Draft Recovery Plan
for the
Black Pinesnake (*Pituophis melanoleucus lodingi*)

Photo courtesy of Kevin Narum

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Regional Director, U.S. Fish and Wildlife Service

RECOVERY PLAN for the BLACK PINESNAKE (*Pituophis melanoleucus lodingi*)

This Recovery Plan describes criteria for determining when the black pinesnake should be considered for removal from the *List of Endangered and Threatened Wildlife* (50 CFR § 17.11). It also lists actions that will be necessary to meet those criteria and estimates the time and cost for implementing recovery actions. Recovery actions are assigned numerical priorities to highlight the relative contribution they may make toward species recovery (48 FR 43098):

Priority 1 – An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2 – An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 – All other actions necessary to provide for full recovery of the species.

Brief descriptions of the species' status, habitat requirements, and limiting factors are included. A detailed discussion of these and other topics pertinent to the recovery of the black pinesnake can be found in the Species Status Assessment (SSA; Service 2022) and the Recovery Implementation Strategy (RIS; Service 2023). These supplemental documents are available at https://ecos.fws.gov/ecp/. The RIS and SSA are finalized separately from the Recovery Plan and will be updated as necessary.

Current Species Status

The black pinesnake was listed as a Threatened species under the Endangered Species Act (ESA) on October 6, 2015, along with a 4(d) rule to provide for the conservation of the species (80 FR 60468). It has been assigned a recovery priority number of 12, based on the moderate degree of threats and low recovery potential. While the overall assessment is that black pinesnake habitat is still diminishing and degrading due to fragmentation, conversion, and fire suppression, there are restoration efforts underway that have slowed down habitat loss from previously reported rates, reducing the high magnitude of this threat. However, the success of such restoration efforts has yet to be realized in regard to a positive response by black pinesnake populations and converting habitat to a condition where a pinesnake population can thrive can take time (minimum 3–5 years) depending on local conditions. Additionally, many of these efforts do not prioritize the objectives of creating and maintaining large, unfragmented tracts of suitable habitat or minimizing subsurface disturbance that could potentially destroy the black pinesnake's underground shelter. Therefore, the recovery potential is considered low for the black pinesnake at the present time because specific threats such as habitat degradation and fragmentation are difficult to alleviate quickly, and endeavors undertaken to address these threats have an uncertain probability of success. Critical habitat was proposed on March 11, 2015, and designation of 324,679 acres (131,392.9 hectares) of critical habitat was finalized on February 26, 2020, in eight units across 10 counties in southern Mississippi and southwestern Alabama (85 FR 11238). Units range in size from approximately 5,900 acres to 131,000 acres (2,387.6 to 53,013.8 hectares); overall land ownership across all units is 68% Federal, 29% private, and 3% State owned. All units are considered occupied by the species.

The black pinesnake is ranked as State Endangered by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), with a status of S2, meaning imperiled because of rarity of

occurrences (6 to 20 occurrences) or because of some factor(s) making it vulnerable to extirpation. As a Species of Greatest Conservation Need (SGCN), it is considered a Tier 2 species; that is, in need of timely conservation action and/or research because of rarity, restricted distribution, unknown or decreasing population trend, specialized habitat needs or habitat vulnerability or significant threats (Mississippi Museum of Natural Science (MMNS) 2015). In Alabama, the black pinesnake is State Protected with a status of S2 (same definition as MMNS 2015, above), as a Priority 1 SGCN (Alabama Department of Conservation and Natural Resources 2015). This means that it is considered critically imperiled and at risk of extinction/extirpation because of extreme rarity, restricted distribution, decreasing population trend/population viability problems, and specialized habitat needs/habitat vulnerability. The species is considered extirpated in Louisiana.

Habitat Requirements and Limiting Factors

Black pinesnakes are endemic to the upland longleaf pine (*Pinus palustris*) forests that once covered southern Mississippi, southern Alabama, and southeastern Louisiana. Habitat for these snakes historically consisted of sandy, well-drained soils with an open-canopied overstory of longleaf pine, a reduced shrub layer, and abundant herbaceous groundcover. As defined in the Black Pinesnake Critical Habitat rule (85 FR 11238), the Physical or Biological Features (PBFs) essential to the conservation of the species include:

1) A pine forest, historically dominated by longleaf pine and maintained by frequent fire, primarily having an open canopy that sustains a reduced woody mid-story and abundant, diverse, native herbaceous groundcover;
2) Tracts of at least 5,000 acres (2,023.4 hectares) of mostly unfragmented forested habitat to support the large home ranges and long-range movements of black pinesnakes;
3) Naturally burned-out or rotted-out pine stump holes and their associated root system tunnels, which represent their primary shelter; and
4) Deep, sandy, well-drained soils with characteristics such as low flooding potential, low gravel composition, deep seasonal water table, and low clay content.

The historical range of the black pinesnake is highly correlated with the historical range of the longleaf pine ecosystem in Mississippi, Alabama, and Louisiana, and this ecosystem has been reduced to 5% of its original extent primarily due to decades of deforestation, fire suppression, and conversion to commercial pine plantations, agriculture, and urban development (Landers et al. 1995). While this loss of habitat has slowed considerably in recent years, in part due to efforts to restore the longleaf pine ecosystem in the Southeast, habitat loss continues today, which leads to further landscape fragmentation. The use of prescribed fire for habitat management has had increased emphasis in recent years; however, expanded urbanization, fragmentation, and regulatory constraints will continue to restrict the use of fire and cause further habitat degradation (Wear and Greis 2013). The most viable, robust populations occur on the De Soto National Forest (DNF) in Mississippi, but much of the habitat outside of DNF has become unsuitable and highly fragmented, and populations on these lands appear to be small and isolated on islands of suitable longleaf pine habitat. Habitat fragmentation and degradation on lands in between known extant populations 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. Throughout the species' range, areas with potentially suitable habitat that are not part of an active longleaf restoration and management plan typically become

overgrown and lose the herbaceous groundcover necessary to support populations of hispid cotton rats (*Sigmodon hispidus*) and cotton mice (*Peromyscus gossypinus*) that are the black pinesnake's primary prey. Once habitat becomes shaded and overgrown, the threat of road mortality also increases as individuals must expand their home ranges to find prey, shelter, and mates. Smaller populations on the edge of the range are more susceptible to localized extinction from catastrophic and stochastic events. Additionally, the footprint of longleaf pine in the Southeast has gone through substantial contraction (Oswalt et al. 2015), creating even higher susceptibility for these peripheral populations.

Recovery Strategy

The recovery strategy for the black pinesnake is to ensure the long-term viability of the species by controlling or reducing threats to the extent that an adequate number of self-sustaining populations are present throughout the species' historical range. The plan involves cooperative habitat restoration, management, protection, and land acquisition where known populations occur; identifying important habitat variables and obstacles to population viability; expanding monitoring programs; identifying and managing for previously undocumented occurrences; developing a reliable survey methodology; and increasing public awareness. Recovery should encompass partnerships and collaboration among various stakeholders; particularly among Federal partners, State conservation agencies, non-governmental conservation organizations, and private landowners.

Successful black pinesnake recovery will require that populations occupy large areas ($\geq$ 5,000 acres) of ecologically suitable habitat. Prey availability will need to be adequate to support populations, and underground refugia such as stumpholes must be abundant and widespread across the landscape. In summary, populations that contribute to recovery will need to be able to sustain a resilience level that allows for growth while withstanding some level of human-induced mortality.

Recovery of the black pinesnake is founded upon the ecological principles of resilience, representation, and redundancy (Wolf et al. 2015). Because black pinesnakes occupy a fairly small range geographically, there are no known genetic differences between populations, and there are no marked differences in ecological requirements among populations, representation necessitates that populations throughout the entire range of this species are a priority for conservation. Therefore, the entirety of the species' current range is important for its recovery, with populations on the periphery needing the same attention as those in the core of the range. High redundancy requires that multiple self-sustaining populations should be conserved within several geographic regions where the black pinesnake occurs. Such highly resilient, self-sustaining populations are highly clustered and currently are only known to exist in a few areas on DNF, including on the Camp Shelby Joint Forces Training Center (Camp Shelby). According to the SSA (Service 2022a) only 3 out of 19 presumed extant populations showed signs of high resilience (i.e., higher population numbers, high percentage of suitable habitat, and low levels of fragmentation), and these are all on DNF. Based on modeling and research on other snake species such as the Florida pinesnake (*P. m. mugitus*) (Miller 2008); eastern massasauga (*Sistrurus catenatus*) (Szymanski et al. 2016; Faust et al. 2011); and western massasauga (*S. tergeminus*) (Seigel and Sheil 1999), we made the reasonable assumption that a minimum viable population (MVP) of black pinesnakes is 50 individuals. This value will be used to measure population resilience when evaluating Recovery Criteria.

Research is needed to improve scientific knowledge of biological and ecological factors that enhance population growth and affect long-term population viability of black pinesnakes, which can then be used to develop adaptive management strategies. Standardized monitoring and surveying protocols must be developed, verified, and implemented to measure the effectiveness of conservation efforts at promoting and maintaining resilient populations. We will continue working cooperatively with State Wildlife Agencies in Mississippi and Alabama, Federal agencies, non-governmental organizations, and private landowners to protect habitat that currently supports or could support the species. We will continue to pursue conservation agreements such as Safe Harbor Agreements (SHA) and grant opportunities to assist our partners with habitat improvement efforts. The U.S. Forest Service (USFS) and Camp Shelby have been managing forest lands for conservation of the gopher tortoise (*Gopherus polyphemus*) and red-cockaded woodpecker (*Dryobates* [*Picoides*] *borealis*) for decades, which is very beneficial to the black pinesnake, and their management plans now include conservation actions directly addressing black pinesnake populations. These programs must continue and be expanded, if possible.

We plan to evaluate the Service's engagement in existing regulatory processes to help ensure avoidance, minimization of loss, and degradation of black pinesnake habitat resulting from non-compatible land uses. We will work with all partners in the forestry community to continue to assess habitat loss, promote education efforts, and establish best management practices specific to pinesnake protection to be distributed widely to anyone working in the range of the species. We encourage private landowners to continue land management that produces open canopy forests with abundant herbaceous vegetation and encourage participation in voluntary programs such as SHAs that provide both habitat restoration/conservation for the species and regulatory certainty for landowners. We will continue to support community-based (e.g., local municipal lands, steering committees, schools, etc.) forest stewardship education, planning, and action through outreach events and materials.

Overall recovery objectives are to protect, restore, and manage habitat to provide conditions necessary to recover and ultimately delist the black pinesnake. Recovery efforts will be focused on the sites most likely to contribute to achieving the overall species' recovery goal, with known, presumed extant sites considered as initial recovery population sites. This will require analyzing whether it is possible to maintain an MVP on a site; if sufficient potential habitat exists and whether necessary restoration and management actions are untenable. Besides managing habitat at known black pinesnake population sites, we must expand our knowledge of where else the species may occur, supporting innovative research, monitoring, and surveying techniques to help fully understand the species' ecological needs, stressors, and most reliable survey methods. Ecosystem restoration and management are the primary objectives that will be the building blocks for recovery of the black pinesnake, while longleaf pine forest is ideal suitable habitat for black pinesnake, forests dominated by other species should not be overlooked for potential suitable habitat. In addition, simultaneous efforts and initiatives focusing on protection, education, and discovery must also be occurring for true recovery to be fully realized. As these objectives are advanced, recovery criteria will be reevaluated when new information becomes available.

Delisting Criteria

The black pinesnake may be considered for delisting when the following criteria are met:

1) At least 9 geographically distinct black pinesnake populations occur across the species' range, with at least 6 in Mississippi and at least 3 in Alabama.
2) Monitoring demonstrates that these populations are viable, as evidenced by:
   a) a population estimate of at least 50 black pinesnakes (or 25 female black pinesnakes);
   b) having stable or increasing population growth rates; and
   c) occurring on tracts of at least 5,000 acres (2,023.4 hectares) of mostly unfragmented upland pine forest habitat.
3) Threats of habitat loss, degradation, and fragmentation are managed. Populations are protected via long-term conservation mechanisms and managed to promote open-canopied upland pine habitat, native plant community integrity, and growth of black pinesnake populations.

***Actions Needed*:** Recovery actions identified in the table below are those that, based on the best available science, we believe are necessary to accomplish the recovery of the black pinesnake. We have included a priority number and estimated cost to complete each action.

	Recovery Action	**Estimated Cost**	**Priority**
1	Work with partners and stakeholders to develop and implement a black pinesnake survey and monitoring strategy for all populations.	$1,910,000	1
2	Work with State and Federal Agencies, non-governmental conservation organizations, and private landowners to obtain protections and/or conservation commitments and land acquisitions (when appropriate) for black pinesnake populations on privately-owned lands.	$1,375,000	1
3	Develop and implement management plans for all populations.	$360,000	1
4	Work with partners and land managers to expand and prioritize prescribed fire programs, emphasizing recommendations on fire intensity, size, frequency, and seasonality.	$930,000	1
5	Facilitate and support surveys to identify new populations.	$195,000	2
6	Conduct and support research that enhances knowledge of black pinesnakes, including population viability models, habitat suitability models, improved management strategies, radio-telemetry studies, and species/habitat distribution models.	$770,000	2
7	Identify potential interpopulation habitat corridor locations and secure agreements to protect and restore suitable habitat in those areas.	$215,000	2
8	Expand outreach efforts, especially education for youth, hunters, foresters, contractors, and outdoors enthusiasts and identify innovative ways to increase public awareness of the need to protect this species and its habitat.	$115,000	3
	Total Estimated Cost	**$5,404,000**	

***Estimated Cost to Delist*:** The cost to recover and, ultimately delist the black pinesnake is estimated to be a minimum of $5,404,000. Some costs are not determinable at this time or may increase in the future, therefore the total cost of recovery may be higher than this estimate.

***Date of Delisting*:** If all actions are fully funded and implemented as outlined, including full cooperation of all partners needed to achieve recovery, we anticipate that recovery criteria for delisting could be met by 2072 (50 years).

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