Short-tailed Snake Biological Status Review Report

March 31, 2011

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
620 South Meridian Street
Tallahassee, Florida 32399-1600

Biological Status Review Report
for the
Short-tailed Snake
(*Lampropeltis extenuata*)
March 31, 2011

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of November 8, 2010 that had not undergone a status review in the past decade. Public information on the status of the short-tailed snake was sought from September 17 through November 8, 2010, but no information was received. The 5-member Biological Review Group (BRG) met on November 18, 2010. Group members were Kevin Enge (FWC lead), Steve Johnson (University of Florida), Thomas Ostertag (FWC), Rick Owen (Florida Department of Environmental Protection), and David Printiss (The Nature Conservancy) (Appendix 1). In accordance with rule 68A-27.0012, Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the short-tailed snake using criteria included in definitions in 68A-27.001, F.A.C., and following 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)*. Please visit http://myfwc.com/wildlifehabitats/imperiled/listing-action-petitions/ to view the listing process rule and the criteria found in the definitions.

In late 2010, staff developed the initial draft of this report which included BRG findings and a preliminary listing recommendation from staff. The draft was sent out for peer review and the reviewers' input has been incorporated to create this final report. The draft report, peer reviews, and information received from the public are available as supplemental materials at http://myfwc.com/wildlifehabitats/imperiled/biological-status/.

Although the BRG found that the short-tailed snake did not meet any of the listing criteria, 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. Under the guidelines for applying the listing criteria that call for using the precautionary principle, FWC staff recommends that the short-tailed snake be listed as a Threatened species because it is a Florida endemic with a restricted geographic range, 57% of its potential habitat is privately owned, 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.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida. FWC staff gratefully acknowledges the assistance of the biological review group members and peer reviewers.

BIOLOGICAL INFORMATION

Taxonomic Classification – The short-tailed snake (Brown 1890) was formerly *Stilosoma extenuatum*, 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 mtDNA sequences demonstrated that recognition of *Stilosoma* as a genus rendered *Lampropeltis* paraphyletic (Crother 2008). Pyron and Burbrink (2009) supported placing the genus *Stilosoma* into synonymy with *Lampropeltis*.

Life History and Habitat Requirements – Information on the short-tailed snake has been summarized by Campbell and Moler (1992) and Ernst and Ernst (2003). It primarily inhabits areas with well-drained sandy soils, particularly longleaf pine (*Pinus palustris*)/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 (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–April and October–November, which are apparently times of the year when it 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 mostly small, smooth-scaled snake species, particularly crowned snakes (*Tantilla relicta*) (Carr 1934, Mushinsky 1984, Campbell and Moler 1992, Rossi and Rossi 1993), but a few captives have eaten small lizards in captivity (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 predators (Highton 1956; Godley et al. 2008; K. Enge, FWC, pers. commun. 2010).

Population Status and Trend – There is no information, but the population is assumed to have declined as the human population in Florida has increased and converted suitable habitat to urban, agricultural, and other land uses. The species has been recorded from the following counties since 2008: Alachua, Citrus, Hernando, Levy, Marion, and Pasco (museum and FNAI records). There are 38 museum records from Alachua County, but only 1 record exists from Columbia (1975) and Seminole (1892) counties. Although this fossorial species is rarely found, residents living in suitable habitat occasionally find them in carports, woodsheds, foundation excavations, driveways, and yards (Florida Museum of Natural History records; B. Kellner, Citrus County Mosquito Control District, pers. commun. 2009). Steve Christman (pers. commun. 2010) claims to have found approximately 2 dozen live or dead short-tailed snakes during the past 40 years. The BRG compiled 126 records with sufficient locality information for mapping purposes (*see* Fig. 1). At least 8 snakes were found between April 2009 and October 2010 (Florida Museum of Natural History Records; K. Enge, FWC, pers. commun. 2010).

Geographic Range and Distribution – The short-tailed snake is endemic to peninsular Florida, occurring from Columbia and Suwannee counties southward to Highlands County (Fig. 1). It is primarily confined to the central ridges, but its range extends west to the Gulf Coast from Levy County southward to Hillsborough and Pinellas counties (Campbell and Moler 1992).

Quantitative Analyses – We are not aware of a population viability analysis for the short-tailed snake. However, we believe that it is unlikely that the species will become extinct within the next 100 years based upon the large acreage of suitable habitat contained in conservation lands throughout Florida and its adaptability to some habitat alteration. A GIS

analysis of potential habitat for the short-tailed snake identified 102,070 ha (252,212 acres) of potential habitat on conservation lands, preserves, or easements, which represents 43.3% of the potential habitat (B. Stys, FWC, pers. commun. 2010). The condition of sandhill habitats on protected lands may improve in the future because of the Gopher Tortoise Management Plan (FWC 2007) and various projects to restore degraded sandhill and scrub habitats.

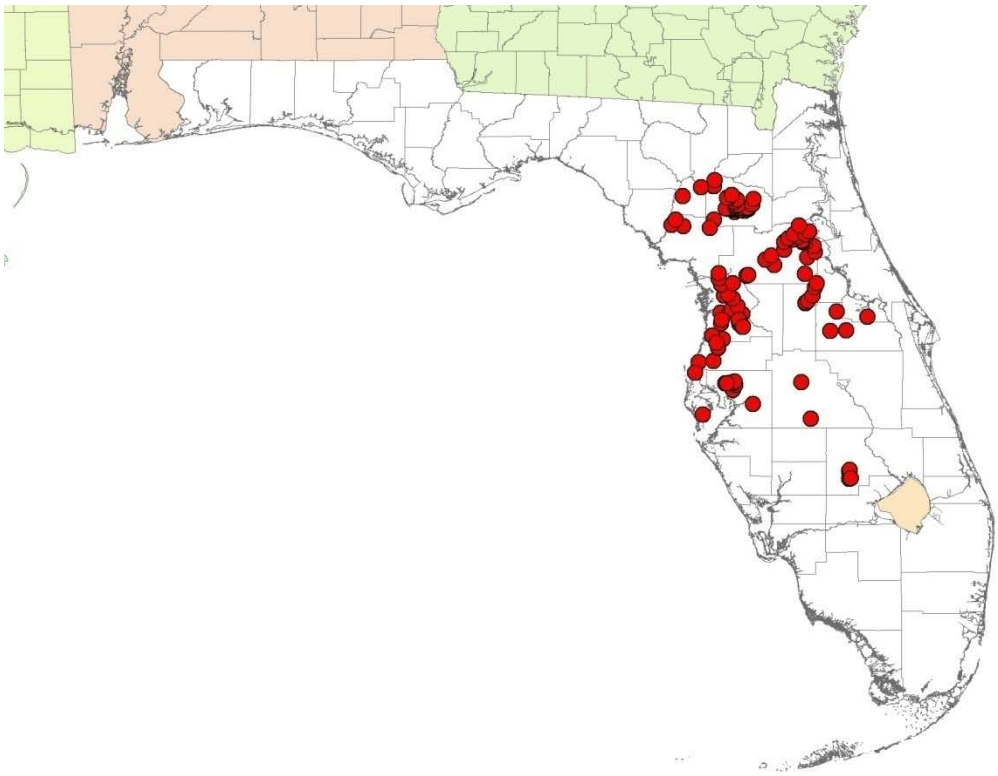

Fig. 1. Locality records from museums, FNAI, and the literature for the short-tailed snake (the record for Suwannee County is not mapped).

BIOLOGICAL STATUS ASSESSMENT

Threats – The greatest threat to short-tailed snakes is loss and alteration of xeric upland habitats resulting from commercial and residential development, silviculture, agriculture, and mining. Intact xerophytic upland ecosystems inhabited by short-tailed snakes have suffered severe losses in Florida, including 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 can 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, FWC, pers. commun. 2010). 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 scrub, may seriously affect the species (Campbell and Moler 1992). However, short-tailed snake populations can persist in unburned sandhill habitat that has undergone ecological succession to oak-dominated xeric hammock (Trescott 1998; K. Enge, FWC, pers. commun. 2010).

Crowned snakes, the primary prey of the short-tailed snake, 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, FWC, pers. commun. 2010). 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, pers. commun. 2009, Florida Museum of Natural History records).

Population Assessment – Findings from the BRG are included in Biological Status Review Information Findings tables. The BRG found that the short-tailed snake did not meet any of the 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.

LISTING RECOMMENDATION

Under the guidelines for applying the listing criteria that call for using the precautionary principle, FWC staff recommends that the short-tailed snake be listed as a Threatened species because it is a Florida endemic with a restricted geographic range, 57% of its potential habitat is privately owned, 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.

SUMMARY OF THE INDEPENDENT REVIEW

This report was sent to 3 potential independent reviewers. Comments were received from 2 reviewers: Mr. Kenneth P. Wray (Florida State Museum) and Mr. J. Steve Godley (Cardno ENTRIX). Both reviewers disagreed with the FWC staff recommendation to list the species as Threatened using the precautionary principle. One reviewer felt that the BRG was conservative in their use of data and came to the correct conclusion, and 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 a 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 Biological Status Review 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 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 of potential habitat was likely.

The IUCN guidelines recommend that assessors adopt a precautionary but realistic attitude to uncertainty when applying the criteria. Staff feels that a precautionary attitude should be applied when assessing the status of the endemic short-tailed snake, because information is lacking on its reproduction, longevity, habitat requirements, home range size, population density, and population size and trends. Specimens have not been documented from much of the potential habitat that was identified as its area of occupancy and 57% of its potential habitat is privately owned and in demand for development because of its upland nature and geographic location. Therefore, staff recommends that the short-tailed snake be listed as a Threatened species until more information is known and its status can be reevaluated. The reviews can be found at MyFWC.com.

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Biological Status Review Information
Findings

Species/taxon: Short-tailed Snake
Date: 11/19/10
Assessors: Enge, Johnson, Krysko, Ostertag, Printiss

Generation length: 6 years

Criterion/Listing Measure	Data/Information	Data Type*	Sub-Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Sub-Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	Causes of reduction (decline in extent and quality of habitat) have not ceased	S	N	
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	<30% population size reduction because only 23.5% increase in human population since 1990 and acquisition of conservation lands. From 1985–89 to 2003, 15.5% of Florida's sandhill habitat and 12.4% of its scrub habitat were converted to other uses, primarily urban or other developed uses.	S	N	Ashton and Ashton (1981), Campbell and Moler (1992), Kautz et al. (2007), U.S. Census Bureau
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	<30% population size reduction because although the human population is projected to increase by 31.7% in next 20 years in the 17 counties of occurrence, 43% of the potential habitat is in conservation lands and the species can survive in some residential areas because of its small size and fossorial nature.	S	N	Zwick and Carr (2006), GIS analysis of potential habitat by B. Stys (FWC)
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	<30% population size reduction (see A2 and A3)	S	N	Zwick and Carr (2006)
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	31,760 km^2, excluding 4 counties	E	N	
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	2,356 km^2	E	N	GIS analysis of potential habitat by B. Stys (FWC)

AND at least 2 of the following:			N	
a. Severely fragmented or exist in ≤ 10 locations		S	N	
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals		P	Y	
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals		S	N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Group suspects >10,000 mature individuals, although there are insufficient data for estimation	S	N	GIS analysis of potential habitat by B. Stys (FWC) and density data for similar-sized snake species
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR		S	Y	See Sub-criterion A3
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:		P	Y	See Sub-criterion A3
a. Population structure in the form of EITHER				
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR		S	N	See Sub-criterion B2
(ii) All mature individuals are in one subpopulation		I	N	
b. Extreme fluctuations in number of mature individuals		S	N	
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	>10,000 mature individuals	E	N	See Criterion C
(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	2,356 km^2	E	N	GIS analysis of potential habitat by B. Stys (FWC)
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	No PVA		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Not Threatened	

Is species/taxon endemic to Florida? (Y/N)	Y
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Not Threatened	

Additional notes – Generation length is defined as the average age of parents of the current cohort, which is greater than the age at first breeding and less than the age of the oldest breeding individual. No demographic data or longevity records are available for the species, which is now considered a kingsnake. Ecologically, its habits are most similar to the yellow-bellied kingsnake (*Lampropeltis calligaster*), which attains sexual maturity in 2–3 years and may live to be 10 years old in the wild in Kansas (>20 years old in captivity) (Ernst and Ernst 2003). However, the short-tailed snake might reach sexual maturity earlier because it lives in a warmer climate than Kansas, and its smaller adult size may lead to higher predation rates and a shorter lifespan in the wild. We infer a mean generation length of 6 years.

Sub-criterion A2. – We assume that the short-tailed snake population has declined as the human population in Florida has increased and converted suitable habitat to urban, agricultural, and other land uses. According to the U.S. Census Bureau, Florida's human population increased by 23.5% from 1990 through 2000 and by 16.0% from 2000 through 2009. From 1985–89 to 2003 (a period of 14–18 years), 15.5% of Florida's sandhill habitat and 12.4% of its scrub habitat were converted to other uses, primarily urban or other developed uses (Kautz et al. 2007). Actual estimates of short-tailed snake populations do not exist, but we suspect that loss and degradation of habitat would not have resulted in a $\geq$30% population decline within the past 18 years, particularly considering Florida's programs for purchasing public conservation lands (e.g., Preservation 2000 and Florida Forever). Short-tailed snakes occur in both in frequently burned sandhill habitat and in the oak-dominated communities (e.g., xeric hammocks) resulting from ecological succession in the absence of fire. Trescott (1998) had more records of short-tailed snakes from hammocks than from sandhills. The fact that snake populations persist in degraded or former sandhill habitat lends support to our suspicion that populations have not seriously declined in the past 18 years. Collection for pets is not a significant threat because of its specialized diet and fossorial habits.

Sub-criterion A3. – Three generations from 2010 would be 2028. If we add up the projected human population in 2010 and 2030 for the 17 counties in which the species occurs, the population in these counties is projected to increase by 31.7% from 2010 through 2030 (Zwick and Carr 2006). However, the exact relationship between human population increase and habitat loss is unknown. Much of the population increase could occur in urban areas, and residential development in suburban and rural areas may not eliminate snake populations. Very little life history information is available for this species and its ability to persist in developed areas in the long term. Efforts are being made to restore degraded sandhill habitat. For example, a 3-year multi-state sandhill ecological restoration project will enhance restoration on public and private lands by providing additional resources to meet sandhill restoration goals, significantly increasing the quality and quantity of habitat for wildlife species on 6,740 ha (16,655) acres of sandhill habitat in Florida by 2012 (https://public.myfwc.com/crossdoi/fundedprojects/GrantDetails.aspx?ID=215). Of the potential habitat identified using GIS analysis, 43.3% is in conservation lands, and presumably short-tailed snake populations will continue to persist on most of these lands, particularly the larger parcels. However, just because land is protected does not mean that it is properly managed. There are ca. 900,000 ha (2.2 million acres) of fire-dominated natural communities on all publicly managed state lands, and ca. 336,000 ha (830,000) acres were reported to have been prescribe burned in fiscal year 2009–10 within the fire interval necessary to maintain optimal habitat conditions

(State of Florida Land Management Uniform Accounting Council 2010). This means that 61% of fire-dominated communities are being fire suppressed. This trend of backlogged, fire-suppressed communities has occurred each year all the way back to the mid-1970s when state agencies in Florida first began using fire as a management tool, and these backlogged acres, on average, are not decreasing (R. Owen, Florida Department of Environmental Protection, pers. commun. 2010). Because of this downward trend, the available optimal habitat for upland species is projected to continue to decrease on the very lands that were meant to conserve them.

Sub-criterion B1. – The extent of occurrence was calculated by adding up the area of all counties of occurrence. The short-tailed snake has been documented from Alachua (874 mi^2), Citrus (584 mi^2), Columbia (797 mi^2), Gilchrist (349 mi^2), Hernando (478 mi^2), Highlands (1,028 mi^2), Hillsborough (1,051 mi^2), Lake (953 mi^2), Levy (1,118 mi^2), Marion (1,579 mi^2), Orange (907 mi^2), Pasco (745 mi^2), Pinellas (280 mi^2), Polk (1,874 mi^2) Putnam (722 mi^2), Seminole (308 mi^2), and Suwannee (688 mi^2) counties. The extent of occurrence is calculated as 37,127 km^2 (14,335 mi^2), although it might have decreased. The 2 northernmost records of the species are from Columbia (may actually be from Alachua County) and Suwannee counties, and these records are from the extreme southern portion of these counties. The only record from Seminole County is from 1892. If we delete the acreages of Columbia, Seminole, and Suwannee counties, along with Pinellas County (old records from heavily developed Tarpon Springs and St. Petersburg), then the extent of occurrence is 31,759 km^2 (12,262 mi^2).

Sub-criterion B2. – A GIS analysis of potential habitat for the species identified 2,356 km^2 (909 mi^2) of potential habitat (B. Stys, FWC, pers. commun. 2010), which we will assume is equivalent to the area of occupancy. The FWC 2003 land-cover classes that comprised the potential habitat were sandhill (1,353.1 km^2; 522.4 mi^2), hardwood hammocks and forest (364.8 km^2; 140.8 mi^2), sand pine scrub (330.5 km^2; 127.6 mi^2), mixed pine-hardwood forest (185.0 km^2; 71.4 mi^2), and xeric oak scrub (122.1 km^2; 47.1 mi^2). In order to be included in the model, most of the land-cover classes also had to have appropriate soil polygons and be situated within 100 m of sandhill habitat; patches <5 ha (12.5 acres) in size were excluded (*see* Cox and Kautz 2000). Because of the emphasis on sandhill habitat, most of the remaining potential habitat identified was on the Brooksville Ridge (Cox and Kautz 2000). If some of the potential habitat identified using GIS analysis is not actually occupied by short-tailed snakes, the area of occupancy could be <2,000 km^2. A continuing population decline in area of occupancy, number of locations, and number of mature individuals can be inferred because of continuing habitat loss and degradation, but there is no evidence of extreme fluctuations, and the range of the species is not severely fragmented. In a GIS analysis conducted by Cox and Kautz (2000), 13 public conservation lands were each estimated to contain >1,000 ha (2,500 acres) of potential habitat. Because of these large tracts of remaining habitat and the ability of populations to persist with some human development, we did not consider the species to have a seriously fragmented distribution. More than half of the area of occupancy is probably not in small and isolated habitat patches incapable of supporting viable populations.

Criterion C. – We are uncertain whether there are >10,000 mature short-tailed snakes. In order for there to be fewer than 10,000 snakes in this much habitat, then there could only be 0.04 snakes/ha or 1 snake every 23 ha (57 acres) of potential habitat identified. Based upon population density data available for similar-sized snake species elsewhere in North America

(0.4 to 100/ha; http://www.pwrc.usgs.gov/neparc/Products/RiskAssessPDFs/Squamata/Density_squamates.pdf), we suspect short-tailed snakes occur at higher densities than 0.04 snakes/ha in good habitat. However, there are no records from some areas of potential habitat identified, and low densities might occur in some scrub and degraded habitats.

APPENDIX 1. Brief biographies of the Short-tailed snake Biological Review Group members.

Kevin M. Enge received his M.S. in Wildlife Ecology and Conservation from the University of Florida and B.S. degrees in Wildlife and Biology from the University of Wisconsin–Stevens Point. He is currently an Associate Research Scientist in the Reptile and Amphibian Subsection of the Wildlife Research Section, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission (FWC). He has worked for FWC since 1989, serving as a nongame survey and monitoring biologist and the Herp Taxa Coordinator. He has conducted numerous surveys of both native and exotic amphibians and reptiles, and he has published >60 scientific papers and 25 reports.

Steve A. Johnson received his Ph.D. from the University of Florida and M.S. and B.S. degrees from the University of Central Florida. He is an Assistant Professor of Urban Wildlife Ecology at the University of Florida, and he holds a teaching and extension position in the Department of Wildlife Ecology and Conservation, Gulf Coast Research and Education Center. His area of expertise is natural history and conservation of amphibians and reptiles, especially those using isolated wetlands, and he has >60 publications.

Richard D. Owen received his M.S. and B.S. in Biology from the University of Central Florida. He is currently a District 2 Environmental Specialist for the Department of Environmental Protection, Florida Park Service specializing in aquatic systems and prescribed fire management at 40 north Florida state parks. He has over 22 years of vertebrate survey and monitoring experience in the southeastern United States. His area of expertise is natural history and distribution of Florida's amphibians and reptiles. He has been involved with over 30 publications on amphibians and reptiles.

Thomas E. Ostertag received his M.S. in Biological Sciences from the University of West Florida and B.S. degrees in Anthropology and Biological Sciences from Florida State University. He is currently the Listed Species Conservation Ecologist in the Species Conservation Planning Section of the Division of Habitat and Species Conservation, FWC. His areas of expertise are the ecology of ephemeral ponds and fire ecology. He has published several papers on the effects of fire in upland pine ecosystems.

David Printiss received B.S. in Biological Sciences from Florida State University. He is currently the Northwest Florida Program Director for The Nature Conservancy and is responsible for management and restoration of over 30,000 acres across 12 preserves. As a Conservancy Field Zoologist, he has surveyed nearly all conservation lands in northern Florida in order to provide rare species and natural community inventories and management plans. Although much of his current work is related to natural community restoration, his early training was in herpetology, and he co-authored many survey and management recommendation reports when he worked for the Florida Natural Areas Inventory.

APPENDIX 2. Summary of letters and emails received during the solicitation of information from the public period of September 17 through November 1, 2010.

No comments were received on this species during the public information solicitation period.