

Fire Management Species Profile

Pine snake (*Pituophis ruthveni*, *P. melanoleucus lodingi*, *P. m. melanoleucus*, and *P. m. mugitus*)

Federal Status (20): Louisiana pine snake (*P. ruthveni*):

Candidate; Black pine snake (*P. melanoleucus lodingi*), Northern pine snake (*P. m. melanoleucus*), Florida pine snake (*P. m. mugitus*): Not listed

State Ranking (20): Louisiana pine snake: Imperiled - LA, TX; Black pine snake: Critically Imperiled - LA, Imperiled -MS; Apparently Secure -AL; Northern pine snake: Possibly Extirpated -WV; Critically Imperiled-VA; Imperiled-GA, KY, NJ; Vulnerable - NC, TN, VA; Florida pine snake: Imperiled - AL, SC; Vulnerable-GA,SC; Not Ranked - FL



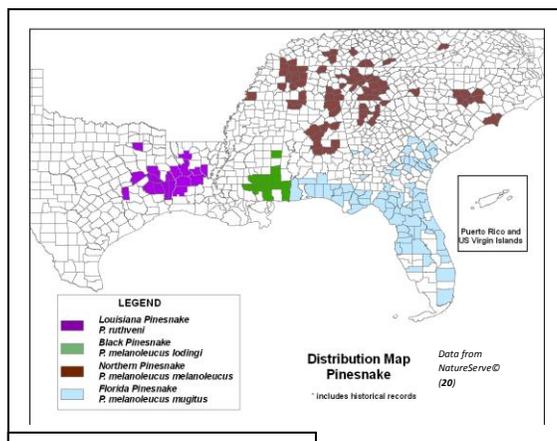
Photo - USFWS: Laura Housh

Bio Facts

Size: 48-66 inches (4)

Most Active: February - November (13, 16, 17, 21)

Prey: Pocket gopher and other small mammals (4)



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Landscape Conservation Cooperatives: *P. ruthveni*- Gulf Coastal Plains and Ozarks (GCPO), Gulf Coast Prairie (GCP); *P. melanoleucus lodingi*- GCPO, GCP; *P. m. mutigus* - GCPO, South Atlantic, Peninsular Florida; *P. m.melanoleucus* - North Atlantic, South Atlantic, Appalachian, GCPO

Landfire Zones: *P. ruthveni*- 3; *P. melanoleucus lodingi* - 46,99; *P. m. mutigus* - 55, 56, 58,99; *P. m. melanoleucus* - 46, 48, 54, 57, 59, 58, 61, 53,47, 60

Desired Vegetation Structure and Fire Components

Criteria	Monitoring Variables
Canopy/Sub-canopy	Open canopy with <50% canopy cover (more canopy cover can be tolerated on fertile land that supports denser herbaceous understory)
Mid-story	Open mid-story with < 10% canopy cover
Understory	Herbaceous vegetation with >40% cover
Ground Cover	<3 inch litter accumulation, 5-15% bare ground
Fire Regime Condition Class	In pine systems, FRCC 1 is most desired ; FRCC 2 will have decreased available herbaceous prey forage (decreased prey base), FRCC 3 will have little available prey forage (decreased prey base)
Seasonality	Growing season burns will be more effective in controlling the woody understory
Fuel Models	In well maintained habitat, fuel models include grass (GR3, GR5, GR6); grass-shrub (GS3, GS4); shrub (SH3, SH4); timber-understory (TU3); and timber-litter (TL8)
Burn Severity	Low to moderate burn severity; Composite Burn Index (CBI) <2.0; litter consumption 50-100%. (5-15% bare ground)
Fire Behavior	No known effect
Landscape Considerations	Stump removal (e.g., site prep) in silvicultural operations can damage subsurface refugia for the black and northern pine snakes

The objective of the Fire Management Species Profile project is to identify habitat management objectives that are specific, measurable, achievable, clearly communicate among habitat management professionals and are firmly based in the best available science. Their use is intended to guide habitat managers in setting local objectives for habitat management in fire-adapted ecological systems. Fire management objectives are specific to habitat conditions in which maintenance and improvement, rather than restoration, of habitat condition is the goal.

Species

Louisiana and Common Pine Snake Species

Two pine snake species are discussed in this profile: the Louisiana pine snake (*Pituophis ruthveni*), and the three subspecies of the common pine snake [black (*P. melanoleucus lodingi*), northern (*P. m. melanoleucus*), and Florida (*P. m. mugitus*)]. Pine snakes are typically associated with well-drained, sandy soils with an open pine canopy and herbaceous understory. There is little overlap in the ranges of the 2 species and the 3 subspecies of common pine snake have distinct geographic distributions. Louisiana pine snakes are primarily found in northwestern Louisiana into eastern Texas. Of the subspecies of common pine snake discussed in this profile, the northern pine snake has the largest range, the core of which extends from northern Georgia to North Carolina, with isolated populations in Alabama, New Jersey, Kentucky, and Tennessee. The black pine snake occurs in fragmented populations in Alabama and Mississippi, and is probably extirpated from Louisiana. Finally, the Florida pine snake is found in southern Alabama, in most of Florida and ranges north into the coastal plains of Georgia and southeastern South Carolina. All the pine snakes are semi-fossorial and spend much of the time underground. The Louisiana and the Florida pine snakes are strongly associated with pocket gophers for food and shelter while the northern and black pine snakes have a more diverse food base and utilize multiple sources of refugia. The distribution map for the species should be used as a general guide given new locations have occurred outside the defined counties.

Desired Habitat Conditions

Based on literature review, the vegetation monitoring variables outlined in the **Desired Vegetation Structure and Fire Components** table established by this profile are assumed to be similar among the two pine snake species. Parameters are defined as to maintain open canopy that allows for an herbaceous understory.

Louisiana Pine Snake

Some older reports for this species will consider it by a subspecific classification (*P. melanoleucus ruthveni*). Multiple telemetry studies documented the snakes preferred open piney woods maintained with frequent fire (**7, 14, 23**). Two old records document individual occurrences outside of this general habitat structure; in a hard bog of dense sweet bay (*Magonlia virginiana*) and swamp cyrilla (*Cyrilla racemiflora*) (**18**) and a predominately blackjack oak (*Quercus marilandica*) habitat (**29**). A more recent study suggest that the species population is decreasing due to loss of the fire maintained open pine habitat (**29**).

Black Pine Snake

The desired habitat conditions can be summarized by a quote “By prioritizing management resulting in open, grassy, forb-rich, longleaf pine ecosystems (growing season burns, lower stand densities) populations of *P. m. lodingi*, and other longleaf pine (*Pinus palustris*) specialists will likely benefit” (**1**). Research has indicated that this species uses the following habitat characteristics at levels significantly different from that available: canopy cover (20-41%), shrubs in midstory (48%), midstory hardwood (1%), ground foliage (54%), forbs (5%), litter, (48-89%), bare soil (5%) (**1, 5**).

Northern Pine Snake

Specific habitat characteristics required by northern pine snake has not been established although an ongoing seven-year study should provide some of those details for the New Jersey population (**R. Zappalorti, Herpetological Associates, Pers. Comm., 16 May 2010**). Northern pine snake prefers well-drained, sandy, upland pine and pine-oak forests throughout their range (**2, 27, 30, 35, 36**). Even though part of the northern pine snake’s range falls outside the historic range of the longleaf pine, the vegetation monitoring variables variables outlined in the **Desired Vegetation Structure and Fire Components** table are assumed to be similar which focus on an open canopy that allows for an herbaceous understory.

Florida Pine Snake

Although Florida pine snakes did not exhibit significant preferences for particular microhabitats during studies conducted in longleaf pine stands of southern Georgia, and the flatwoods and sandhills of north-central Florida, the vegetation characteristics identified can be considered suitable for the Florida pine snake: canopy cover (35-43%); bare sand (13-21%), leaf litter (50-60%), woody debris (8-12%), ground cover (4-6%), herbaceous and grass cover at approximately 25% (**17, 19**).

Habitat

Habitat use by the two pine snakes species include broad commonalities. The primary habitat for these snakes consists of sandy, well-drained soils with an overstory of longleaf pine, a fire suppressed mid-story, and dense herbaceous ground cover (**5, 14, 22, 26, 33**). Both species are primarily fossorial, extensively using a variety of underground sites, including pocket gopher and other small animal burrows (**16, 23**) and stump root channels (**6, 26**).

Louisiana Pine Snake

This species is closely associated with a well-developed herbaceous ground cover of grasses and forbs and with Baird's pocket gopher (*Geomys breviceps*) (**7, 14, 23, 24, 26**). Louisiana pine snakes depend on pocket gophers directly, as a source of food, and indirectly, by using pocket gopher burrows for shelter (**23, 29**). It was concluded that less canopy closure allowed greater sunlight penetration, increasing the growth of herbaceous vegetation which is the main component of pocket gopher forage in the understory (**15**). March through October is defined as the active season for the Louisiana pine snake (**21**).

Black Pine Snake

Black pine snakes are endemic to the longleaf pine forests of the southeastern United States. Tracking studies have also shown that this species spends a considerable amount of time underground. Black pine snakes typically use the trunks or root channels of rotting pine stumps (**6, 26**). In southern Mississippi, black pine snakes were reported to predominantly utilize stumpholes (**1**). Other studies have shown them to use the same pine stump and associated rotted-out root system from year to year, indicating considerable longleaf pine forest site fidelity (**32**). Land management activities that remove stumps (i.e., silviculture site prep) may limit abundance of this snake species (**1**). Black pine snakes move seasonally between warm weather foraging/breeding areas and winter hibernacula (**16**). Emergence from hibernacula occurred in mid-February, and snakes made short excursions near their overwintering site until moving to their active warm weather area in late March. Snakes occupied active areas until late September, when they moved back to overwintering sites. Several juvenile snakes used mole or other small mammal burrows (**16**).

Northern Pine Snake

In South Carolina, Kentucky, Georgia and Alabama, there are no known studies of this species with respect to their habitat use, home range, or movements. In the North Carolina Sandhills Region, pine snakes use a wide range of habitats. Their presence can be defined primarily by soil type (i.e., sandy, loamy soils) and the availability of suitable refugia (e.g., stump holes and burrows), rather than vegetative cover. They have been documented in almost every microhabitat type within the region, and vegetative characteristics, such as diameter at breast height, tree basal area, and percent cover of herbaceous vegetation are not believed to influence habitat use by pine snakes in North Carolina. Pine snakes tracked in North Carolina have used open and forested habitats about equal. Northern pine snakes have been found using frequently-burned longleaf pine-scrub, oak-wiregrass areas extensively (*J. Beane, North Carolina Department of Environment and Natural Resources, Pers. Comm., May 2010*).

In the Tennessee barrens, snakes selected substrates consisting of more than 50% herbaceous groundcover and avoided leaf/straw litter substrates (**12**). They utilized areas with less than 25% canopy cover, and were infrequently found in areas with greater than 50% canopy cover. Like other pine snakes, northern pine snakes in this population were highly fossorial. Northern pine snakes spent the majority of their time underground (> 85% of observations), primarily using stump holes and concrete building foundations located throughout the study area. These structures seemed to be important for pine snakes, especially where the hardened clay soils were less friable (**12**).

In the New Jersey pine barrens, northern pine snakes have been found to occur in pitch pine 93% of the time and occasionally, in scrub oak habitats, but avoid white cedar swamps and lowland pine (**3**). They often used open areas in forest for nesting and basking, and ground cover for foraging, possibly to shield them from high temperatures (**3**). For refugia, snakes used tree stumps, mole tunnels, brush piles, wood chuck burrows, and artificial shelters (**34**). The northern pine snake is thought to be unique in their ability to excavate deep burrows for nesting (**28**). Pine snakes selected nest sites with less ground cover, more open canopy, and had softer sand than randomly selected site (**2**).

Florida Pine Snake

Florida pine snakes prefer natural habitats including upland pine forests and sandhills, but they are also found in scrubby flatwoods, oak scrub, dry oak forests, old fields, and agricultural borders (**8, 10**). Florida pine snakes were found in high pine and turkey oak associations (61%) and ruderal areas (24%) (particularly old pastures); remaining habitat use consisted of xeric hammocks (8%) and littoral margins of clear-water lakes and associated gallberry-fetterbush (*Illex glabra-Lyonia lucida*) thickets (7%)(**9**). The study showed that Florida pine snakes, like other species in the genus, are extremely fossorial. Only 15% of the individuals were observed above ground, with the remainder being found in pocket gopher or other burrows. Similar to the Louisiana pine snake, the Florida pine snake is highly dependent on the southeastern pocket gopher (*Geomys pinetis*) for food and refugia (**11**). A study in southern Georgia found snakes predominately used *G. pinetis* burrows as refugia (i.e., >60% of the time), but no association with any particular refugia was observed during their above-ground activities (**17**). At the landscape scale, Florida pine snakes were most often associated with mixed pine-hardwood habitat, while all other habitats examined were used relative to their availability (**17**).

Landscape/ Spatiality-Temporality

Overall, researchers have found that pine snakes have average home ranges ranging between 68 and 500 acres (**1, 6, 7, 9, 13, 14, 17, 21, 23, 27, 31**). In a general sense, the Louisiana pine snake has shown the smallest home ranges (68-101 acres) (**21, 23**), while the black pine snake shows the largest (115-500 acres) (**1, 6**). Average daily movements for both species ranges from 380 to 900 feet (**1, 7, 9, 13, 14**).

Louisiana Pine Snake

Although the Louisiana pine snake is a large snake, it been shown to be relatively sedentary. The mean distance travelled per move by this species in northwestern Louisiana was 384 feet (range: 118-719 feet) (**14**). In eastern Texas they were also sedentary, but during active periods, were capable of moving longer distances – an average of 535 feet per day (**7**). Long distance movements typically involved travelling from one pocket gopher burrow system to another; while underground, the snakes moved very little, suggesting that they hunt using a lie-and-wait method (**7**). Based on home range and reintroduction studies, several thousand acres of suitable habitat would likely be needed to support a reproducing population (**C. Rudolph, USDA Forest Service, Nacogdoches, Texas, Pers. Comm., May 2010**).

Black Pine Snake

In Mississippi average home ranges were determined to be 117 acres (**6**). In addition, observations made during this study provided some evidence of territoriality in the black pine snake. Subsequent research conducted on the same site provided home range estimates averaging 259 acres (**31**).

Northern Pine Snake

Studies of northern pine snakes have shown similar movement patterns and home ranges to the other species discussed. Snakes in Tennessee exhibited a bimodal activity pattern, moving more often during spring and late summer to early autumn. Snakes traveled an average of 896 feet per move, with males moving greater distances than females during spring (**13**). Snakes traveled longer distances to and from widely separated areas, indicating that this population needs more extensive, contiguous areas to support their biological needs under the current management regime (**13**). Considerably larger average home ranges (378 acres) were found in the New Jersey pine barrens habitat comprised mostly of upland pine forest and disturbed open fields (**35, 36**). Northern pine snakes in the North Carolina sandhills had fairly large home ranges (often travelling > 0.5 mile per day), and frequently showed site fidelity to hibernacula or other refugia. Home range sizes are estimated to be at least 100 acres on average (**North Carolina Department of Environment and Natural Resources, unpubl. Data**).

Florida Pine Snake

Florida Pine snakes were found to be active mainly in May, June, July, and October (**9**). A study in Georgia showed an average annual home range of 146 acres (**17**) and no difference in mean annual home range size between male and female Florida pine snakes. However home range size did vary seasonally, with spring and summer home ranges being significantly larger than fall and winter ranges (**17**).

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