

**A Species Action Plan for the
Florida Keys Mole skink
(*Plestiodon egregius egregius*)**

**Final Draft
November 1, 2013**



Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600
Visit us at MyFWC.com

FLORIDA KEYS MOLE SKINK ACTION PLAN TEAM

Team Leader: Lindsay Nester, Division of Habitat and Species Conservation

Team Members: Randy Grau, Division of Habitat and Species Conservation
Joseph Sage, Division of Habitat and Species Conservation
William M. Turner, Division of Habitat and Species Conservation
(formerly)

Acknowledgements: Laura Barrett, Division of Habitat and Species Conservation
Brian Beneke, Fish and Wildlife Research Institute
Claire Sunquist Blunden, Office of Policy and Accountability
Brie Ochoa, Division of Habitat and Species Conservation

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EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission developed this plan in response to the determination that the Florida Keys mole skink (*Plestiodon egregius egregius*) should be maintained as a Threatened species on Florida's Endangered and Threatened Species List. The goal of this plan is to improve the conservation status of the Florida Keys mole skink to the point that it is secure within its historical range. There are 3 objectives in this plan. The first objective is to maintain the area of occupancy and extent of occurrence of the Florida Keys mole skink. The second objective is to maintain or improve the extent and quality of habitat available for the species. The last objective is to encourage Florida Keys mole skink population growth to exceed 10,000 mature individuals with at least 1 location having more than 1,000 individuals. There are 2 high-priority actions for these objectives: 1) restore, protect, manage, and acquire as much suitable habitat as possible; and 2) continue non-native species removal.

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

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GLOSSARY OF TERMS AND ACRONYMS

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

BRG: Biological review group, a group of taxa experts convened to assess the biological status of taxa using criteria specified in Rule 68A-27, Florida Administrative Code, and following the protocols in the Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1).

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

CCAA: Candidate Conservation Agreements with Assurances

DEP: Florida Department of Environmental Protection

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

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

FKE: Florida Keys Ecosystem

FKWEA: Florida Keys Wildlife and Environmental Area

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

F.S.: Florida Statutes

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

GIS: Geographic Information System

HCP: Habitat Conservation Plan

ISMP: Imperiled Species Management Plan

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

IUCN Red List: (IUCN Red List of Threatened Species) An objective, global approach for evaluating the conservation status of plant and animal species, the goals of which are to: Identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and provide a global index of the state of change of biodiversity.

Less-than-fee acquisition: The acquisition of limited property rights by an outside entity on lands owned by a landowner, usually through a written contract. Less-than-fee acquisitions can occur through direct purchase of specified and agreed upon rights by the outside entity, or through donation of those rights by the landowner. Examples of less-than-fee acquisitions include the purchase/donation of easements, leases, limited use permits, cooperative agreements, etc.

NOAA: The National Oceanic and Atmospheric Administration

NWR: National Wildlife Refuge

Pine Rockland: A natural community unique to extreme southern Florida characterized by an open canopy of South Florida slash pine (*Pinus elliottii* var. *densa*) with a diverse understory and herbaceous layer. Rare and endemic plant and animal species are abundant in pine rocklands. The substrate consists of exposed oolitic limestone with numerous depressions and solution holes where nutrient poor soil and organic debris accumulate. Pine rockland is a fire-dependent natural community, and similar habitat occurs in the Bahamas where Caribbean pine (*Pinus caribaea*) is the dominant pine.

SLAMM: Sea Level Rise Affecting Marshes Model

Take: As defined in 68A-27.001(4), F.A.C. “To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct.”

Tropical hardwood hammock: Also called rockland hammock, is a highly diverse upland forest rich in rare and endemic plant and animal species. The forest floor is mostly covered with a thin layer of well-drained organic soil and leaf litter. Exposed limestone and solution holes are common. Over 120 species of native trees and shrubs can be found in tropical hardwood hammocks along with a number of rare epiphytes, cacti, and herbaceous plants. Many of the plant species are also native to the Bahamas, the West Indies, and the Yucatan peninsula, and most occur in Florida at the northern limit of their range. Typical

GLOSSARY OF TERMS AND ACRONYMS

canopy trees include gumbo limbo (*Bursera simaruba*), wild tamarind (*Lysiloma latisiliquum*), pigeon plum (*Coccoloba diversifolia*), strangler fig (*Ficus aurea*), Jamaican dogwood (*Piscidia piscipula*), poisonwood (*Metopium toxiferum*), and West Indies mahogany (*Swietenia mahagoni*). In the continental U.S., remaining tropical hardwood hammock only occurs in southern Florida, where it is restricted to coastal areas of southern Miami-Dade County, the Florida Keys and a small area of Big Cypress National Preserve in Monroe and Collier counties.

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

INTRODUCTION

Biological Background

Taxonomy and Description

This plan is for the Florida Keys mole skink (*Plestiodon egregius egregius*). The Florida Keys mole skink is 1 of 5 mole skink subspecies in Florida (Krysko et al. 2011). The genus for this subspecies was formerly *Eumeces*, but Brandley et al. (2005) resurrected the name *Plestiodon* for the ancestral group containing all of the North American species north of Mexico plus the East Asian species.

This subspecies is a small, slender, brownish lizard with smooth, shiny scales and hints of black stripes and a red to brownish-red tail with 2 or more pairs of light stripes extending from head and neck and which may reach the base of tail (Florida Natural Areas Inventory [FNAI] 2001). Specimens from the Upper Keys usually show characteristics intermediate between the Keys subspecies and the peninsula mole skink (*P. e. onocrepis*). Typical specimens from the Lower Keys most closely resemble the northern mole skink (*P. e. similis*) in having light dorsolateral stripes extending the length of the body and 2 rows of enlarged middorsal scales (Duellman and Schwartz 1958, Mount 1965). Branch et al. (2003) found Florida Keys mole skinks were genetically more similar to blue-tailed mole skinks (*E. e. lividus*) from the Lake Wales Ridge than to northern mole skinks (*P. e. similis*) or peninsula mole skinks (*P. e. onocrepis*). Crother (2008) recommended further taxonomic study and assessment of gene flow between the mainland and 2 island subspecies.

Geographic Range

The Florida Keys mole skink has been found in the Lower Keys on Key West, Stock Island, East Rockland Key, Middle Torch Key, Big Pine Key, Bahia Honda, West Summerland Key, Saddlebunch Key, and the Dry Tortugas. It has also been found in the Middle Keys on Key Vaca, Boot Key, and Grassy Key. Upper Keys specimens have been recorded from Key Largo and Indian Key, Long Key, Plantation Key, and Upper Matecumbe Key (Florida Museum of Natural History [FLMNH] 2011 and FNAI 2011) ([Figure 1](#)). Florida Keys mole skinks probably occur on many other Keys (Duellman and Schwartz 1958), particularly those with undeveloped shorelines.

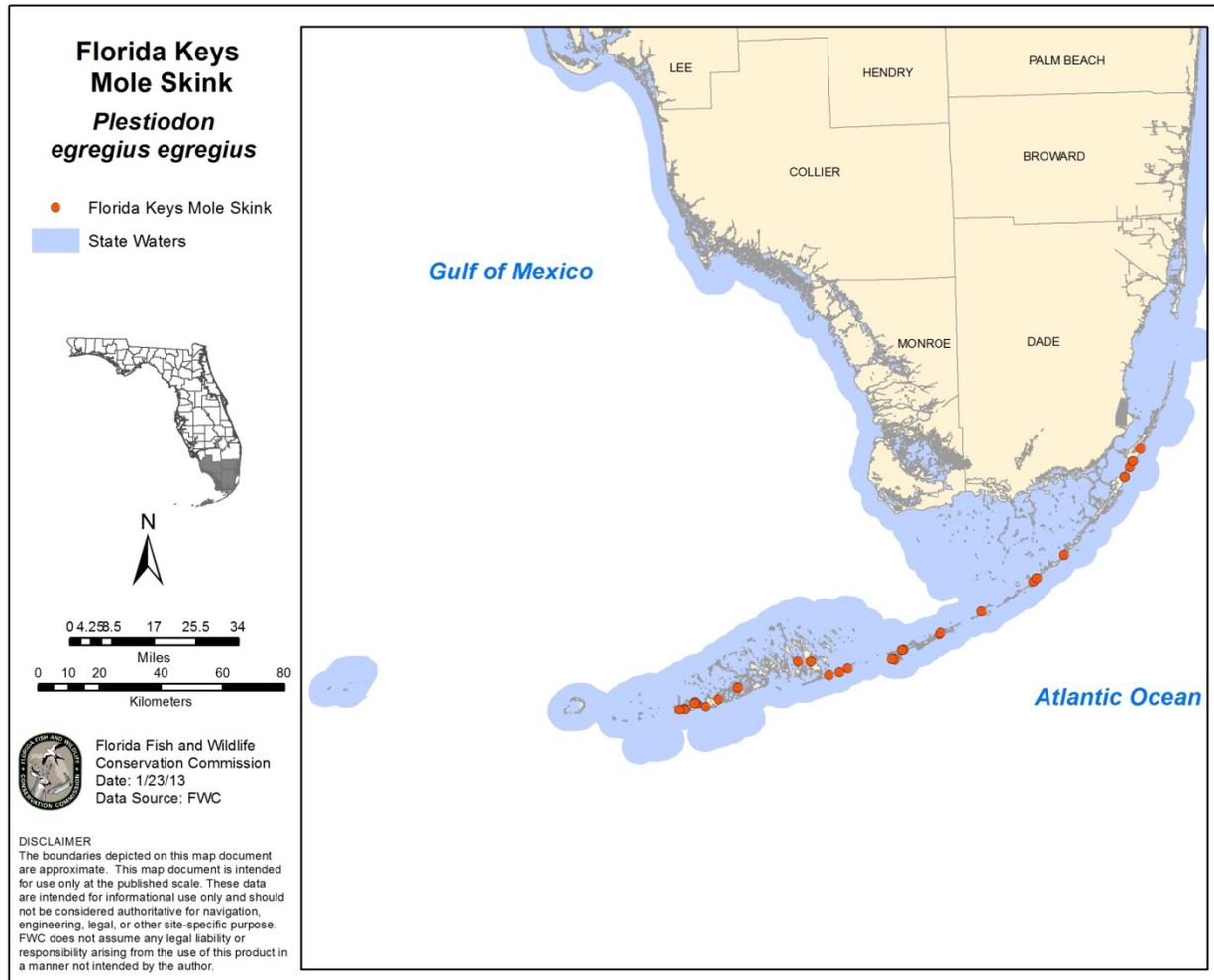


Figure 1. Locality records from FLNMH and FNAI for the Florida Keys mole skink (many specimens from the Upper Keys show intergradations with the peninsula mole skink).

Habitat

This skink inhabits sandy areas, usually near the shoreline under rocks, leaf litter, anthropogenic debris, driftwood, or tidal wrack (Carr 1940, Duellman and Schwartz 1958, Christman 1992). Specimens have been found in rockland hammocks in the Upper Keys (FNAI 2011) and on Key Largo, and in leaf litter on rock (P. Moler, FWC, personal communication). Carr (1940) indicated that they are partly fossorial but are often seen running on the surface of the ground. Carr also noted that Florida Keys mole skinks were numerous among rocks a few feet above the water on railroad embankments in the Upper Keys. Specimens have been found in rockland hammocks in the Upper Keys (FNAI2011). Charles Hilsenbeck found abundant populations at sites in the Lower Keys in the buttonwood (*Conocarpus erectus*) ecotonal communities of coastal rock barrens, where they were most common on open, bare marl soils among dense, but patchy cordgrass (*Spartina* spp.), salt grass (*Distichlis spicata*), and fringe-rush (*Fimbristylis* spp.) (FNAI 2011).

Life History

Florida Keys mole skinks prey on small arthropods, particularly roaches, spiders, and crickets (Mount 1963). Mole skinks lay a clutch of averaging 3 to 5 (range 2 to 11) eggs annually between April and June in an underground nest that the female attends (Mount 1963, Bartlett and Bartlett 1999). Age at maturity is unknown for the Florida Keys mole skink, but blue-tailed mole skinks on the Lake Wales Ridge apparently mature in their first year, mating during the first fall or winter after hatching (Mount 1963).

Conservation History

The State of Florida listed the Florida Keys mole skink as a Threatened species in 1974. The listing status was changed to Species of Special Concern in 1978. Both of these listings prohibited direct take without a permit.

The State of Florida, through the Florida Forever program and its predecessors, has acquired significant tracts of native habitat throughout the Florida Keys that support numerous imperiled species including the Keys mole skink. In addition to state-owned lands, the U.S. Fish and Wildlife Service (USFWS) and Monroe County Land Authority also have acquired significant tracts of land for conservation purposes. While these lands were not specifically acquired for the conservation of the Keys mole skink, protection of imperiled species was an objective, and mole skink conservation is enhanced as these lands are managed to benefit imperiled taxa.

The Coupon Bight Key Deer project and the Florida Keys Ecosystem project are currently active Florida Forever projects in the lower Keys. The Coupon Bight Key Deer project located on Big Pine Key and No Name Key was approved in 1985. As of February 2012, 6.9 km² (2.7 mi²) of the total 13.5 km² (5.2 mi²) project have been acquired. The Florida Keys Ecosystem project (FKE), was created in 1995 by combining 2 existing projects: the Hammocks of the lower Keys and Tropical Flyways. These projects were created in 1991 and 1992 under the sponsorship of The Nature Conservancy and the National Audubon Society to preserve disappearing tropical hardwood hammocks, to conserve imperiled plant and animal species, and to protect critical foraging and resting habitat for numerous migratory bird species. In 2004, the FWC and the USFWS co-sponsored a major expansion of the FKE project in the Lower Keys. Since 2005, additional amendments by multiple sponsors have brought the entire acreage of the FKE project to 52.9 km² (20.4 mi²). As of February 2012, 18.2 km² (7 mi²) of the FKE has been placed in public ownership leaving 34.7 km² (13.4 mi²) remaining to be acquired. The FWC manages the majority of the FKE lands as the Florida Keys Wildlife and Environmental Area (FKWEA). With the exception of several significant parcels acquired by donation, the entire FKWEA consists of lands purchased via the Florida Forever program.

Threats and Recommended Listing Status

Habitat Loss and Fragmentation

Development along shorelines, and the clearing of pine rockland and tropical hardwood hammock habitats, have undoubtedly eliminated Florida Keys mole skinks from some areas. This species is somewhat tolerant of habitat alteration and specimens have been found in cemeteries, vacant lots, and backyards in Key West, and on a golf course on Stock Island (FNAI 2011). In areas with a dense network of roads, mortality from vehicle strikes may be a factor in

reducing Keys mole skink populations. Besides being a source of mortality, roads fragment skink populations, making them more vulnerable to extinction through the reduction of genetic diversity (Jochimsen et al. 2004).

Sea Level Rise and Hurricanes

Florida Keys mole skinks often inhabit the transitional zone 50 to 80 cm (20 to 31 inches) above sea level and which is dominated by salt-tolerant vegetation in woodlands, shrublands, and salt marshes; this zone is frequently very dry but is periodically submerged in salt water. For this reason, hurricanes, and associated seawater surges and short-term flooding of upland habitats in the Keys, will probably kill some Keys mole skinks. A storm surge of 4 m (13 ft) would result in the complete submersion of Big Pine Key and No Name Key, which together provide about 51% of the 276 freshwater sources (Lopez et al. 2004). In 2005, Hurricane Wilma (Category 3) passed just north of the Florida Keys, causing 2 storm surges. The second storm surge caused maximum storm tides 1.5 to 1.8 m (5 to 6 ft) above mean sea level in Key West, flooding approximately 60% of the city. Hurricane Wilma caused a storm surge of 1.5 to 2.4 m (5 to 8 ft) on Boca Chica and Big Pine Keys (Kasper 2007). Models project that sea level rise will increase maximum high tides and will likely exacerbate the effects of storms surges (Florida Oceans and Coastal Council 2009). If this occurs, these conditions would greatly enhance the risk of extinction for the Keys mole skink.

Climate change and associated sea level rise present exceptional challenges to Florida Keys mole skinks due to their coastal habitat. Globally, sea level is rising at an increasing rate (Florida Oceans and Coastal Council 2009). Sea level rose in Key West approximately 22.25 cm (8.76 in) between 1913 and 2006, a rate of about 2.24 mm (0.08 in) per year. This rate appears to be increasing, according to trend analyses by the National Oceanic and Atmospheric Administration (NOAA) (NOAA 2013). While sea level rise is a gradual change, it compounds the effects of many other weather events, including spring tides and storm surges, which cause habitat damage and elimination or conversion into other habitat types. Sea level rise will increase maximum high tides and likely exacerbate the effects of storms surges (Florida Oceans and Coastal Council 2009), which presumably will have a negative influence on Florida Keys mole skinks. Sea level rise has been modeled extensively for the Florida Keys, especially for the National Wildlife Refuges. The [Sea Level Affecting Marshes Model \(SLAMM\)](#) shows that there will likely be significant habitat loss in the Florida Keys that will affect many Keys species. For example, the SLAMM predicts the Great White Heron National Wildlife Refuge (NWR) in the lower and middle Keys will lose 77% of mangrove habitat, 98% of beach, 94% of irregularly flooded marsh, and 69% of regularly flooded marsh (Warren Pinnacle Consulting 2011a). Similarly, the SLAMM predicts that Crocodile Lake NWR in the upper Keys will be moderately impacted. The model predicts that up to 98% of refuge mangroves, which comprise the vast majority of the refuge, will be lost. Simulations using the SLAMM predict Key West NWR will be severely affected under every sea level rise scenario tested. Under the scenario where sea level rises 1.5 m (59 in) by 2100, the entire refuge would be under water (Warren Pinnacle Consulting 2011b).

Non-native Species

The terrestrial nature and small size of the Florida Keys mole skink may make it susceptible to the red imported fire ant (*Solenopsis invicta*), which has invaded the Lower Keys. Mount (1981) suggested that predation by this non-native species is a reason for declines in some oviparous

snake populations in the Southeastern Coastal Plain. In a study conducted in the Lower Keys, transects that were those closest to roads and had the largest amount of development within a 150-m (492-ft) radius of a road had the highest probability of the presence of fire ants (Forys et al. 2002). Snakes occasionally prey on mole skinks (Hamilton and Pollack 1958, Mount 1963), but the impact of indigenous species on the Florida Keys mole skink has probably remained unchanged and presents no current threat. Feral and free-roaming domestic animals may also be a threat to this taxon.

Recommended Listing Status

In 2010, FWC directed staff to evaluate the status of all species listed as Threatened or Species of Special Concern that had not undergone a status review in the past decade. To address this charge, staff conducted a literature review and solicited information from the public on the status of the Florida Keys mole skink. The FWC convened a biological review group (BRG) of experts on the Florida Keys mole skink to assess the biological status of the species using criteria specified in Chapter 68A-27.001, Florida Administrative Code (F.A.C.). This rule includes a requirement for BRGs to follow the Guidelines for Application of the International Union for Conservation of Nature (IUCN) Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1). FWC staff developed an initial draft Biological Status Review report (BSR), which included the BRG's findings and a preliminary listing recommendation from staff. The draft was sent out for peer review, and the reviewers' input was incorporated into a [final report](#).

The Florida Keys mole skink BRG concluded from the biological assessment that the Florida Keys mole skink met criteria necessary to warrant listing as a Threatened species. The FWC listing criteria is available on the [FWC website](#). The BRG concluded that the Florida Keys mole skink meets the definition of a population with a very restricted area of occupancy (Criterion D); the estimated area of occupancy of this subspecies is 20.3 km² (7.8 mi²), excluding high impact urban and mangrove swamp landcover classes. This plan can document actions necessary to overcome the continuing decline documented in the [BSR](#). The objectives of this plan are primarily concerned with maintaining or improving the quality of existing habitat, expanding the amount of available habitat where possible, maintaining the integrity of existing populations, and ensuring that existing populations are protected from stochastic (random) events whenever possible.

CONSERVATION GOALS AND OBJECTIVES

Goal

The conservation status of the Florida Keys mole skink is improved to the point that the species is secure within its historical range.

Objectives

I. Maintain the area of occupancy and extent of occurrence of the Florida Keys mole skink.

Rationale

According to the [BSR](#) for the Florida Keys mole skink, the estimated area of occupancy of the subspecies is 20.3 km² (7.8 mi²). This area of occupancy is very close to the threshold for meeting Criterion D of the FWC listing process, but the extent of the threats the subspecies faces warrant inclusion under this criterion. Because the Florida Keys mole skink is found on a spatially limited island chain, it is unlikely that the area of occupancy or extent of occurrence will increase beyond the minimum area of occupancy defined under Criterion D; however, the current area of occupancy and extent of occurrence can be maintained, and possibly even slightly expanded, through the protection and management of existing potential habitat.

II. Improve potential habitat for the Florida Keys mole skink throughout its range.

Rationale

Future development within the Keys is expected to lead to a reduction in the already limited amount of suitable habitat present. The potential for expanding suitable habitat within the spatially restricted area of the Florida Keys is relatively limited; maintaining and improving habitat quality within its extent of occurrence is the most critical need for securing the Florida Keys mole skink within its historical range. Maintaining and improving habitat will accommodate population growth, thus making this subspecies less susceptible to threats like severe weather events.

III. Ensure that the Florida Keys mole skink exceeds 10,000 mature individuals, with at least 1 location having more than 1,000 individuals.

Rationale

The FWC's listing Criterion D (adapted from IUCN listing criteria for Vulnerable) give a threshold of a population with a very restricted area of occupancy (typically less than 20 km² [8 mi²]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities and/or a population estimated to number fewer than 1,000 mature individuals. The Florida Keys mole skink was estimate to have more than 1,000 mature individuals, but was found to meet the restricted area of occupancy criteria. Criterion D gives the threshold of 1,000 individuals at a minimum of 1 location. The FWC's listing Criterion C (adapted from IUCN listing criteria for Vulnerable) is met by having a low population of less than 10,000 and undergoing a decline. The [BSR](#) for this subspecies concluded that its population size likely exceeds these thresholds for Criterion C (FWC 2011), but did not consider them as criteria for listing. The conclusion that these criteria did not apply to the subspecies was based on indirect evidence, as research data are lacking and there is little available information on the population

CONSERVATION GOALS AND OBJECTIVES

status of the Florida Keys mole skink. Assumptions were made about this subspecies by using data from related taxa, thus resulting in a lack of confidence in the data used in the [BSR](#). As a result, it is important to ensure that research and management confirm that the subspecies truly does fall above these thresholds and to take actions to address these criteria if it is determined that the species does not meet them. The habitat needs of this species are so poorly understood that it is difficult to estimate or model population size or area of occupancy.

CONSERVATION ACTIONS

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

Habitat Conservation and Management

Action 1 Apply management that accommodates the needs of the Florida Keys mole skink within its known range.

Many public state conservation lands are required to have a management plan approved by the Acquisition and Restoration Council or their governing board. For state conservation lands, [s. 253.034\(5\) Florida Statute \(F.S.\)](#) says in part that all land management plans shall include an analysis of the property to determine if significant natural resources, including listed species, occur on the property. If significant natural resources occur, the plan shall contain management strategies to protect the resources. The Florida Forever Act ([s. 259.105, F.S.](#)) adds that all state lands that have imperiled species habitat shall include, as a consideration in the management plan, restoration, enhancement, management, and repopulation of such habitats. For State lands identified by the lead management agency as having Keys mole skink populations or the potential to support them, the FWC should be consulted (as statutorily required). Additionally, the lead management agency of such lands is encouraged to include the FWC as part of its management plan advisory group. This action is designed to ensure that conservation lands are managed in a fashion compatible with the needs of the taxon.

Further research is necessary to determine habitat needs of the Florida Keys mole skink ([Action 6](#)). The habitat needs of this and other imperiled species should be a high priority during land management planning. Management that enhances conditions for this subspecies will help stop its decline, provide the potential to increase the area of occupancy, and enhance its potential to survive extreme weather events.

Action 2 To the greatest extent practical, maintain existing suitable habitat, restore altered habitat, and acquire or otherwise protect as much potential habitat as possible for the Florida Keys mole skink.

Imperiled species endemic to the Florida Keys present a unique conservation challenge because the total habitat available is constrained by the fact that they exist on a relatively small chain of islands. The total area of the Florida Keys is estimated at about 356 km² (137.5 mi²). The relatively limited size of these islands also constrains human use of the land, leading to high-intensity land usage that is often incompatible with the needs of imperiled species. While some historic mole skink sightings occur on moderately disturbed areas, these creatures are thought to be generally intolerant to high-intensity alterations or extensive urbanization. The [BSR](#) indicates there is only 20.3 km² (7.8 mi²) of potential habitat for the Keys mole skink within the islands. The best estimate indicates that less than 25% of the potential habitat for Florida Keys mole skinks is on publicly managed lands (Endries et al. 2009). In addition to protections described in

[Actions 1, 10, 11, 12, and 13](#), the highest-priority action for long-term conservation of this subspecies is the acquisition and management of as much suitable habitat as possible within its range. Coordination with local, state, and federal land managers is necessary to prioritize which parcels to acquire and manage to protect the highest quality habitat for Keys mole skinks. All prioritization of land acquisition under Florida Forever and other conservation land-acquisition programs should consider the potential presence of the Keys mole skink on proposed acquisitions within the subspecies range. Reliable funding for acquisition and management is desirable and necessary to make strides in conservation of this subspecies.

Where opportunities on private lands with willing landowners exist, land management for Florida Keys mole skinks could be beneficial. Beneficial land management would include the removal of non-native plants and animals. This subspecies shows some tolerance for habitat alteration and has been found on altered lands such as cemeteries, golf courses, vacant lots, and backyards (FWC 2011). There are methods that, if employed in the lower Keys, can minimize the effects of roads on reptile populations and would benefit all of the listed reptile species in that area. Jochimsen et al. (2004) review many of those measures. Programs are available that can provide technical assistance and funding to private landowners interested in managing their lands for imperiled species ([Action 11](#)).

Habitat restoration should be considered within potential habitat that has been degraded. Restoration and management of Florida Keys mole skink habitats should follow habitat management recommendations to provide the greatest benefit for the subspecies ([Action 3](#)).

Action 3 Develop Florida Keys mole skink habitat management recommendations for land managers and landowners.

Habitat management recommendations need to be developed to guide land managers (on both public and private lands) regarding habitat management goals and management techniques that may be required to ensure that high-quality habitat is available for this subspecies. These management guidelines are not to be confused with other pre-existing best management programs, such as agricultural or water management programs, that are administered by other state agencies and fit within various regulatory frameworks. The habitat management recommendations proposed here are a stand-alone tool designed specifically to provide guidance for wildlife habitat management, including avoidance and minimization measures as well as measures designed to promote species recovery through improvements in ecosystem health. Habitat management recommendations need to consider factors such as control of non-native animals or free-roaming domestic animals that may present a threat to mole skinks. Unfortunately, data are lacking on the Florida Keys mole skink, and there are many knowledge gaps regarding proper management for this species. These gaps need to be filled to develop sound, comprehensive habitat management recommendations ([Action 6](#)). Managing habitat for the needs of the Florida Keys mole skink will help stem their decline and enhance the ability of the species to survive severe weather events.

Action 4 Continue the removal of non-native species.

Non-native species pose threats to Florida Keys mole skinks and other native species in the Lower Keys. Currently, there are several non-native animals in the Keys targeted for rapid-response removal; these include black spiny-tail iguanas (*Ctenosaura similis*), tegus (*Tupinambis* spp.), monitor lizards (*Varanus* spp.), and certain large-bodied snakes. In addition, numerous non-native plant species are being removed from public and private lands in the Keys. These efforts should be continued and expanded to target additional species identified as potential threats to the Florida Keys mole skink and its habitat. Removing these threats would help stop the decline and may allow for mole skink population expansion, which would help meet the conservation goal.

Population Management

No specific population management actions are identified at this time. Under the right circumstances, a captive breeding program could be considered, but no such program is currently proposed, as managers prefer to focus on habitat improvements as the best approach for achieving conservation of this subspecies.

Monitoring and Research**Action 5** Investigate the taxonomy of the Florida Keys mole skink.

The [BSR](#) for the Florida Keys mole skink reviewed the taxonomic status of this subspecies and summarized research to date on the topic. Some researchers have raised questions about the validity of the current subspecies classification of all Florida mole skinks, and we recommend further investigation of the taxonomic relationships between the Keys and mainland populations. This research should involve genetic characterization of Keys mole skinks and examinations of genetic differentiations from mainland populations of mole skinks. In recognition of the poor understanding of the taxonomy of this species, we recommend that tissue samples be taken when researchers encounter the Keys mole skink and that those tissue samples be provided to the FWC. The FWC will retain samples until enough are collected for analysis. Should further research reveal that mole skinks in the Keys are not taxonomically distinct from Florida's mainland mole skink populations, then these subpopulations may not warrant listing as Threatened.

Action 6 Research life history of the Florida Keys mole skink.

There is little available information about the basic life history of this subspecies. The majority of the life history information for the Florida Keys mole skink is inferred from closely related species. Age of maturity and diet are completely unknown for this species. Current population locations and habitat preferences are almost completely unknown and are inferred from either historical sighting data or information from closely related species. In many cases, inferring demographic information like density may be flawed because Florida Keys mole skinks occupy unique habitats that are dissimilar from those of other mole skinks. Basic information on life history and habitat utilization are critical for informing appropriate management for imperiled

species, so research needs to be conducted on life history and current occurrences. Further, this information is needed to ensure the adequacy of future conservation status assessments.

Action 7 Conduct surveys of existing habitat (survey habitat and determine quality of habitat). Conduct population surveys using methods to be determined for the Florida Keys mole skink.

Because of the relative rarity of the Florida Keys mole skink and its secretive nature, many aspects of the life history of this species, as well as its population status and trends, are poorly known. The cryptic nature of this species, combined with its relative scarcity, make it extremely difficult to collect sufficient data by using traditional survey techniques. As such, at least in the near term, conclusions on the conservation status of this species will be based on indirect observations of existing habitat and less robust surveys relying on presence and absence observations. In spite of these difficulties, active pursuit of research into aspects of the life history, habitat needs, and population trends will be critical to guide management decisions intended to ensure its long-term conservation.

Habitat Surveys

Currently, the extent of suitable habitat found within the range of the Keys mole skink is poorly known. Endries et al. (2009) provided a Geographical Information System (GIS)-based analysis of potential habitat using existing GIS datasets. FWC staff refined this model during the [BSR](#) process to come up with a baseline estimate of potential habitat (20.3 km² [7.8mi²]). However, these models are based on data that are not current, and little of the identified potential habitat has been verified in the field. The habitat needs of this species are so poorly understood that it is difficult to create a model of potential habitat, and the results of these models must be used cautiously. The GIS models only identify "potential" habitat. However, we do not know the condition of this habitat, nor do we know that if the habitat is occupied. To provide a better evaluation of the conservation status of the Keys mole skink, managers would need an assessment of the status of potential habitat. This would require a baseline habitat survey to be conducted to delineate existing potential habitat throughout the subspecies' range. If areas containing significant population clusters of Keys mole skinks occur outside of lands under the management of the FWC, partnerships will need to be developed to ensure the long-term viability of populations on these lands ([Action 15](#)).

Population surveys

As identified in the [BSR](#), virtually no information exists on the population status and trends of the Keys mole skink. The BRG based the estimates on information about closely related species. The cryptic nature of this species in combination with its habitat preferences makes reliably capturing the species extremely difficult. Regardless of the inherent difficulty in finding these animals, a baseline survey of potential habitat within the range of the Florida Keys mole skink needs to be conducted to determine patterns of presence and absence. This would allow for a more accurate estimation of the area of occupancy. An effort should be made to develop a survey protocol robust enough that reliable conclusions on the presence and absence of the species at any particular site can be determined.

Action 8 Develop a long-term monitoring strategy for the Florida Keys mole skink.

It is critical to periodically re-assess the status of identified populations of the Keys mole skink and their habitat to determine if conservation strategies are effective, or to inform further conservation actions needed to mitigate for new or expanding threats. An evaluation of suitable habitat for the species should be conducted on a 10-year timeframe to assess changes in habitat quality or quantity, and to determine if changes in land ownership or land use are having an effect on the viability of the species. Population-monitoring surveys should be conducted to determine if these strategies are providing conservation benefits for the species.

Action 9 Establish a program for reporting sightings of Florida Keys mole skinks.

Because Florida Keys mole skinks are difficult to detect using traditional survey methods, incidental observations of these animals would be an extremely valuable data source. There is no mechanism for sharing incidental observations made by members of the conservation community or the public with conservation agencies or interested organizations, except for contributing voucher sightings to natural history museums or FNAI. A simple, user-friendly mechanism for collecting incidental observations could be an internet database. FWC has several models for such a database which allow uploading of voucher photos and georeferencing through a graphic mapping interface or smart phone application. Partners would be consulted on the creation of such an internet database and website for the Keys mole skink. Once a database is developed, training and outreach materials should be distributed to interested residents of the Keys and members of the conservation community including the Florida Department of Environmental Protection’s Division of Recreation and Parks, the USFWS, Audubon, Florida Reptile and Amphibian Working Group, and the North American Center for Snake Conservation. This training information could include web tutorials on surveying and reporting, as well as identification guides designed to be printed and taken in the field. The database should be easily accessible through a web search for Keys mole skinks, and could be publicized on the FWC website. An easy reporting process and provision of training and informational materials should help foster public interest in the conservation of Florida Keys mole skinks and other imperiled species in the Keys.

Rule and Permitting Intent

Rule Intent

Listing as a Threatened species provides adequate regulatory protection for the Keys mole skink. As such, the Keys mole skink in Florida is protected from take, where *take* is defined as, “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 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” (Rule 68A-27.001(4), F.A.C.).

Permitting Structure

Although the regulatory structure is sufficient to protect populations from take, permits allow individuals to legally conduct activities prohibited or limited in rule. In recognition of the distinctiveness and limited distribution of the Keys mole skink population, all permitted activities should be carefully considered to prevent undue stress and resultant declines to this population.

Intentional Take for Conservation or Research Purposes

Having a scientifically informed listing process requires that researchers be able to “take” species when necessary. In recognition of the poor understanding of the taxonomy of this species, we recommend that tissue samples be taken when researchers encounter the Keys mole skink and that those tissue samples be provided to the FWC. The FWC will retain samples until enough are collected for analysis. Even the gentlest methods might be considered harassment when the animals are handled or their movements are impeded. [Rule 68A-27.007](#), F.A.C., Permits and Authorizations for the Take of Florida Endangered and Threatened Species, provides factors to be considered for the issuance of permits for scientific or conservation purposes. These criteria are sufficient for the issuance of permits that promote conservation while mitigating potentially threatening activities. We recommend that these permits be issued for scientific or educational purposes that contribute to the objectives of this plan or the conservation of the Florida Keys mole skink. We recommend that, as a condition of the permit, be permittees report information collected about this species to the FWC, FNAI, and the Florida Museum of Natural History within 1 year of completion of the work.

The following factors should be considered in determining whether there is a scientific or conservation purpose that will benefit the survival potential of the species:

- whether the purpose for which the permit required is adequate to justify removing specimens of the species from the wild
- the probable direct or indirect effect which issuing the permit would have on the wild population of the species sought to be taken
- whether the permit would conflict with any program intended to enhance the survival of the species sought to be taken
- whether the purpose of the permit would likely reduce the threat of extinction for the species sought to be taken
- the opinions or views of subject matter (species) experts concerning the species sought to be taken
- whether the expertise, facilities, or other resources available to the applicant are adequate to successfully accomplish the objective stated in the application

Law Enforcement

Action 10 Develop and implement a training program for FWC law enforcement officers on the identification of the Florida’s Keys mole skink, and on rules and regulations pertaining to this protected subspecies.

The FWC’s Division of Law Enforcement, in conjunction with federal, state, and local partners, is responsible for enforcing Florida’s wildlife and fisheries laws. The FWC’s law enforcement officers are vital to the success of achieving the goals and objectives of this and other plans

because they ensure the enforcement of conservation laws and educate the public on how to identify and report violations.

Biologists with the FWC will provide adequate training to FWC law enforcement officers to ensure that they are able to accurately identify Florida's protected Keys mole skinks, they are aware of all applicable rules and regulations pertaining to these species, and they are able to explain to the public the ecological importance of Keys mole skinks.

In turn, one of the most important components of the enforcement strategy is ensuring compliance through public education. The FWC law enforcement officers understand the importance of explaining wildlife laws to the public to avoid unintentional violations. However, FWC law enforcement officers actively pursue and recommend prosecution for those who intentionally violate wildlife laws. The FWC's Division of Law Enforcement administers the Wildlife Alert program, which receives information via a toll-free number (1-888-404-3922) that is answered 24 hours a day, 7 days a week. Cash rewards are offered to callers who provide information about any illegal activity that results in an arrest. Callers may remain anonymous and are not required to testify in court. Protecting this species from take will help stem the ongoing population decline and help achieve the conservation goal.

Incentives and Influencing

Action 11 Develop less-than-fee acquisitions on private lands.

Because funding for direct land acquisition and land management is often lacking, or the timeframe for acquisition may not be appropriate, less-than-fee acquisitions on private land should be considered as a land protection strategy. Less-than-fee acquisitions may come in the form of easements or agreements with private landowners who are willing to promote conservation of imperiled species on their lands. These types of acquisitions are often incentive-based to promote participation and to ensure that private landowners receive a benefit from voluntary conservation actions they might not otherwise perform.

Because of the unique nature of habitats within the Florida Keys, many properties in these areas do not fall neatly within the parameters established by existing programs. For instance, some of these programs have minimum acreage requirements that will be difficult to meet on properties within the Keys. However, administrators of these programs often have latitude that may allow some of these programs to be applicable to important properties in the Keys. Biologists with the FWC can provide technical assistance and advice to landowners interested in participating in these programs. In addition, the FWC and other agencies may need to consider new incentives based or less-than-fee programs specifically for the Keys to address the unique nature of these areas. Because of the limited amount of habitat available for the Keys mole skink (as well as other potentially occurring imperiled species), this could likely be achieved at a relatively low cost when compared to similar programs occurring on the mainland.

It is expected that less-than-fee acquisitions in the Florida Keys will likely be a limited opportunity practice due to land-use patterns and the relatively small size of parcels available. In addition, there is probably a limited amount of suitable potential habitat available on parcels that

may be considered for less-than-fee tools, and existing tools are generally not designed for the unique land-use patterns found in the Keys. Less-than-fee acquisitions may nonetheless still be important even if they are rare. Any protection and suitable management of the extremely limited available potential habitat for the Keys mole skink will have an important role in ensuring the long-term viability of this population.

Florida also provides tax incentives including property tax exemptions under [s.196.26, F.S.](#), for landowners who put a perpetual conservation easement on their land. Additional incentives may include exemption from permits for activities, such as removal of invasive non-native vegetation, that enhance wildlife habitat as long as the activities are not a precursor to development.

Action 12 Coordinate with USFWS staff and evaluate [Habitat Conservation Plans \(HCPs\)](#) and [Candidate Conservation Agreements with Assurances \(CCAAs\)](#) as means to provide conservation benefit for Keys mole skinks and to provide incentives to private landowners.

Action 13 Implement as appropriate HCPs and CCAAs to benefit the conservation of the Florida Keys mole skink with interested landowners.

HCPs can apply to both listed and non-listed species, including those that are candidates or have been proposed for listing. CCAAs are proactive, voluntary agreements between the USFWS and a private party that allows a property owner to implement voluntarily conservation measures on lands that benefit the species in the agreement, while providing regulatory assurances to the landowner should the species become federally listed under the Endangered Species Act. Because the USFWS was recently petitioned to list the Florida Keys mole skink as federally Threatened, HCPs and CCAAs are tools that can be used to work with private landowners to conduct activities that benefit Florida Keys mole skinks on private lands. HCPs are planning documents that are developed during the application process for an incidental take permit for a federally listed species. These plans outline the effects of anticipated future impact and proposed actions to be undertaken to minimize and mitigate such impacts. The FWC will work cooperatively with landowners and the USFWS to determine if HCPs and CCAAs are useful tools for furthering the conservation of Florida Keys mole skinks.

Education and Outreach

Action 14 Direct outreach to local conservationists and interested members of the public.

There are many local conservationists and recreational herpetologists who could provide sighting information and supplement the monitoring program. [Action 9](#) calls for an internet database where the public could add sightings. Outreach will encourage reports of sights from the public through local conservation groups and partners such as DEP's Division of Recreation and Parks, USFWS, Audubon, Florida Reptile and Amphibian Working Group, and North American Center for Snake Conservation.

Coordination with Other Entities

Action 15 Coordinate with and provide information and technical assistance to local government on occurrences of Florida Keys mole skinks and on local environmental issues related to this subspecies.

Biologists with the FWC will meet with local government staff to share information on research, range, distribution, occurrences, and other information on Florida Keys mole skinks, as well as provide technical assistance on land development conservation measures and other protections for this subspecies. Information will be provided to county or local government permitting programs to give to property owners that have mole skinks on their property. Information could be distributed with their permit information or materials. The FWC will help encourage inclusion and enforcement of listed species and habitat protections in local comprehensive plans and ordinances. Local governments could assist in distributing information to businesses receiving occupational licenses such as contractors, landscapers, and golf courses.

Monroe County's Comprehensive Plan addresses land development and protection of native habitats. Local government's implementation and enforcement of these laws are vital for the goals outlined in this plan. Regulations address state listed species in general terms and have provisions for protection of native habitats. In addition to county regulations, the Village of Islamorada, the City of Marathon, and the City of Key West have comprehensive plans that address protecting native habitats and species.

Table 1. Florida Keys Mole Skink (*Plestiodon egregius egregius*) Conservation Action Table

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

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
2	2	1	Apply management that accommodates the needs of the Florida Keys mole skink within its known range.	Habitat Conservation & Mgmt	ONGOING	YES	NO	TBD	Trust fund, legislature, donations, and other	HSC	DEP, State Parks, USFWS, UF, Monroe County, Nature Conservancy	Highly likely.	Yes it can be done, yes it is practical, and relationships exist.	No, this will not reduce the critical threats, but will make this species more secure in its range; that is why this action is giving 2 priority.
2	1	2	To the greatest extent practical, maintain suitable habitat, restore existing altered habitat, and acquire or otherwise protect as much potential habitat as possible for the Florida Keys mole skink.	Habitat Conservation & Mgmt	ONGOING	YES	NO	TBD	Trust fund, legislature, donations, and other	HSC	DEP, State Parks, USFWS, UF, Monroe County, Nature Conservancy	Highly likely.	Yes it can be done, yes it is practical, and relationships exist. If programs like Florida Forever are funded this could facilitate the process.	No, this will not reduce the critical threats, but this is one of the most important things to do for this species. There is very limited habitat available to the Lower Keys population. The population will not recover without adequate habitat.
2	2	3	Develop Florida Keys mole skink habitat management recommendations for land managers and landowners.	Habitat Conservation & Mgmt	NEW	YES	YES	TBD	Existing budget, maybe grant funding	HSC	DEP, State Parks, USFWS, Monroe County, the Nature Conservancy, Local Governments, Private Land Owners	Likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this is given a 2 priority because it will improve habitat.
2	1	4	Continue the removal of non-native species.	Habitat Conservation & Mgmt	EXPANDED	YES	YES	TBD	Grants legislature, existing budget	HSC	DEP, State Parks, USFWS, Monroe County, Local Governments, UF	Likely.	Feasibility and practicality depends on the species, relationships exist.	No, this will not reduce the critical threats, but this is one of the most important things to do for this species. Non-native predators released on islands can quickly reproduce to numbers that could threaten the recovery of this species.
3	3	5	Investigate taxonomy of the Florida Keys mole skink.	Monitoring & Research	NEW	YES	YES	\$5,000	Existing budget	FWRI	State Parks, USFWS, FSU	Very likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this could affect future listing status.
3	1	6	Research life history of the Florida Keys mole skink.	Monitoring & Research	NEW	YES	NO	TBD	Grant	FWRI	State Parks, USFWS, Monroe County	Unlikely. to have successful surveys, but any success will greatly increase our knowledge of this species.	Yes it is feasibility, but it is not practical. It will require many hours to gain any knowledge but it is important for the conservation of this species. Relationships exist.	No, surveys will not reduce critical threats to the survival of this species, but is this work must be conducted first prior to other conservation actions.
1	1	7	Conduct surveys of existing habitat (survey habitat and determine quality of habitat). Conduct population surveys using methods to be determined for the Florida Keys mole skink.	Monitoring & Research	NEW	YES	NO	\$50-100k	Grant	HSC and FWRI	State Parks, USFWS, UF, Monroe County	Moderately likely.	Yes, but can't predict level of detail of data collected.	No, surveys will not reduce critical threats to the survival of this species, but this work must be conducted first prior to other conservation actions.
1	2	8	Develop a long-term monitoring strategy for the Florida Keys mole skink.	Monitoring & Research	NEW	YES	NO	TBD	Unknown	HSC and FWRI	State Parks, USFWS, UF, Monroe County	Unknown	Unknown, because it is a data deficient species a certain level of knowledge will need to be obtained before this is known.	No, this will not reduce the critical threats, but this is essential to determining status and recovery.
1	2	9	Establish a program for reporting sightings of Florida Keys mole skinks.	Monitoring & Research	NEW	YES	YES	\$10,000	Existing budget	HSC and FWRI	State Parks, USFWS, UF, Monroe County, Center for Snake Conservation	Likely.	Yes it can be done, yes it is practical and some of the relationships exist.	No, this will not reduce the critical threats, but this will greatly aid monitoring.
1	3	10	Develop and implement a training program for FWC law enforcement officers on the identification of the Florida's Keys mole skink, and on rules and regulations pertaining to this protected subspecies.	Law Enforcement	ONGOING	YES	YES	TBD	Existing budget	HSC	State Parks, USFWS, Monroe County, Local Governments and National Park Service	Likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this will aid in protecting the species from take.

Table 1. Florida Keys Mole Skink (*Plestiodon egregius egregius*) Conservation Action Table

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
2	2	11	Develop less-than-fee acquisitions on private lands.	Incentives & Influencing	EXPANDED	YES	YES	TBD	Unknown	HSC	DEP, USFWS, UF, Monroe County, Local Government	Likely.	Yes it can be done, yes it is practical, and relationships exist. It is more practical on larger parcels and if it is closely located to other conservation land.	No, this will not reduce the critical threats, but this could improve habitat.
2	3	12	Coordinate with USFWS staff and evaluate Habitat Conservation Plans (HCPs) and Candidate Conservation Agreements with Assurances (CCAA) as means to provide conservation benefit for Keys mole skinks and to provide incentives to private landowners.	Incentives & Influencing	NEW	YES	YES	TBD	Unknown	HSC	USFWS, Land owners	Likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this could improve habitat.
2	3	13	Implement as appropriate Habitat Conservation Plans (HCPs) and Candidate Conservation Agreements with Assurances (CCAA) to benefit the conservation of the Florida Keys mole skink with interested landowners.	Incentives & Influencing	NEW	YES	YES	TBD	Unknown	HSC	USFWS, Land owners	Likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this could improve habitat.
1	3	14	Direct outreach to local conservationists and interested members of the public.	Education & Outreach	NEW	YES	YES	\$5,000	Grant/ existing budget	OCR, HSC	State Parks, USFWS, UF, Monroe County	Likely.	Yes it can be done, yes it is practical and some of the relationships exist.	No, this will not reduce the critical threats, but this will aid monitoring.
1	2	15	Coordinate with and provide information and technical assistance to local government on occurrences of Florida Keys mole skinks and on local environmental issues related to this subspecies.	Coordination with Other Entities	ONGOING	YES	YES	\$1,500	Existing budget	HSC	State Parks, USFWS, UF, Monroe County	Likely.	Yes it can be done, yes it is practical and relationships exist.	No, this will not reduce the critical threats, but this will aid in protecting this species and its habitat.

Acronyms used in this table:

- CCCA: Candidate Conservation Agreement with Assurances
- DEP: Florida Department of Environmental Protection
- FSU: Florida State University
- FWC: Florida Fish and Wildlife Conservation Commission
- FWRI: Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission
- HCP: Habitat Conservation Plan
- HSC: Habitat and Species Conservation, a Division of the Florida Fish and Wildlife Conservation Commission
- LE: Law enforcement
- OCR: Office of Community Relations, administered by the Florida Fish and Wildlife Conservation Commission
- TBD: To be determined
- UF: University of Florida
- USFWS: United States Fish and Wildlife Service

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