

**Recovery Outline For
Louisiana pinesnake (*Pituophis ruthveni*)
April 2018**



Photo courtesy of USFWS

I. INTRODUCTION

This document outlines a preliminary course of action for the recovery of the Louisiana pinesnake until a comprehensive recovery plan for the species is approved. The Louisiana pinesnake is a large, non-venomous snake that was historically known from seven west central Louisiana parishes and eleven counties in east Texas. However, currently it is known from only six isolated sites in Louisiana and Texas. The Louisiana pinesnake was listed as a threatened species in the *Federal Register* on April 6, 2018 (83 FR 14958). The primary threat to this snake is modification and curtailment of its habitat and range due to a variety of human-induced impacts, particularly habitat loss (forest conversion, degradation and fragmentation), vehicle-caused mortality, and isolation of small populations with questionable genetic robustness. This species' small, isolated populations, low genetic diversity and reduced range also increase its vulnerability to catastrophic events.

Listing and Contact Information:

Listing Classification:	Threatened range-wide
Effective Listing Date:	May 7, 2018
Lead Agency, Region:	U.S. Fish & Wildlife Service, Southeast Region
Lead Field Office:	Louisiana Ecological Services Field Office (LESFO)
Contact Biologist:	David Castellanos, 337-291-3100, david_castellanos@fws.gov

II. RECOVERY STATUS ASSESSMENT

A. BIOLOGY/THREATS ASSESSMENT

The Louisiana pinesnake (*Pituophis ruthveni*) is a powerful constricting snake with keeled scales, a disproportionately small head (Conant and Collins 1991) and good burrowing ability. The length of a typical adult Louisiana pinesnake ranges from 48 to 56 inches (Conant and Collins 1991), and they produce three to five large (five inches) eggs in one nest. Himes et al. (2006) documented an average home range size of 82 acres (ac) (range 16 to 267 ac) for the

species. Louisiana pinesnakes are known from and associated with a disjunct portion of the historical, longleaf-dominated pine ecosystem that existed in west-central Louisiana and east Texas (Reichling 1995). Their habitat generally consists of sandy, well-drained soils in open-canopy pine forest, which may include species such as longleaf, shortleaf, slash, or loblolly pines with a sparse midstory, and well-developed herbaceous ground cover dominated by grasses and forbs (Young and Vandeventer 1988; Rudolph and Burgdorf 1997). Abundant ground-layer herbaceous vegetation, especially forb species, (Wagner et al. 2016) is important for the Louisiana pinesnake's primary prey, Baird's pocket gopher (Rudolph et al 2012). Baird's pocket gophers also create the underground burrow systems in which Louisiana pinesnakes are most frequently found (Rudolph and Conner 1996; Rudolph and Burgdorf 1997; Himes 1998; Rudolph et al. 1998; Rudolph et al. 2002; Himes et al. 2006). The snakes use these burrow systems as refugia and hibernacula, and to escape from fire (Rudolph and Burgdorf 1997; Rudolph et al. 1998; Ealy et al. 2004; Rudolph et al. 2007; Pierce et al. 2014).

The Louisiana pinesnake is one of the rarest snakes in North America (Young and Vandeventer 1988; Himes et al. 2006). There are 291 occurrence records of 251 individual Louisiana pinesnakes from 1927 through November 1, 2017 (excluding reintroductions), all from Louisiana and Texas (Pierce 2017, unpub. data). Currently, six occupied areas are distributed among three Texas counties and four Louisiana parishes.

Several threats to the Louisiana pinesnake have been previously identified. Both the quantity and quality of the natural longleaf pine ecosystem, the primary historical habitat of the Louisiana pinesnake, have declined sharply in Louisiana and Texas since European settlement. The loss, degradation, and fragmentation of the longleaf pine dominant ecosystem was historically caused by logging, turpentineing (a process that involves removing resin from trees), fire suppression, alteration of fire seasonality and periodicity, conversion to tree plantations, agriculture, and free-range hogs (Frost 1993). Incompatible silviculture and fire suppression, and other land use changes continue to threaten habitat.

The Louisiana pinesnake is also very likely impacted by native predators, and potentially by invasive species such as feral hogs. Known predators of other pinesnake species include mammals such as shrews, raccoons, skunks, red foxes (Ernst and Ernst 2003; Yager et al. 2006), some birds (Ernst and Ernst 2003; Yager et al. 2006), and domesticated mammals, including dogs and cats (Ernst and Ernst 2003). Snake fungal disease (SFD) is an emerging disease in certain populations of wild snakes. It has been linked to morbidity and mortality for other species (Allender et al. 2011; Rajeev et al. 2009; McBride et al. 2015), including the death of one juvenile broad-banded watersnake (*Nerodia fasciata confluens* [Blanchard]) in Louisiana (Glorioso et al. 2016). As of November 2017, the causative fungus (*Ophidiomyces ophiodiicola* [OO]) (Lorch et al. 2015; Allender et al. 2015) has been found on at least five Louisiana pinesnakes from the Bienville and Fort Polk populations since 2015, and evidence of disease has been documented in at least three individuals.

The six remaining, extant Louisiana pinesnake populations are isolated and small which make them vulnerable to the threats of decreased demographic viability, increased susceptibility of extirpation from stochastic environmental factors (e.g., extreme weather events, epidemic disease), and the potential loss of valuable genetic resources resulting from genetic isolation with subsequent genetic drift, decreases in heterozygosity, and potentially inbreeding depression (Lacy 1987). Habitat fragmentation and degradation on lands in between extant populations

(Rudolph et al. 2006) have likely reduced the potential for successful dispersal among remnant populations, as well as the potential for natural recolonization of vacant or extirpated habitat patches. Unassisted recovery of a Louisiana pinesnake population from the existing individuals within the population following a decline is also uncertain because of the species' low reproductive rate (smallest clutch size of any North American colubrid snake) (Reichling 1990).

Roads surrounding and traversing the remaining Louisiana pinesnake habitat pose a direct threat to the species (Himes et al. 2002; Pierce 2015, unpub. data), and roads have been found to fragment habitat for wildlife (Dodd et al. 2004; Clark et al. 2010). Population viability analyses have shown that extinction probabilities for some snake species may increase due to road mortality (Row et al. 2007).

B. CONSERVATION ACTIONS

a. Habitat

As early as the 1980s, forest restoration and management (e.g., prescribed burning and thinning) had been implemented by the Army on Fort Polk, Peason Ridge, and adjacent U.S. Forest Service (USFS) lands to restore and maintain conditions of widely spaced trees, clear of dense midstory growth (U.S. Department of the Army 2014, p. 21) for training suitability and red-cockaded woodpecker habitat. The USFS has also implemented habitat restoration and management of tens of thousands of acres for many years on Sabine National Forest, Angelina National Forest and Kisatchie National Forest to benefit the red-cockaded woodpecker and more recently for the Louisiana pinesnake. A 2003 candidate conservation agreement (CCA) (revised to include habitat modeling in 2013) for the Louisiana pinesnake, which includes the Service, USFS, Department of Defense, Texas Parks and Wildlife Department, and the Louisiana Department of Wildlife and Fisheries, targets conservation actions on Federal lands in Louisiana and Texas, and provides a means for the partnering agencies to work cooperatively on projects that avoid and minimize impacts to the species. Approximately 1,700 to 3,000 acres of pine forest is beneficially managed voluntarily to benefit the red-cockaded woodpecker and/or the Louisiana pinesnake by private landowners in Louisiana and Texas. The Service and LDWF have also developed a programmatic candidate conservation agreement with assurances (CCAA) for the Louisiana pinesnake to facilitate the conservation of candidate species by giving non-Federal property owners (enrollees) incentives to implement conservation measures. Although the threat of further habitat loss has been largely eliminated on federally owned lands, there has been no apparent trend of increased trap success in Louisiana pinesnake populations over time (Rudolph et al. 2015; Pierce 2017, unpub. data) that would imply an increase in abundance.

b. Population Enhancement

The AZA Species Survival Plan (SSP) for the Louisiana pinesnake was implemented in 2000, to manage the captive Louisiana pinesnake population (Reichling et al., in litt. 2015). The goals of the SSP are to: maintain an assurance colony for wild Louisiana pinesnake populations, preserve or increase genetic heterozygosity into the future, preserve representative genetic integrity of wild populations, and provide individuals as needed for research and repopulation for the conservation of wild populations (U.S. Fish and Wildlife Service 2013). As of November 2017, the captive-breeding Louisiana pinesnake population consists of 191 individuals managed at 13 institutions (Reichling 2017, pers. comm.; Foster 2017a pers. comm.). Except for a downturn between about 2001 and 2005, hatching success has steadily increased since about 1987

(Reichling 2017, pers. comm.), especially in the last 2 years: the number of hatchlings produced in 2017 increased nearly 50 percent over the number of hatchlings produced in 2016 (Foster 2017b, pers. comm.).

An experimental reintroduction of the Louisiana pinesnake is being conducted to determine the feasibility of using individuals from a captive population to establish a viable population in restored habitat. Since 2010, 91 captive-bred Louisiana pinesnakes have been released into the wild at the Catahoula Ranger District of the KNF (Pierce 2017 pers. comm.).

III. PRELIMINARY RECOVERY STRATEGY

A. RECOVERY PRIORITY NUMBER WITH RATIONALE

The Louisiana pinesnake is assigned a recovery priority of 8C, which indicates the species faces a moderate degree of threat, has a high recovery potential and, has potential conflict with construction or other development projects or other forms of economic activity. The degree of threat is considered moderate because the species is not facing immediate extinction, however the threats to the Louisiana pinesnake and its habitat are numerous and ongoing, thus contributing to a continual decline. The decline of the Louisiana pinesnake is primarily the result of 1) habitat loss and degradation from land use changes, including conversion to timber plantation; 2) natural (predator) and unnatural (vehicle) mortality combined with a low reproductive potential and lack of population genetics robustness. Recovery potential is considered high because several biological and ecological limiting factors are known, threats to the habitat are known and management to improve habitat is well understood and has been accomplished in multiple areas on a large scale. Additionally, the tool of captive propagation has been employed for many years and has been increasingly successful.

B. RECOVERY STRATEGY/INITIAL ACTION PLAN

The ultimate goal of the recovery effort being developed is to ensure the long-term survival of the Louisiana pinesnake by controlling or reducing threats to the extent that an adequate number of self-sustaining populations are present across the species' historical range, and protections afforded by the Endangered Species Act are no longer required. The initial plan is to continue our engagement of our partners, landowners and stakeholders to reduce and alleviate threats to the Louisiana pinesnake. We plan to work cooperatively with County/Parish, State (TX/LA), Federal agencies, and private landowners to protect habitat that currently supports or could support the species. Specifically, we will pursue conservation agreements and grant opportunities to assist our partners with habitat improvement efforts. We plan to evaluate existing regulatory processes to minimize and mitigate the loss and degradation of Louisiana pinesnake habitat resulting from non-compatible land uses. We will encourage development of state laws/regulations that are protective of the species' habitat and engage parish and county officials or planners in voluntary conservation efforts for the species. We will work with all partners to continue to assess habitat and existing threats to determine the recovery possibilities where the species has limited documentation. We will also support community-based forest stewardship planning and action.

Recovery actions for the Louisiana pinesnake will focus on surveying and monitoring existing populations, searching for unidentified individuals or populations, reintroducing captive animals into the wild in appropriately selected areas, and protecting habitat within occupied areas. These

and other actions may include developing novel techniques to accomplish goals. Recovery actions (not in priority order) include:

1. Identify better methods to locate unknown inhabited areas and initiate searches for new populations to include other areas (for example those referenced in the listing rule). We have begun communications to the public for citizen science efforts.
2. Reevaluate unconventional search methods like scent dogs and find solutions to previously identified obstacles to securing those services.
3. Evaluate terrestrial eDNA methods for detection of the species.
4. Identify large unfragmented tracts of land in Louisiana and Texas for additional reintroduction efforts. Must have relatively few roads and preferable or suitable soils.
5. Consider the development of HCPs, SHAs, and other means of voluntary habitat improvement with private landowners, especially in Texas where a CCAA was not available prior to listing.
6. Use section 4(d) of the Endangered Species Act to allow specific exemptions that will facilitate cooperation and beneficial habitat stewardship with private citizens.
7. Conduct research to further the knowledge of life history requirements of the Louisiana pinesnake and apply the results toward management and protection of the species. Refine life history investigations to include aspects of environmental temperature tolerances, nesting requirements in the wild, required habitat patch size and degree of connectivity, and viability of populations.
8. Continue to refine and implement technology for maintaining and propagating the Louisiana pinesnake in captivity. Investigate the potential use of captive-reared or translocated Louisiana pinesnakes to augment existing natural populations or repopulate a previously occupied habitat where suitable conditions exist or can be restored.
9. Cooperate and assist with planned efforts to use wild caught male snakes as donors for artificial insemination of captive females in order to increase the genetic variability of the captive population which was grown from relatively few founders.
10. Continue to closely monitor incidence of SFD in populations and develop and implement procedures during trapping and other handling to reduce spreading of the fungus to uninfected individuals.
11. Determine causes for lack of evidence of population increases in areas where suitable habitat has been restored and is currently maintained.
12. Reevaluate and modify trapping methods or increase trapping efforts.
13. Develop a more accurate and efficient method to determine pocket gopher abundance
14. Determine the recruitment rate to, and amount of pocket gophers in newly created suitable habitat and explore the feasibility of artificial enrichment of pocket gophers in those areas.
15. Research the specific requirements (i.e., high value forage species, minerals, etc.) needed for optimum growth and reproduction of the pocket gopher and potentially further enhance newly created habitat.
16. Investigate methods to reduce vehicle mortality (e.g., fencing, culvert crossings, reduced speed zones) in occupied areas in near proximity to roads.
17. Encourage and work with all landowners to restore, enhance, and manage habitat to expand suitable habitat for the Louisiana pinesnake, particularly within and adjacent to estimated occupied habitat areas.
18. Continue to closely monitor existing Louisiana pinesnake populations.

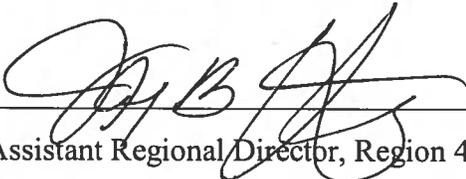
IV. PREPLANNING PROCESS

A. PLANNING APPROACH

A Species Status Assessment (SSA) will be completed prior to producing a recovery plan for the Louisiana pinesnake. Overall, an SSA uses the conservation biology principles of resiliency, redundancy, and representation (collectively known as the “3Rs”) as a lens to evaluate the current and future condition of the species. As a result, the SSA characterizes a species’ ability to sustain populations in the wild over time based on the best scientific understanding of current and future abundance and distribution within the species’ ecological settings. An SSA is in essence a biological risk assessment to aid decision makers who must use the best available scientific information to make policy decisions. The recovery plan will include objective and measurable criteria which when met, will ensure the conservation of the species. Recovery criteria will address all meaningful threats to the species, as well as estimate the time and the cost to achieve recovery. The Louisiana Ecological Services Field Office will lead the recovery planning effort, and will coordinate with all offices in the species range. The draft plan should be finalized and sent to the Regional Office for review by December 2018. The final recovery plan should be finalized and sent to the Regional Office for review by October 2019. These timelines may change as affected by available resources and regional priorities.

B. STAKEHOLDER INVOLVEMENT

During the recovery planning process, input, comments and review will be sought from multiple stakeholders within Louisiana and Texas. These will include State and Federal agencies, timber management companies, research universities, and conservation organizations. Many stakeholders are currently cooperating in ongoing conservation planning and action groups within the range of the Louisiana pinesnake.

Approve: 
Assistant Regional Director, Region 4

Date: 5/7/2018