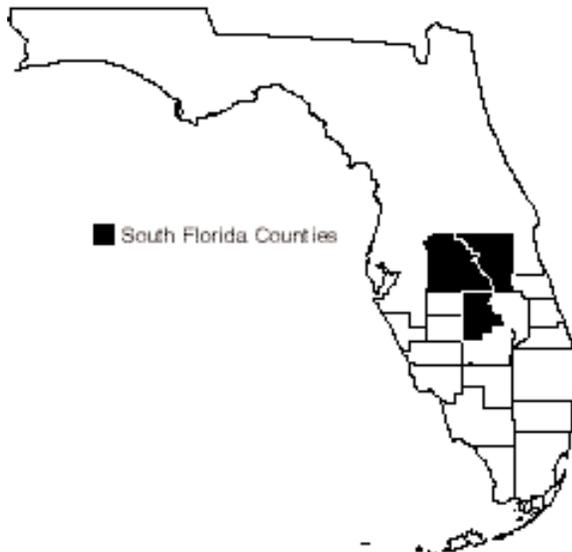

Bluetail Mole Skink

Eumeces egregius lividus

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|------------------------------|-------------------------------|
| Federal Status: | Threatened (November 6, 1987) |
| Critical Habitat: | None Designated |
| Florida Status: | Threatened |
| Recovery Plan Status: | Revision (May 18, 1999) |
| Geographic Coverage: | Rangewide |

Figure 1. Distribution of the bluetail mole skink.



The bluetail mole skink is a small, slender lizard that occupies xeric upland habitats of the Central Ridge in peninsular Florida. It requires open, sandy patches interspersed with sclerophyllous vegetation. Much of the bluetail mole skink's habitat has been destroyed or degraded due to residential, commercial, and agricultural development. Habitat protection and management are essential for the survival of this species. Efforts to conserve the bluetail mole skink and other rare species dependent on xeric upland communities have been initiated; a number of private and public xeric upland preserves have been established or are proposed for acquisition. Recovery of the bluetail mole skink will require protection and management of occupied and potentially restorable habitat. Reintroduction of the bluetail mole skinks into restored habitat may also be a valuable recovery tool.

This account represents a revision of the existing recovery plan for the bluetail mole skink (FWS 1993).

Description

The bluetail mole skink is a small, shiny, brownish to pink, cylindrical, lizard. Juveniles usually have a blue tail which makes up slightly more than half of the 13 cm length (Christman 1992; P. Moler, GFC, personal communication 1998). Regenerated tails and the tails of older individuals are typically pinkish. The legs are somewhat reduced in size and are used only during surface locomotion, not when the animal "swims" through the sand (Christman 1992). The coloration in the bluetail mole skink is brown with lighter paired dorsolateral stripes diverging posteriorly (Christman 1978). During the breeding season, males develop a colorful orange pattern on their sides.

Taxonomy

The taxonomy of the species *Eumeces egregius*, and for *E. e. lividus* specifically, is discussed in detail by Mount (1965), who indicated that the species was first recognized by Baird

in 1858 as *Plistodon egregius*. In 1871, *P. onocrepis* was described by Cope. In 1875, the two species were reassigned to the genus *Eumeces*. Cope (1990) subsequently synonymized *E. onocrepis* with *E. egregius*. In 1935, two subspecies were defined, *E. e. egregius* and *E. e. onocrepis*. In 1957, *E. e. similis* was separated from *E. e. egregius*. Mount (1965) described two additional subspecies: *E. e. lividus* and *E. e. insularis*.

Distribution

The bluetail mole skink occurs in suitable habitat on the Lake Wales Ridge in Highlands, Polk, and Osceola counties in central Florida. It is apparently rare throughout its range, even in the most favorable habitats (Christman 1992), and is not uniformly distributed within xeric upland communities. To date, there are 34 locality records for this subspecies, all occurring on the Lake Wales Ridge and, with the exception of one observation, above 30 m in elevation.

Habitat

A variety of xeric upland communities provide habitat for *E. e. lividus*, including rosemary (*Ceratiola ericoides*) and oak-dominated scrub, turkey oak barrens, high pine, and xeric hammocks. Areas with few plant roots, open canopies, scattered shrub vegetation, and patches of bare, loose sand provide optimal habitats (Christman 1988, 1992). Bluetail mole skinks are typically found under leaves, logs, palmetto fronds, and other ground debris. Shaded areas presumably provide microhabitat conditions which are important for thermoregulation, egg incubation, and availability of prey (Mount 1963). Bluetail mole skinks tend to be clumped in distribution with highly variable densities, sometimes approaching 62.5 adults per ha (Christman 1992). This pattern appears to be linked to the distribution of surface litter and, thus, soil moisture and prey distribution.

Behavior

Reproduction

The reproductive biology of the bluetail mole skink is poorly known. Reproduction is presumably very much like that of *E. e. onocrepis* (Mount 1963), where mating occurs in the winter. In *E. e. onocrepis*, three to seven eggs are laid in a shallow nest cavity less than 30 cm below the surface. The eggs incubate for 31 to 51 days, during which time the female tends the nest. Individuals probably become reproductively active at 1 year of age (Mount 1963, Christman 1978).

Feeding

Foraging activities of the bluetail mole skink are primarily at the soil surface or at shallow depths to 5 cm (FWS 1993), usually during the morning or evening. Roaches, crickets, and spiders make up the bulk of the diet of mole skinks, including *E. e. lividus* (Mount 1963).

Bluetail mole skink. *Original photograph by Barry Mansell.*



Relationship to Other Species

The bluetail mole skink occupies habitat similar to that of the sand skink (*Neoseps reynoldsi*), however, these species do not compete because of resource partitioning. Sand skinks are primarily fossorial and take prey below the surface, whereas the bluetail mole skink hunts at the surface and consumes mostly terrestrial arthropods (Smith 1977, 1982).

Like the sand skink, the bluetail mole skink's abundance is inversely related to the abundance of the Florida scrub jay (*Aphelocoma coerulescens coerulescens*) (Mushinsky and McCoy 1995). It is unclear whether this relationship is due to ecological interactions between species or imperceptible differences in xeric habitat that favor one species over another. Though we know of no specific records of scrub jays preying on bluetail mole skinks, it is likely that they take them opportunistically. It has also been suggested that management of scrub habitat for the threatened scrub jay may create conditions which may not be compatible with the habitat requirements of the bluetail mole skink. The relationships among presence of scrub jays, oak canopy closure, and bluetail and sand skinks requires further investigation.

Status and Trends

The historic and anticipated future modification and destruction of xeric upland communities in central Florida were primary considerations in listing the bluetail mole skink as threatened under the ESA in 1987 (52 FR 42662). By some estimates, as much as 90 percent of the xeric upland communities on the Lake Wales Ridge have already been lost because of habitat destruction and degradation due to residential development and conversion to agriculture, primarily citrus groves (Florida Department of Natural Resources 1991). Remaining xeric habitat

on private lands is especially vulnerable because projections of future human population growth suggest additional demands for residential development within the range of the bluetail mole skink.

Campbell and Christman (1982) characterized *Eumeces* as colonizers of a patchy, early successional, or disturbed habitat type which occurs throughout the sandhill, sand pine scrub, and xeric hammock vegetative associations as a result of biological (*Gopherus*, *e.g.*) or catastrophic factors. Susceptibility of mature sand pine to windthrow may be an important factor in maintaining bare, sandy microhabitats required by bluetail mole skinks and other scrub endemics (Myers 1991).

At the time of Federal listing, there were 20 locality records for the bluetail mole skink. Currently, 34 sites are known. The increase in locality records is largely the result of more intensive sampling of scrub habitats in recent years and does not imply that this species is more widespread than originally supposed. On the contrary, we believe that continued residential and agricultural development of xeric upland habitat in central Florida has destroyed or degraded extensive tracts of habitat containing the bluetail mole skink. Estimates of habitat loss range from 60 to 90 percent, depending on the xeric community type (Christman 1988, Christman and Judd 1990, Kautz 1993, Center for Plant Conservation 1995).

Management

The protection and recovery of bluetail mole skinks will require that habitat loss be stopped and that unoccupied but potentially suitable habitat be restored. The existing protection of the bluetail mole skink includes a number of private and public preserves within the Lake Wales Ridge. Current efforts to expand the system of protected xeric upland habitats on the Lake Wales Ridge, in concert with implementation of aggressive land management practices, represent the most likely opportunity for securing the future of this species. Comprehensive land acquisitions that protect areas occupied by the bluetail mole skink include: the FWS's Lake Wales Ridge NWR and the Florida CARL program's Lake Wales Ridge Ecosystem Project (FWS 1992).

Effective land management will be required to maintain or restore the wide diversity of xeric upland communities found in the protected sites described above. Just as natural xeric uplands contained a mosaic of open and vegetated patches that varied in time and space, we believe good land management practices can create and maintain similar habitat conditions for the bluetail mole skink and other xeric upland-dependent species.

Fire has been used and is the preferred tool for managing xeric communities, such as those containing skinks. The natural patchiness resulting from fire provides suitable bluetail mole skink habitat. Partitioning of protected sites into numerous small burn units ensures that habitat heterogeneity is maintained under managed conditions. Although we presume that the benefits to vegetative communities resulting from the use of prescribed fire will also result in benefits to the bluetail mole skink, additional post-burning herpetological monitoring will be necessary to document this relationship.

Mechanical disturbances have been used successfully in some locations to manage xeric vegetation, especially where the use of fire is not practical. However, these techniques may be harmful to the bluetail mole skink and other non-vagile species. Depending on the technique used, bluetail mole skinks can be directly harmed or killed, or their habitat modified by mechanical treatment. Tree cutters, bushhogs, or rollerchopping equipment can crush individuals and destroy or degrade sandy substrates by introducing vegetative debris.

Protection of the bluetail mole skink from further habitat loss and degradation is the most important means of ensuring its continued existence. It is not certain whether existing protected areas are adequate for its survival because many life history and population characteristics relevant to long-term survival are unknown (FWS 1993).

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Recovery for the Bluetail Mole Skink

Eumeces egregius lividus

Recovery Objective: DELIST.

Recovery Criteria

In order to delist this species, efforts must continue towards the immediate protection of the remaining xeric upland communities where the bluetail mole skink occurs. We must ensure that existing protected habitat, in combination with xeric uplands proposed for protection through acquisition, is adequate for recovery. The bluetail mole skink can be delisted when: risk assessment and population viability analyses demonstrate that a sufficient number of sites containing bluetail mole skink populations are protected and managed to ensure a 95 percent probability of persistence of the species over the next 100 years; and when research and monitoring of the biology and ecology of this species determine the population is stable or increasing for no less than 6 years.

Species-level Recovery Actions

- S1. Determine the status and distribution of bluetail mole skinks.** Archbold Biological Station maintains a geographic information system (GIS) to compile species distribution information. Scrub habitat that may support populations of bluetail mole skinks that has not yet been surveyed or needs to be re-surveyed should be targeted for subsequent efforts, and tracts where the status of skinks is uncertain should be identified.
 - S1.1. Compile distribution data for bluetail mole skinks from all available sources.** Existing data sources should be combined and synthesized using GIS overlays. Habitat occupied by bluetail mole skinks, suitable but unoccupied habitat, and unsurveyed but suitable habitat should be identified. Maintaining and updating a current GIS database on the distribution and status of skinks is essential for long-term monitoring needs and for developing habitat management strategies.
 - S1.2. Conduct distribution surveys to determine additional sites in need of protection.** If additional surveys locate occupied habitat that is determined to be essential for the survival of bluetail mole skinks, efforts should be made to incorporate these areas into scrub protection initiatives. The development of site-specific management plans for habitat purchased in the Lake Wales Ridge NWR and the Lake Wales Ridge Ecosystem Project should include provisions for baseline and long-term monitoring efforts for bluetail mole skinks. Additional areas which may support skink populations should be surveyed, and if occupied and essential to the survival of the species, should be considered for protection under existing or new habitat-acquisition programs.

- S2. Protect and enhance existing populations.** If the proposed Federal and State purchase of scrub and associated xeric communities is achieved, the resulting network of publicly and privately owned and protected scrub will encompass about 16,200 ha on the Lake Wales Ridge. This mosaic of varying size scrub patches should prove adequate to protect this species indefinitely, provided that the communities are protected and suitable management practices favorable to skinks are identified and implemented. Site-specific management prescriptions that assure a mixture of successional stages and ecotonal areas required by skinks should be developed for tracts purchased in the Lake Wales Ridge NWR and Lake Wales Ridge Ecosystem Project initiatives.
- S2.1. Conduct section 7 consultations on Federal activities that may affect bluetail mole skinks.** Section 7 of the Endangered Species Act requires Federal agencies to consult with the FWS to ensure appropriate consideration of impacts to listed species from all Federal actions. The bluetail mole skink needs to be considered, along with other listed species in scrub habitat, in any proposed Federal actions (authorized, funded, or carried out by Federal agencies) that might adversely affect the species and their habitats. These could include but are not limited to road and facility construction, timber management practices, land clearing and conversion, wetland dredge and fill activities, and pesticide applications involving use of Federal funds.
- S2.2. Protect skinks on public and private lands.** Develop and implement land management techniques that maintain natural diversity. Periodic burning, cutting, mowing or other techniques are needed to maintain ecotonal areas between xeric habitats. Habitat must also be protected from off-road vehicle traffic and commercial forestry practices.
- Where bluetail mole skinks are known to exist on private lands, efforts should be made to contact landowners, and information on the status and habitat requirements of the species provided. Recommendations should be provided for managing private lands. Long-term renewable leases and conservation agreements involving Federal, State, and local governmental agencies are options where outright acquisition is not acceptable to the landowner.
- S2.3. Control domestic animal predation.** Where domestic animals prey on bluetail mole skinks, it may be necessary to trap or develop deterrent programs to minimize mortality. Trapping efforts may be needed on public lands where free-ranging domestic animals threaten bluetail mole skinks or their habitat.
- S2.4. Control pesticide use in or adjacent to bluetail mole skink habitat.** Because pesticide use on adjacent agricultural and residential lands poses a potential risk to bluetail mole skinks, management plans should consider these risks and alleviate threats whenever possible.
- S3. Conduct research on life history and population ecology of bluetail mole skinks.** Adequate long-term protection of bluetail mole skinks depends on a thorough understanding of their life history. Many aspects of the life history of this species are poorly understood or remain entirely unstudied. Much of what is known about the bluetail mole skink's life history has been extrapolated from studies on the closely related *E. e. onocrepis*. While this may provide information about the basic biological strategies of mole skinks in general, more specific studies of the life history characteristics of *E. e. lividus* are needed to ensure that land management efforts are compatible with the habitat requirements of the bluetail mole skink.

- S3.1. Develop standardized survey techniques.** Research specific habitat requirements in relation to vegetation structure. Develop better survey methods to accurately monitor existing skink populations and their response to management prescriptions.
- S3.2. Support studies of reproduction, fecundity, and longevity.** Obtain data on mating behavior, reproductive success, productivity, longevity, and other basic population characteristics. Use of captive animals may be necessary to obtain some of this data.
- S3.3. Develop methods to determine home range size, age of dispersal, and dispersal distance of this species.** These data are needed to evaluate recolonization capabilities and susceptibility to local extinctions. Refine and standardize mark-recapture methodology to address these data needs. There are suitable protected sites at present to conduct baseline studies.
- S4. Monitor skink populations.** Once standardized survey techniques are developed, begin long-term monitoring on protected public and private lands. Start monitoring efforts at Archbold Biological Station, where periodic controlled burns are used to maintain scrub habitats. Initiate efforts to assess populations at other public and private scrub preserves as we learn more about the biology of this species and appropriate monitoring techniques.
- S5. Increase public awareness of bluetail mole skinks.** Efforts to protect this and other scrub species benefit from public education about the scrub ecosystem. Species-specific educational materials probably will not be as effective as habitat-based efforts that currently exist, because we know very little about the biology of this species.

Habitat-level Recovery Actions

- H1. Prevent degradation of existing scrub habitat.** The key to the long-term recovery of bluetail mole skink habitat lies in the immediate protection of as much of the remaining scrub ecosystem as is economically feasible within the Lake Wales Ridge.
- H1.1. Acquisition of scrub habitat.** Fee simple title, conservation easements, transfer of development rights, land trades, or other conservation measures will be necessary to protect remaining scrub habitat.
- H1.1.1. Continue Federal acquisition efforts.** Continue acquisition efforts within the Lake Wales Ridge NWR complex. Much of the habitat targeted for acquisition will be acquired by 1998. One or possibly two additional but currently unidentified parcels may subsequently be targeted for acquisition.
- H1.1.2. Support State acquisition efforts.** The CARL program Lake Wales Ridge Ecosystem Project includes over 30 key scrub areas (Appendix F). The State's Save Our Rivers (SOR) acquisition program administered by the water management districts targets wetlands for protection, but some sites also contain xeric uplands, and potentially bluetail mole skink habitat.
- H1.1.3. Encourage acquisition by non-governmental organizations.** Encourage acquisition by non-governmental organizations. Occupied bluetail mole skink habitat not targeted in Federal and State acquisition programs may become available for private purchase and management. Scrub habitats already protected, such as those at Archbold Biological Station and The Nature Conservancy's Tiger Creek Preserve, Saddle Blanket Lakes, and Lake Apthorpe areas will continue to play an important role in the long-term persistence of bluetail mole skinks.

- H1.2. Manage scrub habitat.** Like most vegetative communities in Florida, the scrub requires periodic fire or other sources of disturbance to maintain its diversity and distribution.
- H1.2.1. Develop scrub habitat management guidelines.** The Nature Conservancy and Archbold Biological Station have gained experience in the management of scrub communities. Information gathered by these organizations should be consolidated into a set of standardized management guidelines that could be used by other landowners wishing to effectively manage scrub.
- H1.2.2. Develop cooperative scrub management programs.** Concurrently with **H1.2.1**, develop cooperative agreements for efficient scrub management. Public and private funding is limited and expenditures for land management can represent a large portion of operating expenses. Currently, five private organizations, and four State and two Federal agencies own or are responsible for the management of scrub habitat that may contain bluetail mole skinks. Large expenditures in equipment and personnel can be avoided through cooperative planning.
- H1.2.3. Control off-road access.** Fence or sign scrub habitat to eliminate off-road use. In many areas, off-road access has degraded habitat and destroyed individual rare plants. Soil stabilization, trash removal, and replanting may be necessary in some cases to effectively manage scrub.
- H2. Restore scrub to suitable habitat.** Identify areas of restorable habitat and develop a management plan to restore habitat. Much of the remaining scrub is degraded because fire has been excluded and the vegetation has become overgrown. Overgrown scrub can lose much of its function and value as it tends toward a more mesic condition.
- H2.1. Control exotic species.** Although exotic species are not currently a threat to most xeric communities, site-specific control measures may be needed, especially in ecotonal areas or human-disturbed areas.
- H2.2. Control overgrowth.** In most situations, unmanaged scrub tends to become dense and tall, conditions which are not favorable to many scrub-dependent species. Management of overgrown scrub must include thinning, burning, mowing, or other techniques to reduce vegetative density.
- H3. Conduct research to determine habitat needs for this species.** Basic life history requirements and habitat needs for this species are not known. As we learn more about the basic biology of this species we will also gain better insight into their habitat needs. Research on bluetail mole skink habitat should be concurrent with investigations into the biology of this species.
- H4. Monitor status of bluetail mole skink habitat.** Once we understand the habitat requirements for this species we will be better able to develop habitat management and monitoring recommendations. Until species-specific information is available, monitoring should ensure maintenance of ecotonal boundaries, diversity within scrub, and open sandy patches.
- H5. Increase public awareness of the scrub ecosystem.** Efforts should highlight habitat acquisition initiatives, importance of biodiversity, and biology of scrub-dependent species. Federal, State, and County governments, as well as private organizations, should support the development and dissemination of educational materials pertaining to the conservation of the

scrub ecosystem and endemic scrub species. Materials such as brochures, posters, postcards, slide programs, and videotapes can improve public understanding of and increase appreciation for protection of scrub habitat. Environmental education programs across central Florida should be encouraged to distribute materials or develop lesson plans on scrub ecosystems, particular scrub species, and the importance of maintaining biological diversity.

