

**A Species Action Plan for the
Short-Tailed Snake
*Lampropeltis extenuata***

**Final Draft
November 1, 2013**



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SHORT-TAILED SNAKE ACTION PLAN TEAM

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EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) developed this plan in response to the determination that the short-tailed snake (*Lampropeltis extenuata*) should remain designated as Threatened on the Florida Endangered and Threatened Species List until further research can confirm its status in Florida. The presumed primary threat to the short-tailed snake is loss and degradation of xeric upland habitats associated with commercial and residential development, silviculture, agriculture, and mining. The goal of this plan is to improve the conservation status of the short-tailed snake to a point where the species can be removed from Florida's Endangered and Threatened Species List and will not need to be listed again. The conservation objectives to meet this goal are:

- Increase or maintain the amount of suitable habitat in the state.
- Fill data gaps in our understanding of the species and identify and address factors related to species decline.
- Determine and track the status of population.
- Encourage public understanding and support of the conservation actions.

Conservation actions for the short-tailed snake will take many forms. The primary focus is increasing the amount of suitable habitat through habitat restoration and through support and technical assistance to public and private landowners engaged in restoration efforts. Due to the lack of data on basic biology and population trends, a major component of achieving this objective will focus on research and monitoring. Actions to fill the data gaps include soliciting information on recent sightings and developing an effective sampling method to determine the habitat requirements, life history traits, and population trends for the species. FWC staff will provide technical support and identify cost-share opportunities for landowners managing for appropriate short-tailed snake habitat. We recommend the use of incentive-based conservation tools to further the goal and objectives of this plan. FWC staff will develop internal training for law enforcement officers to aid in the identification of short-tailed snakes and enhance knowledge of the rules and regulations pertaining to the species. FWC staff will develop outreach materials to inform and educate the public about the natural history of the short-tailed snake and the threats to the species. These materials will also address conservation actions the public can take to aid in conservation of the species. Finally, FWC will establish a partnership network for the collaboration and sharing of research among individuals and entities engaged in short-tailed snake research efforts.

Successful implementation of this plan will require cooperation among local, state, and federal governmental agencies; non-governmental organizations; development and industrial interests; private landowners; and academic institutions. Revision of the plan will be needed as the research and monitoring portions of the plan clarify the biology, habitat needs, and population trends of the short-tailed snake.

This plan details the actions necessary to improve the conservation status of the short-tailed snake. A summary of this plan will be included in the Imperiled Species Management Plan (ISMP), in satisfaction of the management plan requirements in Rule 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 our stakeholders.

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GLOSSARY OF TERMS AND ACRONYMS

ARC: Acquisition and Restoration Council

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 International Union of Conservation of Nature (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. Proactive, voluntary agreements between the U.S. Fish and Wildlife Service and a private party that allows a property owner to voluntarily implement 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.

Commensal: An organism living in a relationship in which 1 animal derives food, refuge, or other benefits from another animal without hurting or helping the other animal.

DNA: Deoxyribonucleic acid

Endemic: Confined to a limited area.

ESA: Federal Endangered Species Act of 1974

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.

FFS: Florida Forest Service, formerly the Florida Division of Forestry.

FMNH: Florida Museum of Natural History

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.

Fossorial: Adapted for digging or burrowing.

F.S.: Florida Statutes

GLOSSARY OF TERMS AND ACRONYMS

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

ITP: Incidental Take Permit

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

LAP: Landowner Assistance Program, a federal cost-sharing program administered by the Florida Fish and Wildlife Conservation Commission.

mtDNA: Mitochondrial DNA, extranuclear or nonchromosomal DNA, often used in phylogenetic analyses.

NGO: Non-Governmental Organization

Oviparous: Animals that lay eggs.

Paraphyletic: An artificial taxonomic grouping due to 1 or more descendants of an ancestor being excluded from the group.

Phylogenetic Analysis: The use of unique derived characters to reconstruct the evolutionary relationships and the grouping of taxa based on common ancestry.

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

TNC: The Nature Conservancy

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

Wildlife Conservation Action: This term includes the activities designed to restore, maintain or enhance fish and wildlife populations or their requisite habitat. This term also includes those provisions that avoid or minimize the chance for incidental take of listed species of wildlife when conducting activities specifically designed for land or water use objectives other than wildlife.

Xeric: Refers to upland plant community that is limited by the availability of water.

INTRODUCTION

This section provides a brief summary of information on selected aspects of the biology and life history of the short-tailed snake (*Lampropeltis extenuata*). For more detailed reviews and information on the biology and conservation of this species, the reader may refer to the [Biological Status Review Report](#) (BSR) for the short-tailed snake (Florida Fish and Wildlife Conservation Commission [FWC] 2011).

Biological Background

Taxonomy

The short-tailed snake (Brown 1890) was formerly *Stilosoma extenuata*, a monotypic genus. Highton (1956) described 3 subspecies, but these are no longer recognized (Highton 1976). Dowling and Maxson (1990) found *Stilosoma* to fall within kingsnakes (*Lampropeltis*) based on immunological distance data. The genus was not changed until further phylogenetic analyses of mitochondrial DNA (mtDNA) sequences demonstrated that recognition of *Stilosoma* as a genus rendered *Lampropeltis* paraphyletic (Crother 2008).

Identification

The short-tailed snake is a slender snake varying in average length from 31 to 51 cm (12 to 20 in). The record length for a specimen is 65 cm (29.5 in). The head is not distinct from the cylindrical body, while the tail is no more than 10% of the body length (Campbell and Moler 1992, Ernst and Ernst 2003). The scales are smooth, lacking keels or pits, and the anal plate is single (Conant and Collins 1998). The dorsal color is gray to silver with 50 to 80 dark brown to black lateral and dorsal blotches with many areas of yellow to reddish pigment between the dark dorsal blotches. The head is dark with a triangular or Y-shaped mark with a yellow or orange crown. A black post-orbital stripe is present, as well as black speckles on the chin. The ventral surface is gray to brown with white spots and flecks (Ernst and Ernst 2003).



Figure 1. Short-tailed snakes. Photographs by Kevin Enge, FWC.

Life History and Habitat

Information about this species has been summarized by Campbell and Moler (1992) and Ernst and Ernst (2003). The short-tailed snake primarily inhabits areas with well-drained sandy soils, particularly longleaf pine (*Pinus palustris*) and xeric oak (*Quercus* spp.) sandhills, but also scrub and xeric hammock habitats (Van Duyn 1939, Carr 1940, Campbell and Moler 1992, Enge 1997). It is primarily fossorial and spends most of its time burrowed in sand. It has been plowed

up by farmers and dug up by gardeners and builders (Van Duyn 1939, Highton 1956, Woolfenden 1962). Some specimens have been found under fallen logs or other cover, including sphagnum moss (*Sphagnum* spp.) adjacent to upland habitat (Carr 1940), and one was seen entering a gopher tortoise (*Gopherus polyphemus*) burrow (Florida Natural Areas Inventory [FNAI] Element Occurrence Record 34112). Most records are from March through April and October through November, which are apparently times of the year when the snake spends more time crawling on the surface (Campbell and Moler 1992; Florida Museum of Natural History and FNAI records). It has been found active in the daytime as well as at night (Highton 1956). Nothing is known regarding its reproduction or clutch size. Its prey is thought to be smaller, smooth-scaled snakes, particularly crowned snakes (*Tantilla relictata*) (Carr 1934, Mushinsky 1984, Campbell and Moler 1992, Rossi and Rossi 1993), but short-tailed snakes in captivity have also eaten small lizards (Allen and Neill 1953, Ashton and Ashton 1981). The nonnative Brahminy blind snake (*Ramphotyphlops braminus*) provides an additional food source (Godley et al. 2008). Eastern coral snakes (*Micrurus fulvius*) and domestic cats and dogs are known to be predators of short-tailed snakes (Highton 1956, Godley et al. 2008, K. Enge, FWC, personal communication).

Geographic Distribution

The short-tailed snake is endemic to peninsular Florida, occurring from Columbia and Suwannee counties southward to Highlands County ([Figure 2](#)). It primarily occurs in the central ridges, but its range extends west to the Gulf Coast from Levy County southward to Hillsborough and Pinellas counties and eastward to Orange, Seminole, and Putnam counties ([Figure 3](#)) (Campbell and Moler 1992).

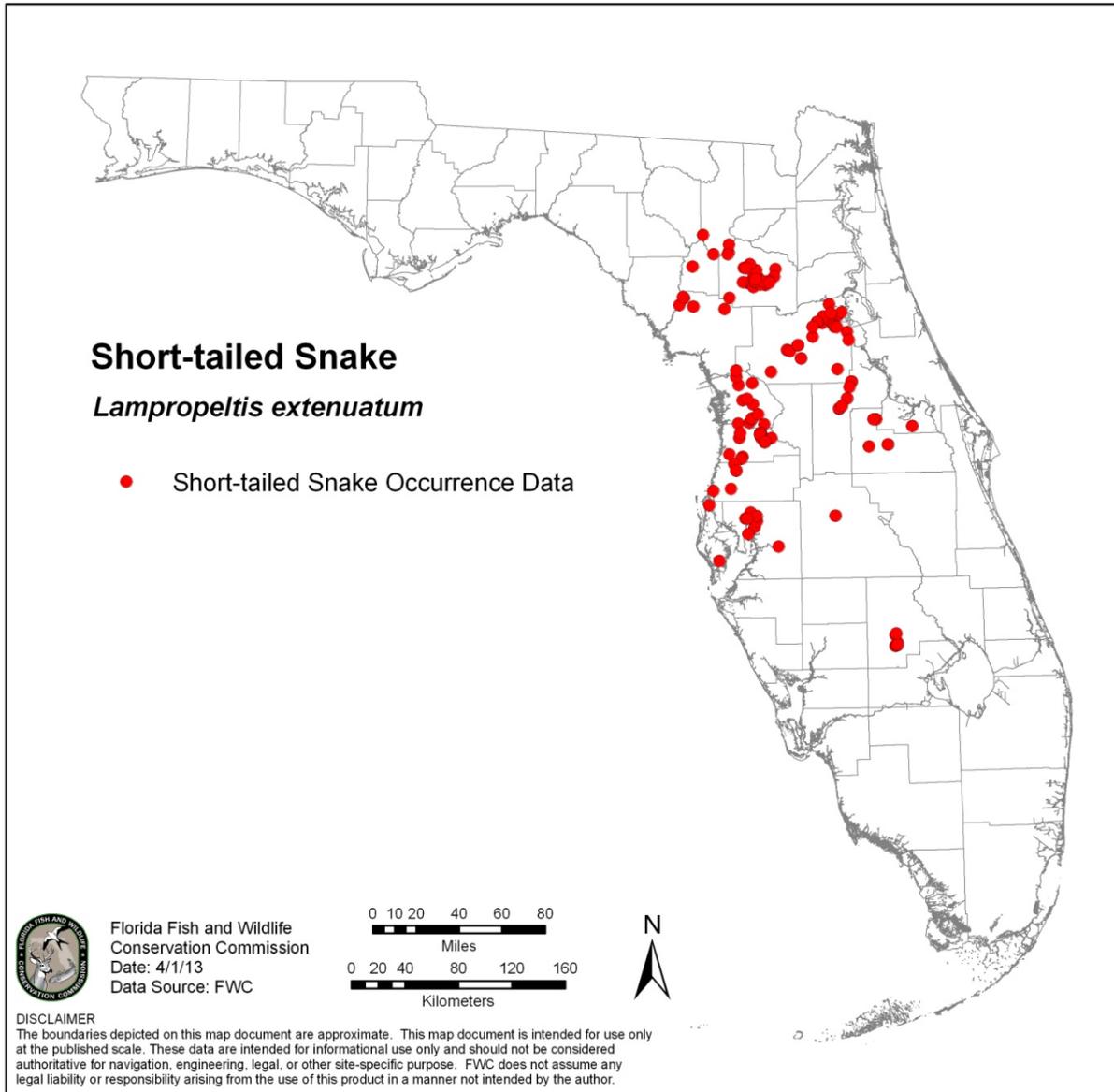


Figure 2. Geographic distribution of the short-tailed snake occurrences. Specific localities are from Krysko et al. (2011).

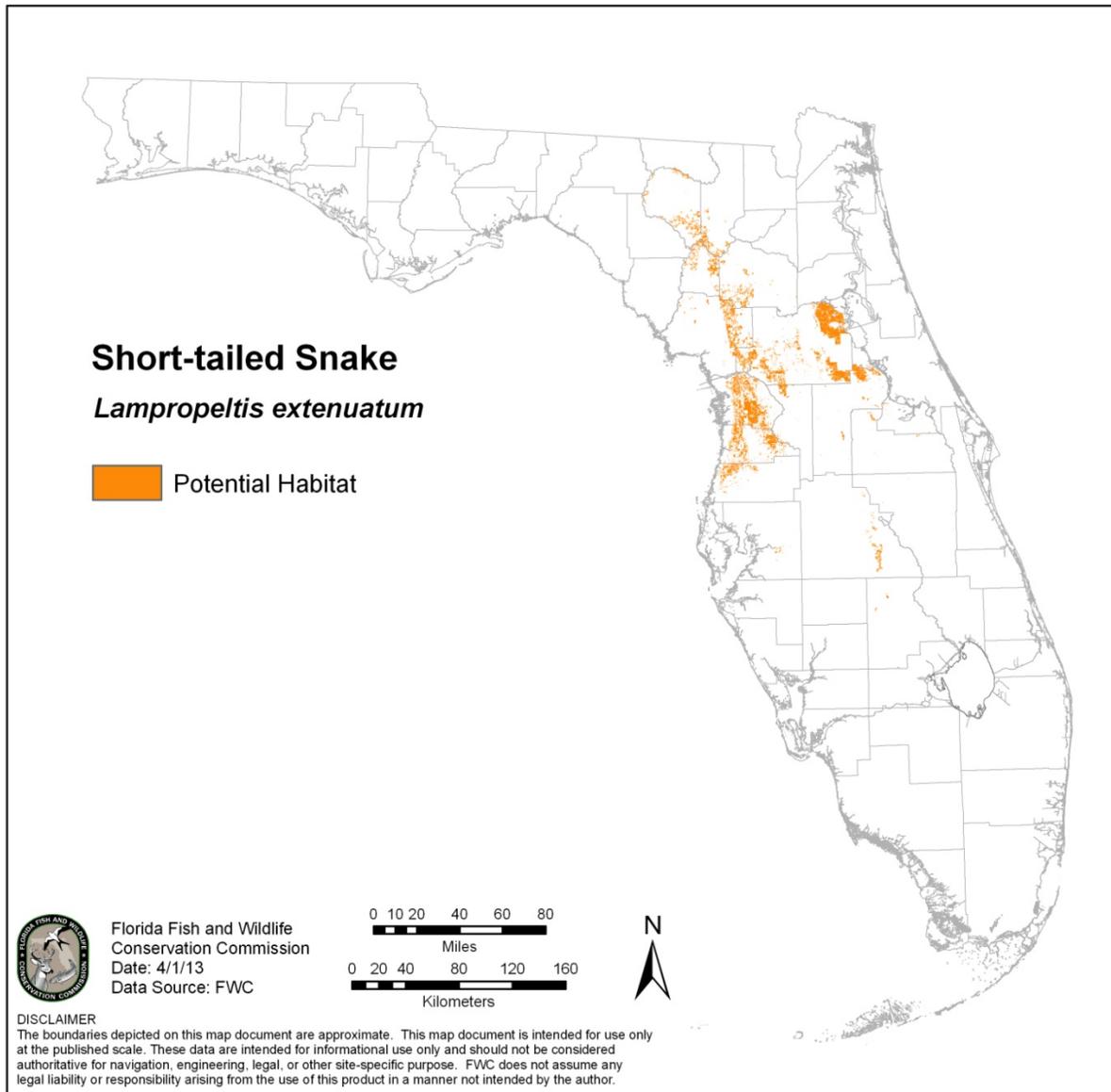


Figure 3. Geographic distribution of the potential short-tailed snake habitat.

Conservation History

In 1975, the Florida Game and Fresh Water Fish Commission (predecessor to the FWC) listed the short-tailed snake as Endangered. This species was later reclassified as Threatened in 1979. These protections make it illegal to take, transport, sell, or possess this species, its young, or its parts in the state without a permit issued by FWC. This snake remains protected by its status as Threatened on the Florida Endangered and Threatened Species List. In July 2012, the United States Fish and Wildlife Service (USFWS) received a petition from the Center for Biological Diversity to list the short-tailed snake as Threatened under the Endangered Species Act. To date, no other conservation efforts have been directed at this species, although the short-tailed snake has likely benefitted from efforts to conserve xeric uplands through state land acquisition

programs. These programs have acquired potential habitat within the range of the short-tailed snake.

Threats and Recommended Listing Status

The greatest threat to short-tailed snakes is loss and alteration of xeric upland habitats resulting from commercial and residential development, incompatible silviculture, agriculture, and mining. There have been dramatic reductions and fragmentation of Florida's xeric upland ecosystems, particularly longleaf pine-dominated sandhill as well as scrub habitat on the ridges of central Florida and the Gulf Coast of Florida (Means and Grow 1985, Myers 1990, Kautz 1998, Enge et al. 2003, Kautz et al. 2007). Short-tailed snake populations may coexist with human development in some areas; populations persist in subdivisions as long as some natural ground cover is retained (Ashton and Ashton 1981, Campbell and Moler 1992, K. Enge, personal communication). While short-tailed snakes have been found in developed areas that retain some amount of native groundcover, the vast majority of urbanized areas do not support viable populations of this species. It is thought that harvest of longleaf pines and subsequent timber management that produces turkey oak (*Quercus laevis*)-dominated communities, as well as clear-cutting and other timber management programs in sand pine (*Pinus clausa*) scrub, may seriously affect the species (Campbell and Moler 1992). However, short-tailed snake populations may persist in unburned sandhill habitat that has undergone ecological succession to oak-dominated xeric hammock (Trescott 1998; K. Enge, personal communication). Although the short-tailed snake may persist in sub-optimal habitat, the long-term survival of viable populations in such situations has not been demonstrated.

The primary prey of the short-tailed snake, crowned snakes, typically have the highest densities of any snake species in xeric habitats (Mushinsky and Witz 1993, Enge 1997). Any factor that reduces crowned snake populations would be expected to impact short-tailed snake populations. Predation by red imported fire ants (*Solenopsis invicta*) has been suggested as a reason for declines in some oviparous snake populations in the Southeastern Coastal Plain (Mount 1981). Because of their fossorial nature and small size, short-tailed snakes and crowned snakes would appear to be particularly susceptible to fire ants. Domestic dogs and cats, as well as landowners, occasionally kill short-tailed snakes (Godley et al. 2008; K. Enge, personal communication). Highway mortality may be a threat during periods of surface activity, and dead snakes have been found on driveways and unpaved and paved roads (B. Kellner, unaffiliated, personal communication; Florida Museum of Natural History records).

In 2010, the 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 short-tailed snake. The FWC convened a biological review group (BRG) of experts on the short-tailed snake to assess the biological status of the species using criteria specified in Rule 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 a draft Biological Status Report that included the BRG's findings and a preliminary listing recommendation from

staff. FWC distributed the draft for peer review, and the reviewers' input was incorporated into a [final report](#).

The BRG concluded from the biological assessment that the short-tailed snake did not meet any listing criteria, but the BRG was not confident in its ability to infer or project trends for several of the listing criteria because data are lacking for this species. Based on the findings of the BRG and the IUCN guidelines that direct assessors to apply a precautionary attitude when applying criteria, FWC staff recommended the short-tailed snake remain listed as Threatened until more information could be gathered to reevaluate the species' listing designation.

The staff recommendation was based on the following considerations: the short-tailed snake is a Florida endemic with a restricted geographic range; 57% of the snake's potential habitat is privately owned and subject to potential development; it inhabits upland habitats that are in great demand for development; and information is lacking on its life history, habitat requirements, and population size and trends. The FWC received no information from the public during the information request period. The 2 peer reviewers did not agree with the FWC staff recommendation but did not provide evidence that changed the review finding. Both reviewers disagreed with the FWC staff recommendation to list the species as Threatened under the precautionary principle. One reviewer felt that the BRG came to the correct conclusion, but he felt that listing would compromise future research aimed at filling in missing information gaps, such as life history. FWC has issued scientific research permits in the past to maintain short-tailed snakes in captivity for the purpose of collecting life history information, but only information on food habits was obtained. This reviewer also thought that the use of life history information for the mole kingsnake was suspect because of differences in size, life history, and geography. The BRG used the mole kingsnake as a surrogate because no data were available for the short-tailed snake, which is now classified as a kingsnake.

The other reviewer was somewhat surprised that the BRG did not comment more fully on the seeming rarity of this fossorial species in good to excellent habitat; instead, the BRG stated that it "may be locally common" without much support. The BRG did not use the term "locally common" in the [BSR](#) Information tables; staff used this term in the Population Status and Trend section. Staff agreed with the reviewer that this subjective term was inappropriate for characterizing short-tailed snake populations, and the sentence was reworded. The reviewer provided information on the rarity of the species in the vicinity of the University of South Florida in the 1970s and early 1980s, when good sandhill habitat was still present. This reviewer used data from a congener, the common kingsnake (*Lampropeltis getula*), to illustrate that a high density of potential snake prey does not necessarily mean that there would be a high density of a predatory snake species, but he agreed that a minimum density of 1 mature short-tailed snake for each 23 ha (56.8 ac) of potential habitat was likely.

CONSERVATION GOALS AND OBJECTIVES

Goal

Conservation status of the short-tailed snake is improved to a point that the species can be removed from the Florida Endangered and Threatened Species List and will not again need to be listed.

Objectives

I. Fill data gaps in our understanding of the species and identify and address factors causing population declines.

Rationale

Due to its fossorial nature, many aspects of the short-tailed snake's ecology and life history are unknown or poorly understood. Unfortunately, gathering this information is very difficult due to the lack of a reliable way to detect this species. If an effective detection method can be devised, further research should be conducted on the basic life history requirements and conservation needs of this species.

II. Maintain or enhance the amount of suitable habitat for short-tailed snakes in the state.

Rationale

The loss and alteration of xeric upland habitats is the greatest threat to this species (FWC 2011). Although short-tailed snake habitat requirements are not well understood, this species is only found within the xeric uplands of northern and central peninsular Florida, areas that have already suffered severe losses due to the conversion of upland habitat to commercial and residential development, agriculture, silviculture, and mining (Kautz et al. 2007, FWC 2011). Future losses are predicted for these habitats as Florida's human population continues to increase and expand into existing natural areas (Zwick and Carr 2006). These habitat conversions will negatively affect short-tailed snake populations unless efforts are taken to offset these losses by providing additional suitable habitat through land acquisition and restoration of degraded lands.

III. Determine and track the status of populations statewide.

Rationale

Short-tailed snakes are burrowing animals that are rarely encountered in the wild and which are difficult to detect. There have been no systematic population surveys, and the status of this species is unknown. If an effective method can be developed, surveys are needed to establish baseline population information and track population trends over time. Such information is necessary to accurately assess threats and evaluate management actions.

IV. Encourage public understanding of the species and support for conservation actions.

Rationale

Public knowledge of the natural history and ecological importance of short-tailed snakes, and snakes in general, is lacking. The short-tailed snake is a fossorial species only rarely encountered

CONSERVATION GOALS AND OBJECTIVES

in the wild, but threatened by human activities. Education and outreach are necessary to increase public awareness of and support for species and habitat conservation.

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

Little is known about the habitat requirements of short-tailed snakes other than that they inhabit a variety of xeric upland habitats. Although short-tailed snakes have been found in both fire-maintained and fire-suppressed upland habitats, Campbell and Christman (1982) found the snake to be more abundant in early successional sand pine scrub than in advanced stages with closed canopies, dense shrub understory, and thick leaf litter. This species appears to be tolerant of some degree of human disturbance, as it has been found in residential areas, although its long-term survival in these areas has not been demonstrated. The dependence of this species on upland habitats and its status as a Florida endemic with a small range make it vulnerable to upland habitat loss.

Action 1 Increase or maintain the amount of suitable short-tailed snake habitat that is protected.

According to a geographic information system (GIS) analysis of short-tailed snake potential habitat, only 102,070 ha (252,212 ac) exists within the entire range of this species. Of this potential habitat, only 43% is on public conservation lands (FWC 2011). This species requires xeric upland habitat, which is also in demand for development. Florida's human population is projected to increase significantly over the next 25 years (Zwick and Carr 2006), increasing development pressure on the state's uplands. In addition, habitat displacement of some of Florida's coastal residents is predicted to occur in the future due to sea level rise (Misra et al. 2011), which may drive patterns of increased development of xeric inland habitats as displaced coastal residents move inland over the next 50 to 100 years. Due to the limited range of this Florida endemic species and the pressures on its habitat, it may experience future declines if additional habitat is not protected. However, the direct purchase of additional public lands for this species may be difficult as state funding for land acquisition has been cut significantly in recent years. In the past, during favorable economic climates, Florida's land acquisition programs were well funded. Funding may or may not return to previous levels, given the current funding constraints, this plan encourages the use of voluntary less-than-fee-simple acquisitions (e.g., conservation easements) and other habitat-protection measures, such as land use agreements and partnerships between governmental agencies and private landowners, to protect additional lands for this species. FWC staff will coordinate with federal agencies, the state Acquisition and Restoration Council (ARC), non-governmental organizations, and local governments to promote land acquisition projects that acquire and/or protect upland communities important to the short-tailed snake. Because loss of habitat is the primary threat to the species, increasing the amount of protected habitat is an action that will most directly help overcome the threat and therefore provide the best chance of meeting the conservation goal.

Action 2 Increase restoration efforts on degraded upland habitats on public and private lands such that natural plant communities and functions are restored.

Active restoration of degraded habitat on public and private lands will increase the amount of available habitat for short-tailed snakes in the state. Potential strategies for implementing this action include supporting the restoration of native vegetation on degraded lands; reduction of hardwood species in overgrown habitats by using fire, chemical, and mechanical methods; and removal of invasive species.

Public lands afford a high level of security to “at risk” populations of wildlife because of statutory requirements and provisions for long-term management funding. Consequently, this plan advocates increased management focus and intensity on public lands capable of supporting the habitat and life history requirements of the short-tailed snake. However, there is concern that current land management funding is insufficient to achieve desired levels of upland habitat management on publicly owned lands. Successful implementation of this plan may require a legislative commitment to supply management agencies with the necessary personnel, equipment, and funding to undertake required management actions.

Many public conservation lands are required to have a management plan approved by ARC or their governing board. Specifically, s. 253.034(5), Florida Statutes (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 lands identified by the lead management agency as having short-tailed snake populations or the potential to support gopher tortoise populations, FWC will be consulted as statutorily required, and the lead management agency is encouraged to include FWC as part of the management plan advisory group. During consultation, FWC staff will ensure that short-term and long-term management objectives outlined in each plan are compatible with and help advance the goal and objectives of this plan.

To assist in management plan development consistent with requirements of s. 253.034 and 259.105, F.S., FWC staff recommends that managers consider using the following text in an area’s management plan, when the short-tailed snake has been identified as a significant natural resource on the property:

- Xeric uplands and natural communities that support short-tailed snakes will be managed to achieve or maintain vegetative parameters comparable to those found in comparable reference sites. Frequent prescribed fire is the preferred tool, but other treatments will be used when necessary. Maintaining these communities in a manner that replicates their natural form and function helps ensure they meet the needs of the short-tailed snakes and the other species dependent on these communities.

Because loss of habitat due to degradation is the primary threat to the species, increasing the amount of restored and properly managed habitat is an action that will directly help overcome the threat and therefore provide the best chance of meeting the conservation goal.

Action 3 Coordinate with FWC’s Landowner Assistance Program (LAP) and partner agencies to provide support and technical assistance to private landowners for managing short-tailed snake habitat.

Because a substantial amount of short-tailed snake habitat occurs on private lands, supporting and encouraging appropriate habitat management on these lands will be important to the long-term survival of the species in Florida. The LAP and other state and federal programs provide technical and financial assistance to private landowners who conduct wildlife management practices on their lands. FWC staff will coordinate with the LAP and other landowner assistance programs to identify private lands in need of restoration for short-tailed snakes and existing programs that can assist private landowners who are willing to conduct restoration activities. Because of the large amount of short-tailed snake habitat occurring on private lands, increasing the amount of protected and properly managed habitat on privately owned land is an actions that will help to meet the conservation goal.

Population Management

No population management actions are recommended at this time for the short-tailed snake. Little is known about the short-tailed snake’s life history, population dynamics, and potential threats to the species. These data gaps will be addressed by the monitoring and research actions in the following section. Should these research and monitoring actions uncover threats to the species that require specific management actions, those actions will be included in future versions of this plan.

Monitoring and Research

The lack of basic natural history and population data make the following actions a priority for the development and implementation of habitat conservation and management as well as population management actions. Coordination and partnerships with public and private entities will be essential to implement these research and monitoring activities. Fortunately, Florida has numerous academic institutions, researchers, and non-governmental organizations (NGOs) capable of assisting with the research and monitoring activities described in this plan.

Action 4 Solicit information on short-tailed snake sightings from public and private land managers, snake enthusiasts, and the public. Use new and past observations of this species to create a potential habitat model using GIS.

Cox and Kautz (2000) created a GIS-based model to determine the amount and location of potential habitat for the short-tailed snake in the state. However, this model was based on a relatively small number of observations. Because an accurate habitat model is necessary to direct conservation actions and more information on habitat preferences is needed to inform species management, sightings will be solicited in order to create a more accurate potential habitat model. The additional data garnered from this action will help meet the conservation goal and [Objective I](#).

Action 5 Develop and implement an effective sampling method to determine the status of this species on public and private lands, determine habitat requirements, fill life-history data gaps, and repeat as necessary to monitor changes in populations.

Currently, our understanding of the status of this species is based on anecdotal evidence, as there have been no quantitative studies to determine the statewide population status and trend of short-tailed snakes. Short-tailed snakes are fossorial animals that spend most of their time underground, making it difficult to determine their abundance or even presence in any given area. This makes it challenging to design studies that can evaluate the status of short-tailed snake populations. FWC will collaborate with species experts and other partners to design and implement studies in an attempt to determine the status of this species state wide. Potential strategies that may be used include soliciting recent sightings from public land managers and others knowledgeable about this species, intensive trapping on specific areas of interest, conducting road surveys including the collection and identification of road-killed snakes, and timed searches of areas with appropriate habitat. The ability to effectively survey for the short-tailed snake and to clarify data gaps in its life history will help to achieve the conservation goal.

Rule and Permitting Intent

As the short-tailed snake is retained as a Threatened species, no new permitting actions are proposed at this time.

The short-tailed snake will remain listed as Threatened on the Florida Endangered and Threatened Species List under Rule 68A-27.003, F.A.C. The [Monitoring and Research](#) section of this plan includes several actions to identify the habitat needs and population dynamics of the short-tailed snake populations. If these results indicate that the short-tailed snake warrants greater conservation protections, then protection language should be developed. Land management activities should be exempt from incidental take permitting when conducted according to prescribed Wildlife Conservation Actions.

The intent is to limit the direct or intentional take of the short-tailed snake until more information is gained through the [Monitoring and Research](#) section of this plan. Additional language should include that if a short-tailed snake is incidentally taken, the carcass and corresponding data should be provided to FWC for deposition in an appropriate museum collection.

Action 6 Develop comprehensive conservation measures that are based on habitat management needs and habitats requirements as research clarifies these issues.

The lack of habitat and population data for the short-tailed snake inhibits FWC from making specific recommendations regarding land management activities that may result in incidental take. The results of the aforementioned research may clarify current informational gaps and aid FWC in the development of comprehensive conservation measures and specific permitting guidelines, if needed.

Law Enforcement

Action 7 Develop and implement a training program for FWC law enforcement officers for identification of short-tailed snakes to aid in the enforcement of rules and regulations pertaining to protected snake species.

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. FWC's law enforcement officers are vital to the success of achieving the goals and objectives of this plan because they both ensure the enforcement of conservation laws, and educate the public on how to identify and report violations. FWC staff will provide adequate training to FWC law enforcement officers to ensure that they are able to accurately identify Florida's protected species, are aware of all applicable rules and regulations pertaining to these species, and are able to explain the ecological importance of Florida's reptiles to the public.

Incentives and Influencing

Incentive Programs

FWC currently takes advantage of several programs that promote conservation by providing technical and financial assistance to private landowners. FWC partners with other state and federal agencies to administer the Forest Stewardship Program, Wildlife Habitat Incentives Program, Wetlands Reserve Program, Environmental Quality Incentives Program, Partners for Fish and Wildlife Program, and the Cooperative Conservation Blueprint. These programs are voluntary and some may provide financial incentives, depending on annual appropriations, for wildlife conservation and habitat management on private lands. Florida also provides tax incentives including property tax exemptions for landowners that put a perpetual conservation easement on the land. Additional incentives may include exemption from permits for activities that enhance wildlife activities such as mowing, roller-chopping, and tree-stand thinning, as long as they are not a precursor to development. Any number of these incentive programs may be applicable for protecting the short-tailed snake and its preferred habitat.

Conservation banking is another program available to private landowners interested in habitat conservation. Conservation banking for listed species is comparable to wetland mitigation banking in that lands are permanently protected and can be used to offset development related impacts that adversely affect wildlife resources, including habitat. FWC may consider developing or supporting a conservation banking program for the short-tailed snake similar banking programs used for other species in the same or similar habitat such as the sand skink and the Florida scrub-jay.

Influencing

County growth management plans and land development regulations provide the avenue by which FWC can inform and influence land and water uses relevant to the conservation of Florida's fish and wildlife, including state-listed species. FWC offers conservation planning services to local governments during their growth management plan development and also when considering plan amendments and associated development proposals. In order to promote the types of technical assistance and incentives available to landowners, FWC typically provides

information to local governments regarding existing species management plans, permitting options (including avoidance and minimization), and incentive programs available to applicants, developers, landowners, and the general public.

The FWC is working to develop Wildlife Conservation Actions ([Action 4](#)) to address the short-tailed snake and its habitat requirements ([Action 5](#)) and which may inform local land-development regulations (see [Incentives](#) section). However, s. 163.3184, F.S., indicates that a county may not require as a condition of processing a development permit that an applicant obtain a permit or approval from any other state or federal agency unless the agency has issued a notice of intent to deny the federal or state permit before the county action on the local development permit.

FWC's LAP advances species conservation objectives through public-private conservation partnerships ([Action 3](#)). These programs are voluntary and some offer financial assistance to landowners implementing conservation plans. Participation in any of these incentive programs would provide FWC opportunities to gather information on private agricultural lands or those slated for development. FWC's assistance in evaluating the effects of development practices on the short-tailed snake population would help provide FWC information necessary to develop better options for avoidance, minimization, and mitigation for agriculture, silviculture, mining, and development on private lands.

As discussed in the [Habitat Conservation and Management section](#), private lands will play an important role in achieving the goal and objectives for short-tailed snake conservation in Florida. Conservation-based incentives provide a way to engage private landowners in conservation activities that benefit short-tailed snakes and other wildlife. These incentives typically consist of financial payments, regulatory assurance, or both, which help further the goals and objectives of species conservation plans. The following incentive-based actions will be further developed and implemented in later versions of this plan after the completion of initial research on life history and habitat associations.

Wildlife Conservation Actions

FWC may also develop low-impact development or conservation measures for lands slated for development other than those with an agricultural exemption. Use of these measures could preserve or enhance additional habitat or avoid take of short-tailed snakes by identifying such things as the preferred timing of clearing and construction; methods of clearing and re-vegetating; preferred locations and methods of stormwater management features; preservation of onsite ecosystem features; preferred location of open space, green space, or conservation areas; inclusion of development or density buffers; or inclusion of conservation easements over conservation areas. Incentives for incorporating these conservation measures into development proposals could include reduced or expedite permitting, reduced permitting fees, local or state recognition, tax incentives, or density bonuses.

Action 8 Identify cost share opportunities for landowners who manage short-tailed snake habitat on private lands.

The FWC's LAP provides technical and financial assistance to private landowners who conduct certain wildlife management practices on their lands. In addition to administering cost-share programs, this program administers or assists other agencies with the application of several landowner incentive programs that may be useful in achieving the goal and objectives outlined in this plan. Among these are the Forest Stewardship Program, Wildlife Habitat Incentives Program, Environmental Quality Incentives Program, and Partners for Fish and Wildlife Program. The FWC, through its landowner assistance program, will enhance the application of these programs on appropriate privately owned uplands for short-tailed snake conservation.

Action 9 Evaluate and implement as appropriate Habitat Conservation Plans (HCPs) and Candidate Conservation Agreements with Assurances (CCAA) as means to provide a conservation benefit for short-tailed snakes and provide incentives to private landowners.

An HCP is required as part of a permit application for a federal Incidental Take Permit (ITP). ITPs authorize the take, as defined in the federal Endangered Species Act (ESA), of listed species incidental to an otherwise lawful activity. HCPs are planning documents that are developed during the application process for an ITP for a federally listed species. They outline the effects of anticipated future impact of proposed actions to be undertaken, and attempt to minimize and mitigate such impacts. HCPs can apply to both listed and non-listed species, including those that are candidates or have been proposed for listing. While it may not be practical to develop individual HCPs for many of the state's listed fish and wildlife species, FWC may investigate the potential to develop HCPs that address a suite of species that includes the short-tailed snake. On the other hand, CCAAs are proactive, voluntary agreements between the USFWS and a private party that allow a property owner to implement 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 ESA.

Because the USFWS was recently petitioned to list the short-tailed snake as a federally Threatened species, HCPs and CCAAs may provide incentives for private landowners to conduct activities that benefit short-tailed snakes on private lands. FWC will work cooperatively with landowners and the USFWS to determine if HCPs and CCAAs are useful tools for furthering the conservation of short-tailed snakes in Florida.

Education and Outreach

Education and outreach are necessary to increase the public's knowledge of and concern for this fossorial species. Education also can be used to address the threats of wanton killing and persecution, which are important threats to short-tailed snakes and other snake species in Florida. Citizens who are well-informed regarding imperiled species and their habitat can make better decisions and can understand and support sound conservation measures to secure those species' continued survival. Both formal and informal settings can serve as opportunities to inform Floridians about imperiled species they may encounter. Proper identification and education describing the benefits of the species and its habitat will be important to the conservation of the species and to prevent violation of Florida's wildlife laws. A comprehensive approach to

education and outreach will serve to inform the public about the need to protect short-tailed snakes.

Action 10 Create and distribute outreach materials to provide the general public with information on the identification, distribution, biology, threats to this species and possible conservation actions to decrease the persecution of snakes.

Snakes are among the most misunderstood groups of organisms, making their conservation difficult due to public misconceptions. Effective education efforts should seek to inform the public of the ecological importance of snakes and of their benefit to humans (Dodd 1987). An effective public outreach and education program is of great importance because short-tailed snake populations may coexist with human development in some areas (Ashton and Ashton 1981, Campbell and Moler 1992).

Moving vehicles pose a major threat to upland snake species, and may be a threat to short-tailed snakes during periods of activity above ground; dead snakes have been found on driveways and on unpaved and paved roads (B. Kellner, personal communication; Florida Museum of Natural History, unpublished data). FWC staff recommends the development and distribution of outreach materials to motorists in order to educate them about the ecological importance of snakes and the negative impacts of road mortality on Florida's snake species. Potential outreach materials include bumper stickers, fact sheets or pamphlets, postings on social media and on the FWC website, and press releases.

Strong landowner outreach and education program are of great importance because short-tailed snake populations may coexist with human development in some areas (Ashton and Ashton 1981, Campbell and Moler 1992; K. Enge, personal communication). Providing the general public with information that will help gain a better understanding and respect for snakes will help meet this conservation goal.

Coordination with Other Entities

FWC will continue to collaborate with and provide information to local governments regarding species management plans, permitting guidelines, assistance programs and incentive-based programs that are available to landowners, as well the general public. FWC will continue to coordinate with local governments is through the Florida Wildlife Conservation Guide.

The [Florida Wildlife Conservation Guide](#) is an online resource that facilitates effective land use planning, project design, and the management of natural communities, with a focus on wildlife conservation. Developed by FWC in partnership with the USFWS and FNAI, the guide's purpose is to provide an easily accessible repository of life history, habitat management, and conservation options for a wide range of Florida's fish and wildlife species. The guide aims to provide a common platform of wildlife information based on the best available scientific and ecological information. As a dynamic resource, it is maintained with current guidelines and recommendations for wildlife management and protection, and includes numerous links to relevant external sources of information. The guide will have the specific information related to the short-tailed snake and necessary conservation measures that are developed.

Local governments and other agencies also play a substantial role in short-tailed snake conservation and management by providing protected and managed areas for the snake. Many local governments have created habitat-acquisition and management programs, which can provide important assistance in achieving the goal and objectives of this plan. FWC will continue to coordinate with local governments and other agencies to help ensure that local land-acquisition programs and comprehensive plans implementing ordinances and policies are: 1) consistent with the goal and objectives of this plan and 2) focus on acquisition priorities for short-tailed snake and other important wildlife species.

Action 11 Create and maintain a group of partners and stakeholders who actively engage in short-tailed snake research, and actively collaborate and share the results of the research needed to ascertain the basic biology and population data needed to effectively manage this species.

Short-tailed snakes inhabit lands that are managed by multiple public agencies, organizations, and private citizens. Coordination and partnership with both public and private entities will be necessary to implement the [Monitoring and Research](#) activities described in the previous sections of this plan. [Outreach](#) and coordination with land managers on properties supporting potential high-quality habitat and with a history of sightings and collected specimens (e.g., Ocala National Forest) should be a priority. In addition, Florida has numerous academic institutions, researchers, and NGOs capable of assisting with the [Monitoring and Research](#) activities described in this plan.

Table 1. Short-tailed Snake (*Lampropeltis extenuata*) 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?
1	2	1	Increase the amount of suitable short-tailed snake habitat that is protected.	Habitat Conservation & Mgmt	ONGOING	YES	YES	TBD	Existing Budget, Grants	WHM	USFWS, USDA, NGOs	Highly likely	Yes, through easements and current land management programs.	Not known at this time.
1	1	2	Increase the restoration efforts on degraded upland habitats on public and private lands such that natural plant communities and functions are restored.	Habitat Conservation & Mgmt	ONGOING	YES	YES	TBD	Grants, Existing Budget	WHM	USFWS, USDA, DEP, FFS, NGOs	Highly likely	Yes, through current land management programs.	Not known at this time.
1	2	3	Coordinate with FWC's Landowner Assistance Program (LAP) and partner agencies to provide support and technical assistance to private landowners for managing short-tailed snake habitat.	Habitat Conservation & Mgmt	EXPANDED	NO	NO	TBD	Existing Budget, unknown	SCP or FWRI	USDA, IFAS	Likely	Yes, currently being done for other species.	NO
2	2	4	Solicit information on short-tailed snake sightings from public and private land managers, snake enthusiasts, and the public. Use new and past observations of this species to create a potential habitat model using GIS.	Monitoring & Research	EXPANDED	YES	YES	TBD	Existing Budget	SCP	FMNH, FNAI, DEP	Likely	Yes	No
2	1	5	Develop and implement an effective sampling method to determine the status of this species on public and private lands, determine habitat requirements, fill life-history data gaps, and repeat as necessary to monitor changes in populations.	Monitoring & Research	NEW	YES	NO	\$25-50k	Grants, Existing Budget	FWRI	Universities	Likely	Yes	Yes, critical to obtaining the data needed to make informed management decisions.
2	1	6	Develop comprehensive conservation measures that are based on habitat management needs and habitats requirements as research clarifies these issues.	Protections & Permitting	NEW	YES	YES	TBD	Grants, Existing Budget	WHM, SCP, LAP	USFWS, USDA, DEP, FFS, NGOs	Likely	Yes	Yes, critical to make informed management decisions.
4	3	7	Develop and implement a training program for FWC law enforcement officers for identification of short-tailed snakes to aid in the enforcement of rules and regulations pertaining to protected snake species.	Law Enforcement	NEW	YES	YES	TBD	Existing Budget	HSC, SCP	NA	Likely	Yes	No
4	3	8	Identify cost-share opportunities for landowners who manage short-tailed snake habitat on private lands.	Incentives & Influencing	EXPANDED	YES	YES	TBD	Existing Budget	LAP	NA	Likely	Yes	No
4	2	9	Evaluate and implement as appropriate Habitat Conservation Plans (HCPs) and Candidate Conservation Agreements with Assurances (CCAA) as means to provide a conservation benefit for short-tailed snakes and provide incentives to private landowners.	Incentives & Influencing	EXPANDED	YES	YES	TBD	Existing Budget	HSC, SCP	USFWS	Likely	Yes	No, these plans are time intensive.
4	5	10	Create and distribute outreach materials to provide the general public with information on the identification, distribution, biology, threats to this species and possible conservation actions to decrease the persecution of snakes.	Education & Outreach	NEW	NO	NO	TBD	Grants, Existing Budget	HSC, SCPS, OCR	FDOT	Unknown	Maybe	No

Table 1. Short-tailed Snake (*Lampropeltis extenuata*) 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?
4	2	11	Create and maintain a group of partners and stakeholders who actively engage in short-tailed snake research and actively collaborate and share the results needed to ascertain the basis biology and population data needed to effectively manage this species.	Coordination with Other Entities	NEW	YES	YES	TBD	Existing Budget	SCP, FWRI	Universities	Likely	Yes	No

Acronyms used in this table:

- CCAA: Candidate Conservation Agreement with Assurances
- DEP: Florida Department of Environmental Protection
- DOACS: Florida Department of Agricultural and Consumer Services
- FDOT: Florida Department of Transportation
- FFS: Florida Forest Service
- FMNH: Florida Museum of Natural History
- FNAI: Florida Natural Areas Inventory
- FWC: Florida Fish and Wildlife Conservation Commission
- FWRI: Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission
- GIS: Geographic information system
- HCP: Habitat Conservation Plan
- HSC: Habitat and Species Conservation, a Division of the Florida Fish and Wildlife Conservation Commission
- IFAS: Institute of Food and Agricultural Sciences, a program administered by the University of Florida
- LAP: Landowner Assistance Program
- NA: Not applicable
- NGO: Non-governmental organization(s)
- NRCS: National Resource Conservation Service
- OCR: Office of Community Relations, administered by the Florida Fish and Wildlife Conservation Commission
- SCP: Species Conservation Planning, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation
- TBD: To be determined
- USDA: United States Department of Agriculture
- USFWS: United States Fish and Wildlife Service
- WHM: Wildlife and Habitat Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation

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