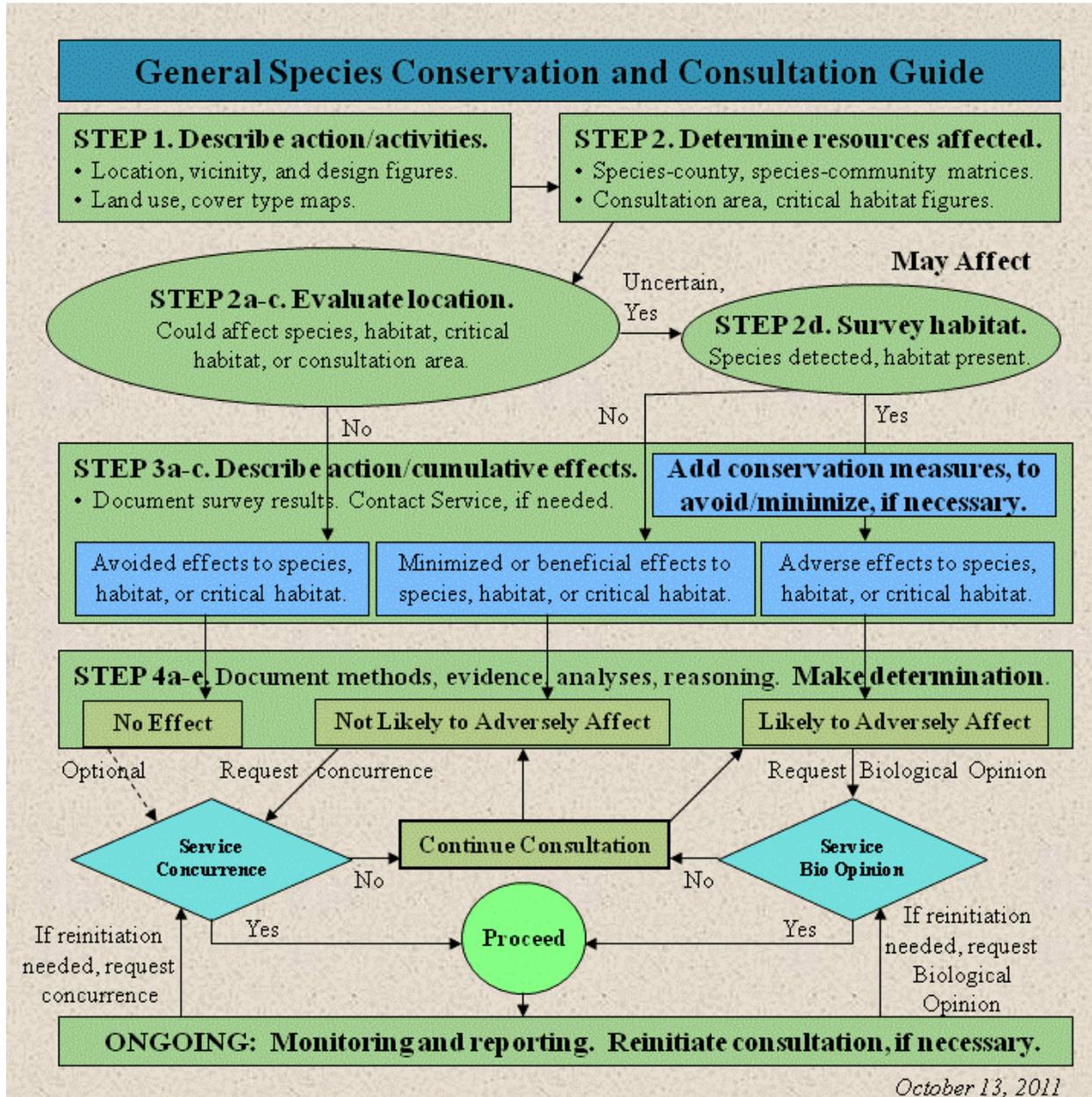


Figure 2. General species conservation and consultation chart for Federal actions that may impact federally listed species. Each step corresponds to a description in the text of the document.

**APPENDIX A**

**Sand Skinks and Blue-tailed Mole Skinks**

**Survey Protocol  
Peninsular Florida**

## Appendix A

### Sand Skinks and Blue-tailed Mole Skinks

#### Survey Protocol Peninsular Florida

The U.S. Fish and Wildlife Service (Service) provides this revised skink survey protocol for all counties in Florida in which the sand skink (*Neoseps reynoldsi*) and blue-tailed (bluetail) mole skink (*Eumeces egregius lividus*) occur based on the 5-year status review of the two species (Service 2007) and our assessment of skink surveys to date. The purpose of this recommended survey protocol is to standardize survey and data collection procedures among project proponents to ensure consistent and comparable information that may improve our knowledge of the species' occurrence and habitat use over space and time. The current guidance will be updated as new information becomes available.

The three most important factors in determining the presence of skinks are location, elevation, and suitable soils. Sand skinks occur on sandy ridges of interior central Florida. The extant range of the sand skink includes Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam Counties (Christman 1988; Telford 1998). Principal populations occur on the Lake Wales Ridge, Winter Haven Ridge, and Mount Dora Ridge (Christman 1970; Christman 1992; Mushinsky and McCoy 1995). Blue-tailed mole skinks are only known to occur on the Lake Wales Ridge in Highlands, Osceola, and Polk Counties (Mount 1965; Christman 1978). Both skink species are found in this geographic area typically at elevations 82 feet (ft) (25 meters [m]) above sea level or higher (Florida Natural Areas Inventory 2007). A reference map depicting the consultation area can be found along with this protocol on our webpage ([www.fws.gov/verobeach](http://www.fws.gov/verobeach)). Sand skinks are more numerous, broadly distributed, and easily detected than blue-tailed mole skinks. As such, sand skinks will be used as a proxy for both species in the counties in which they co-occur (See Skink Conservation and Consultation Guide for additional information).

Within appropriate geographic area and elevation, skinks are found in excessively drained, well-drained, and moderately well-drained sandy soils. Suitable soil types include: Apopka, Arredondo, Archbold, Astatula, Candler, Daytona, Duette, Florahome, Gainesville, Hague, Kendrick, Lake, Millhopper, Orsino, Paola, Pomello, Satellite, St. Lucie, Tavares, and Zuber. These soil types typically support scrub, sandhill, or xeric hammock natural communities, although they may be degraded by human impacts to overgrown scrub, pine plantation, citrus grove, old field, or pasture. Skinks have been found in all these degraded conditions where soil types are suitable regardless of vegetative cover (Pike et al. 2008a). Thus, habitat condition is of secondary importance in determining whether a site is occupied by skinks. If a site has suitable soils at the appropriate elevation within the counties where skinks are known to occur, there is a likelihood of presence, and potential effects to skinks should be considered.

When the location, elevation, and soil type are suitable and the proposed action may disturb the soils on-site, then either: (1) a skink survey is necessary to determine if the site is occupied or (2)

presence may be assumed by the applicant and the appropriate avoidance, minimization, mitigation, or conservation measures should be implemented.

If presence of the species is not assumed, then skink surveys are needed. A two-tiered approach is used to survey for presence of skinks. A visual pedestrian survey to detect skink tracks should be conducted first. This survey can be performed at any time of the year, but tracks are most detectable in the spring (March through May) and fall (October through November) (Ashton and Telford 2006; Pike et al. 2008b). We recommend a thorough pedestrian survey be completed during one of these periods prior to proceeding with a more intensive coverboard survey. Sand skinks leave a sinusoidal (“S”-shaped) track (Figure 1) at the surface that can be readily identified through a visual pedestrian survey. All open, exposed sandy areas on the property should be surveyed. The survey route (preferably global positioning system [GPS] based) should be recorded and depicted in map form with all locations of skink sign (skinks or skink tracks) marked. A photo documentation log of the skink signs should also be provided. A coverboard survey is not required if the site is determined occupied by the pedestrian survey.

If the pedestrian survey is negative on some or all portions of the site, then a coverboard survey, with boards regularly dispersed across suitable soils, is necessary on those portions with negative pedestrian survey results. Prior to initiating coverboard surveys, we strongly encourage you to contact a Service biologist in the appropriate field office (Figure 2) to confirm survey dates, obtain guidance on placement of the boards across the landscape, and determine if a site visit is needed to verify sampling protocol.

Coverboard surveys should be conducted from March 1<sup>st</sup> through May 15<sup>th</sup>. Negative results obtained outside this period of time are not considered adequate to presume absence of skinks. Surveys should be conducted a minimum of four times during four consecutive weeks within the survey time period to presume that skinks are not present. Coverboards must be lifted and checked for tracks a minimum of once per week over the four consecutive weeks. It is important to conduct surveys when survey conditions are suitable for detecting skinks (*i.e.*, the surrounding soil is not compacted as a result of rainfall or other events that may preclude skink movement, such as atypical weather conditions).

Coverboards should be placed within suitable soil types at a minimum density of 100 coverboards per hectare (40 per acre). Coverboards should be located in areas of bare sand or sparse vegetation adjacent to leaf litter or detritus. Carefully rake or grade the soil to ensure full contact of the coverboard with the soil surface. Removal of soil from surrounding areas and placement under coverboards may be necessary where stems or roots preclude full contact of the coverboard with the soil surface. The additional soil must be deep enough to allow skinks to move through it and for tracks from their movements to be detectable (5 centimeters [cm]). Certain conditions (overgrown scrub, old fields, pastures) may require vegetation to be removed to place sufficient coverboards. Xeric scrub habitat where skinks occur may also be occupied by rare, State and federally listed plants. While setting up coverboard surveys, minimize effects to rare plant communities (For more information on plants, see <http://www.archbold-station.org/fai/species4.html#Plants>).

Coverboards should be 61 cm by 61 cm (2 ft by 2 ft) in dimension and may be constructed of 1.2 cm (0.5 in) or greater thick plywood, masonite, rigid insulation board (without metallic sheathing), or other rigid material of the same dimensions. Record the geographic coordinates of all coverboards. Coverboards should be allowed to acclimate for 7 days before the first sampling event. Therefore, the latest date that one could deploy coverboards and complete the survey according to protocol in a given year is April 17. Check for tracks upon lifting each coverboard. The use of gloves during sampling is highly recommended as coverboards often attract venomous insects and reptiles. We recommend lifting the coverboards from the edge farthest from you to keep the coverboard between you and any potential threats. After checking for tracks and skinks, carefully smooth the soil surface with the edge of the coverboard and replace the coverboard. During each site visit, look for and record tracks in sandy patches between coverboard locations. Once tracks or skinks are detected in an area, the survey can be concluded in that area. Do not leave coverboards in the field between sampling seasons as weathering can degrade the effectiveness of the boards to detect skink tracks (Pike et al. 2008b).

A survey report that includes the following, as applicable, should then be forwarded to the Service:

1. Project description of the action including site-specific habitat and vegetative descriptions, habitat structure (*i.e.*, the extent of canopy, understory, and ground cover, etc.) and fire history, if available.
2. Soil map over a topographical map or aerial photograph of the project area including the path of the pedestrian surveys, coverboard locations, and locations of skinks and skink signs.
3. Photo documentation of tracks.
4. Field data sheets that include:
  - A. Survey dates with starting and ending times of all surveys conducted and personnel conducting surveys;
  - B. Weather conditions during all surveys, including average temperature, wind speed and direction, visibility, and precipitation;
  - C. Total number of skink tracks observed; and
  - D. All skink observations.
5. The following ArcGIS layer files in shapefile format that include accurate metadata (the preferred projection is Florida Albers NAD83 in meters):
  - A. Project boundary;
  - B. GPS locations of survey routes;
  - C. Coverboard locations; and
  - D. Skink and skink track/sign locations.

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Figure 1. Typical “S”-shaped track of the sand skink (photographs courtesy of Randy Mejeur; Glatting Jackson Kercher Anglin Lopez Rinehart, Inc; 2000).



Figure 2. Skink survey protocol: US Fish and Wildlife Service areas of responsibility.

**APPENDIX B**

**Sand Skinks and Blue-tailed Mole Skinks**

**Conservation Measures  
Peninsular Florida**

## **Appendix B**

### **Sand Skinks and Blue-tailed Mole Skinks**

#### **Conservation Measures Peninsular Florida**

The purpose of this document is to provide a suite of potential conservation measures that project proponents may incorporate into their projects in order to avoid, minimize, compensate, and mitigate the effects of those projects on listed skinks. Federal project proponents are required to ensure proposed actions are not likely to jeopardize the continued existence of federally listed species by avoiding and minimizing the potential negative effects of their projects. Non-Federal project proponents developing a Habitat Conservation Plan (HCP) for an Incidental Take Permit for federally listed species are required to minimize and mitigate impacts to the maximum extent practicable. The best opportunity to avoid and minimize the potential impacts of a proposed project on listed species, including skinks, is during project planning and design. Project proponents should describe what conservation measures they are incorporating into their projects when preparing Biological Assessments or HCPs for submittal to the U.S. Fish and Wildlife Service (Service). Contact the Service early for additional assistance when planning or designing projects.

The most effective way to minimize the potential effects of a project on skinks is to avoid impacting occupied skink habitat. This includes avoiding both direct impacts to the habitat (*e.g.*, minimizing the project footprint), and indirect impacts to the habitat (*e.g.*, altering the hydrology of a site through modifications on- or off-site). Project proponents should consider limiting the impacts of all project components on skinks including, but not limited to, access and staging areas, land clearing and filling, construction, road building, landscaping, and anticipated project operations, maintenance and management.

In addition to avoiding skink habitat, the following avoidance and minimization measures should be considered:

- Limit roads, lanes, or other paths accessed by heavy equipment in and around skink habitat.
- Limit activities likely to disturb or compact soil in and around skink habitat (*e.g.*, disking, roller-chopping, use of heavy equipment, material storage, etc.).
- Limit black pavement that builds up heat during the day and increases air temperatures. Break up larger expanses of pavement to provide natural drainage and water filtration and to provide shade for paved areas.
- Incorporate green spaces and connectors into residential, residential-recreation, and other multi-use-residential developments.

- Set mower height at greater than 4 inches to avoid or minimize adverse effects to ground-dwelling wildlife.
- Implement appropriate best management practices (*e.g.*, <http://www.dep.state.fl.us/water/nonpoint/pubs.htm#URBAN%20POLLUTION%20PREVENTION>).
- Limit use of chemicals, if practicable, and follow all product labels when applying chemicals such as fertilizers, herbicides, and pesticides.
- Landscape with local and appropriate native plant species (for examples, see county extension websites).
- Designate any areas to be avoided as environmentally sensitive, delineate with temporary fencing or flagging to prevent accidental disturbance during project activities, and mark with signs (signs need to include information regarding the presence of listed skinks and any other federally protected species).

In some situations, it will not be possible to avoid taking skinks through the destruction or conversion of their habitat. In those cases, project proponents should propose appropriate compensation or mitigation to offset potential adverse impacts to skinks and their habitat. An analysis of how the compensation or mitigation will offset the habitat loss as a result of the proposed action will be required. If compensation or mitigation is proposed off-site, the order of preference for location is: first, on the same ridge as the impact (preferably within the same genetic unit<sup>a</sup>); second, on the ridge adjacent to the impact; and third, elsewhere in the range of the listed skink being affected by the proposed action.

The following compensation or mitigation options may be available and are presented in priority order:

1. In the case of a project that is covered by a regional HCP, mitigate consistent with the HCP.
2. If credits are available at a Service-approved conservation bank whose service area covers the proposed project, mitigate or compensate by purchasing the appropriate number of credits from the bank.
3. Protect, restore, and perpetually manage occupied skink habitat that is off-site and adjacent to existing conservation lands acceptable to the Service. In some instances, a parcel that is

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<sup>a</sup> Emerging research (*e.g.*, Mushinsky et al. 2011) indicates that there are different sand skink genetic units that should be considered in conservation priorities. Project proponents should work with Service staff regarding genetic considerations for proposed compensation or mitigation.

shown occupied by skinks but is not adjacent to existing conservation lands could be a suitable option, if large enough and managed appropriately.

4. In rare cases, on-site compensation or mitigation may be acceptable to the Service. On-site conservation of occupied skink habitat may be appropriate when: none of the previous options are available, it is adjacent to existing conservation lands, it provides a connection among populations, or is otherwise desirable under the recovery plan. While skinks can persist on small parcels, on-site lands that are isolated by development have not been demonstrated to consistently support long-term viability of skink populations and are difficult to manage and maintain.

#### **Requirements for compensation and mitigation areas (both on- and off-site)**

If project compensation or mitigation involves skink habitat protection, restoration (if needed), and management, then the following are needed to ensure the habitat is protected and managed in perpetuity:

- **Permanent site protection:** A conservation easement that is granted to a Service-approved non-profit entity (government or non-government) and allows the Service third-party rights of enforcement is the Service's preferred mechanism of permanent site protection. The non-profit entity should have experience in habitat conservation, be independent of the applicant, and be willing to monitor the easement annually and report its findings to the Service. The easement should be recorded in the county in which the protected property is located. Other site protection measures, such as deed restrictions and restrictive covenants, are considered on a case-by-case basis.
- **Restoration:** A detailed restoration plan, including a thorough budget, is required if the mitigation or compensation parcel requires restoration. The project proponent should describe how they will fund the restoration and provide funding assurances upfront. The preferred funding mechanism is the establishment of a Trust Fund to be held by a non-profit entity with experience in managing money for conservation purposes and to be drawn upon as restoration activities are conducted. Other funding mechanisms, such as a letter of credit or a bond, are considered on a case-by-case basis.
- **Long-term management:** A detailed Habitat Management Plan that includes a burn plan, invasive species management, skink monitoring, vegetation monitoring, and reporting of all results is required. In addition, an entity that is willing to manage the compensation or mitigation parcel and has demonstrated their ability to manage skink habitat should be identified. A management agreement with this entity is recommended when the applicant is not the manager. Additional information regarding Habitat Management Plans is provided below.
- **Funding for management activities in perpetuity:** A non-wasting Trust Fund (a fund in which only the interest generated is used to fund management activities) held by a non-profit entity

with experience in managing money for conservation purposes is the Service's preferred method to secure permanent management funding. The non-profit entity should be independent of the applicant. The principal amount placed in the Trust Fund should take into account all costs associated with the compensation or mitigation parcel, the fee charged by the Trust Fund holder, and the interest and inflation that are expected to occur after the money is deposited. Other funding mechanisms, such as a letter of credit or a bond, are considered on a case-by-case basis.

## **Habitat Management Plans**

A Habitat Management Plan should be created to support any on- or off-site compensation or mitigation. A Habitat Management Plan includes a detailed description of how the habitat will be managed; what steps will be taken to improve the habitat, how it will be maintained over time, and funding mechanisms to ensure beneficial management in perpetuity. The plan should also include any survey reports and any land preservation covenants. If habitat improvements or restoration are proposed, the management plan needs to include a habitat monitoring component.

Research indicates overgrown scrub to be less suitable or unsuitable for skinks. Management practices beneficial to skinks may include, but are not limited to:

- Prescribed burns (not more than once every 10 years) or other activities that mimic natural disturbances in xeric scrub habitat,
- Non-native or invasive wildlife and vegetation removal, and
- Native vegetation restoration.

Structural characteristics of scrub habitat that can be managed to benefit skinks include a well-defined litter layer and shade in the form of a scattered shrub or tree overstory, but having both shrub and tree overstory can be detrimental to skinks. These structural characteristics are necessary for skinks to be able to regulate their body temperature. See the Habitat section in the main text of the *Skink Conservation and Consultation Guide* for more information on skink habitat characteristics.

Where monitoring is incorporated into the habitat management plan, a coverboard survey should be carried out once per year for 5 years during the appropriate period, then once every 5 years in perpetuity (see Appendix A for survey protocol). A survey report should be sent to the Skink Lead Biologist, South Florida Ecological Services Office, 1339 20th Street, Vero Beach, Florida 32960. Other observations of skinks, skink sign, and other listed species should be included in the survey report.

Additional items to consider for inclusion in a Habitat Management Plan for skinks include, but are not limited to:

- Implementing the avoidance and minimization measures beginning on page 1,
- Controlling overgrowth and managing overgrown scrub by thinning, burning, mowing, or other techniques to reduce vegetative density and create patchy, sandy open areas,
- Protecting habitat from detrimental off-road vehicle traffic and commercial forestry practices,
- Controlling domestic predators, such as cats, using traps or other deterrents,
- Developing and incorporating listed species conservation strategies, such as natural history kiosks and brochures, and
- Reporting land management activities and natural disturbances (*e.g.*, wildfire, controlled burns, etc.).

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