

LOUISIANA PINE SNAKE: (*Pituophis ruthveni*)

The Louisiana pine snake is a non-venomous constrictor of the Colubridae family. It is large, usually 4-5 feet long; the largest reported specimen was 5.8 feet long. One-year-old and two-year-old snakes may reach 2-3 feet and 3-4 feet in total length, respectively. Sexual maturity may be attained at a minimal total length of 4 feet and an age of at least three years. The species is oviparous, with a gestation period of about 21 days, followed by 60 days of incubation. This species exhibits a remarkably low reproductive rate, with the smallest clutch size (3-5) of any North American colubrid snake and the largest eggs of any U.S. snake, generally 5 inches long and 2 inches wide. It also produces the largest hatchlings reported for any North American snake, ranging 18-22 inches in length, and up to 107 grams in weight. This low fecundity magnifies other threats to the pine snake; species with such low reproductive rates are typically incapable of quickly recovering from events that affect population size, increasing their potential for local extirpations.

In studies in east Texas and west Louisiana, pine snakes spent at least 59% of their time below-ground, exhibiting only short-range movements of 10-20 feet. They were most active late-morning and mid-afternoon, and least active at night and early morning. Above-ground snakes usually moved underground at least once during the day, possibly for foraging, body cooling, or predator avoidance. Seasonally, Louisiana pine snakes were most active March-May and fall (especially November) and least active during hibernation in December-February, and in summer (especially August). Their below-ground refuges were almost exclusively pocket gopher burrow systems. Pocket gophers appear to be their primary food source, but other reported food items include other rodents, cottontails, amphibians, and ground-nesting birds and eggs.

Their annual home range varied from 12 acres (juveniles) to 195 acres in size, and averaged 69 acres. Adult males had larger home ranges (145 ac) than females (25 ac). Pine snakes in east Texas usually moved less than 33 feet daily. However, when snakes did move longer distances, usually from one pocket gopher burrow system to a new one, the average daily distance moved was 669 feet for adult females and 568 feet for adult males; in Louisiana, males moved an average of 492 feet, and females 344 feet. Males tended to make long moves in May-July, while females moved primarily in July-September. There was no indication of seasonal migration.

HABITAT:

The Louisiana pine snake is generally associated with sandy, well-drained soils; open pine forests, especially longleaf-pine savannah; moderate to sparse midstory; and a well-developed herbaceous understory dominated by grasses. Its activity appears to be heavily concentrated on low, broad ridges overlain with sandy soils.

Baird's pocket gophers (*Geomys breviceps*) appear to be an essential component of Louisiana pine snake habitat. They create the burrow systems in which the pine snakes are most frequently found, and serve as a major source of food for the species. Up to 90% of radio-tagged snake relocations have been underground in pocket gopher burrow

systems, and movement patterns are typically from one pocket gopher burrow system to another. Snakes disturbed on the surface retreated to nearby burrows, and hibernation sites were always within burrows. Both native and captive-released snakes were found most frequently in areas containing an ample number of pocket gopher mounds, and snakes stayed active longer and moved greater distances where pocket gopher burrows were abundant.

Pocket gopher abundance is dependent upon an abundance of herbaceous ground-cover and loose, sandy soils. The amount of herbaceous vegetation is related to canopy cover. Generally, a rich ground layer requires a high degree of solar penetration onto the forest floor. Pocket gopher abundance was associated with a low density of trees and an open canopy, which allowed greater sunlight, more understory growth, and better forage for pocket gophers.

STATUS AND DISTRIBUTION:

Louisiana pine snakes originally occurred in at least 9 Louisiana parishes and 14 Texas counties, coinciding with a disjunct portion of the longleaf pine ecosystem west of the Mississippi River. They are now found in only 4 Louisiana parishes and 5 Texas counties. In Texas, records confirm their presence only in the southern portion of Sabine National Forest (Sabine County) and adjacent private land (Newton County), and in the southern portion of Angelina National Forest (Angelina, Jasper, Tyler counties). Nearly all recent records are from two separate areas, each measuring less than 4 miles in radius, and a third site (Scrappin= Valley) managed by Temple-Inland Corporation in northern Newton County.

Most Louisiana records originate in Bienville Parish on privately owned forestland. A second population occurs on Federal lands in Vernon Parish (Fort Polk, U.S. Army, and Kisatchie National Forest). An apparently third population has been found near the juncture of Vernon, Sabine and Natchitoches parishes.

Studies suggest that extensive population declines and local extirpations of the Louisiana pine snake have occurred during the last 50-80 years. A habitat assessment of known historical localities found that only 34% were still considered capable of supporting a viable population of pine snakes. The species has not been documented in over a decade in some of the best remaining habitat within its historical range, suggesting extinction or extreme rarity. It is now recognized as one of the rarest snakes in North America, and one of the rarest vertebrate species in the United States.

As a candidate, the Louisiana pine snake receives no formal Federal protection under the Endangered Species Act. It is State-listed as threatened in Texas and protected from direct harm and unauthorized collection. It is classified as imperiled-to-vulnerable in Louisiana.

THREATS:

Urban development, conversion to agriculture, road construction, and mining have all

contributed to loss and fragmentation of pine snake habitat. Direct human predation and collection for the pet trade may have also impacted populations. However, the greatest impact to Louisiana pine snakes has been loss of the native longleaf and shortleaf-pine ecosystem.

Loss of native pine savannah:

Virtually all timber in the South was cut during intensive commercial logging from 1870 to 1920. In 1935, only 3% of remaining longleaf-pine forests in Louisiana and Texas existed as uncut, old-growth stands. In the 1980's, only 15% in Louisiana and 7% in Texas of the 1935 levels of natural longleaf-pine forest still remained. The majority of this historic longleaf and shortleaf-pine savannah forests has been replaced with plantations of fast-growing loblolly and slash pine. These commercial plantations are typically grown in very dense, closed-canopy stands that are harvested on short rotations of less than 40 years. These forests have sparse and poorly structured understory plant communities, rendering them uninhabitable for pocket gophers.

Fire suppression:

Any remaining pine habitat occurs in isolated blocks and is often degraded by the lack of periodic fires. The suppression of natural fire events may represent the greatest threat to the Louisiana pine snake in recent years, decreasing both the quantity and quality of habitat available to pine snakes. The longleaf-pine savannah forest evolved as a fire-climax community, adapted to the occurrence of frequent, but low-intensity, ground fires. These natural fire events on sandy, well-drained soils typically maintained an overstory dominated by longleaf-pine, with minimal midstory cover but a well-developed understory of native bunch-grasses and herbaceous plants. These park-like forests supported ideal habitat for pocket gophers and, subsequently, pine snakes. In the absence of periodic fires, these upland pine savannah ecosystems rapidly develop a dense mid-story which suppresses or eliminates any herbaceous understory. Since the presence of pocket gophers is directly related to the extent of herbaceous vegetation available to them, their population numbers and distribution declines as such vegetation declines. No pine snakes have been captured in areas substantially degraded by fire suppression. Observations indicate that pine snakes are well adapted to fire. Above-ground snakes quickly move into pocket gopher burrows as flames come near. Nine pine snakes residing in areas subjected to prescribed burns over three years time all survived with no damage.

Vehicle mortality:

Louisiana pine snakes are also impacted by vehicle-caused mortality, both on state roads and on off-road trails. Researchers documented the loss of 3 snakes to vehicle traffic, including off-road vehicles. Further research indicated that roads with moderate to high traffic levels can reduce populations of large snakes by 50-75%, up to 2800 feet away. Known conflicts between pine snakes and motorized vehicles exist in sections of the Longleaf Ridge Area of Angelina National Forest. Motorized vehicles have eliminated a large part of the Millstead Branch bog community and the Catahoula Barrens community. In Sabine National Forest, vehicle conflicts occur on Foxhunter Hill and the Stark Tract.

RECOVERY MEASURES:

In March of 2004, a Candidate Conservation Agreement was developed and approved in order to identify and establish management protection for the pine snake on Federal land by protecting known populations and habitat, reducing threats to its survival, maintaining its ecosystem, and restoring degraded habitat. This agreement was intended to establish a framework for cooperation and participation in the pine snake's protection, conservation, and management within the boundaries of the Angelina and Sabine National Forests of Texas, Kisatchie National Forest in Louisiana, and Fort Polk Military Reservation in Louisiana. This agreement was implemented by the U.S.D.A. Forest Service; Fort Polk, U.S. Army, Department of Defense (Fort Polk); Region 2 and 4 of the U.S. Fish and Wildlife Service; Texas Parks and Wildlife Department; and Louisiana Department of Wildlife and Fisheries. Restoration measures will include prescribed burning, thinning, and replanting of long-leaf pine forest.