

Longleaf Pine Reptile Guild

PRIMARY SPECIES

Mimic Glass Lizard *Ophisaurus mimicus*

Pine Snake *Pituophis melanoleucus melanoleucus* and *P. m. mugitus*

Southern Hognose Snake *Heterodon simus*

Eastern Diamondback Rattlesnake *Crotalus adamanteus*

Coral Snake *Micrurus fulvius*

SECONDARY SPECIES

Slender Glass Lizard *Ophisaurus attenuatus*

Pine Woods Snake *Rhadinea flavilata*

Contributors: Stephen H. Bennett and Kurt A. Buhlmann

DESCRIPTION

This guild comprises five primary species and two secondary species. Five of the species are snakes and two are lizards; all of the species are commonly associated with one or more of the natural communities that comprise the longleaf pine ecosystem. Primary species are high priority species that are directly tied to the unifying feature/habitat. Secondary species are priority species that may occur in or be related to the unifying feature at some time in their life.

All of the species in this guild are associated with the longleaf pine ecosystem that was extensive across the southeastern United States at the time of European settlement (Bartram 1791; Guyer and Bailey 1993). The longleaf pine ecosystem has declined to less than ten percent of its original land area (Frost et al. 1986). Much of the previously forested lands are now urban or agricultural (Gibbons and Buhlmann 2001). Those lands that are forested have been planted in pine species other than longleaf and have been managed on shorter rotations, in many cases without prescribed fire and without concern for the diverse herbaceous plant species that once occurred with the longleaf pine. It is not surprising, therefore, that the reptiles associated with this ecosystem are also species of concern.

Taxonomy and Basic Description

The mimic glass lizard is a recently described species that reaches a maximum length of approximately 65 cm (25.6 inches). This is the smallest glass lizard and is generally similar in color and pattern to the slender and island glass lizards, making identification difficult. The mimic glass lizard is typically light brown with dark brown or black longitudinal stripes. A dark mid-dorsal stripe is typically present. All glass lizard species lack limbs and are also known as legless lizards (Conant and Collins 1991; Martof et al. 1980).

There are two subspecies of the pine snake found in South Carolina: the northern pine snake (*P. m. melanoleucus*) and the Florida pine snake (*P. m. mugitus*). The Florida pine snake is generally restricted to the southwestern-most counties of our state, primarily



Jasper, Beaufort, Allendale and Hampton Counties. The northern pine snake occurs throughout the remainder of the state. Along the western border of South Carolina, adjacent to the Savannah River, there is a region of intergradation between the two subspecies, primarily in Barnwell, Aiken and Lexington Counties (Conant and Collins 1991). For purposes of this report we will treat the pine snake at the species level.



The pine snake is a large snake with a maximum length of approximately 228 cm (7.5 feet). The pattern of this species can be variable. The pine snake typically has a light brown to ivory background color with large brown or black blotches down the length of the body. In the Florida subspecies, the anterior blotches are typically not present and the pattern is indistinct. Pine snakes from different regions of South Carolina can be very different in coloration and pattern, ranging

from light backgrounds with distinct, dark blotches to dark animals with indistinct patterns; occasionally individuals with red (erythristic) blotches or background colors are found (Conant and Collins 1991; Martof et al. 1980).

The southern hognose snake is the smallest of the hognose snakes, a group of snakes that possess a sharply upturned snout, believed to be an adaptation for burrowing (Conant and Collins 1991). This species averages from 36 to 51 cm (14 to 20 inches) in length. The southern hognose snake is typically tan-brown with darker blotches running down the back. The colors of this snake are typically less variable than its more common relative, the eastern hognose (Conant and Collins 1991).



The eastern diamondback rattlesnake is the largest venomous snake in the United States, with a maximum reported length of 243 cm (8 feet). In South Carolina, most adult specimens are typically smaller, averaging approximately 84 to 183 cm (2.75 to 6 feet) in length. Typical of pit vipers, the eastern diamondback is a large-bodied snake, with a very large head and a tail rattle composed of keratinized epidermis. This rattlesnake is usually light brown to dark brown with dark diamond-shaped blotches running the length of the body. These blotches are typically outlined by a single row of yellow-white scales. The eastern diamondback has a distinctive wide, dark stripe across the eye, surrounded on either side by a narrow, light stripe (Conant and Collins 1991; Martof et al. 1980).

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The coral snake is the only member of the Family Elapidae found in South Carolina; this family includes cobras and their relatives. This venomous snake is very different from all of South Carolina's other venomous snakes, which are all pit vipers. Instead, this species has short, fixed fangs. The coral snake is a brightly colored species with red, yellow and black annular rings running the length of the body. There are two species of non-venomous snakes that are similarly patterned: the scarlet kingsnake and the scarlet snake. On the coral snake, the red and black bands never touch, whereas on the non-venomous species, the red and yellow bands never touch. In addition, the coral snake has a black head and the non-venomous species have red heads. The coral Snake can reach a maximum length of 120 cm (47 inches); however most specimens are typically in the range of 51 to 76 cm (20 to 30 inches) (Conant and Collins 1991; Martof et al. 1980).



The slender glass lizard is moderately large; this species can reach lengths from 56 to 106 cm (22 to 42 inches) (Conant and Collins 1991). This species is typically brown with dark longitudinal markings that are similar to those of the mimic glass lizard. The slender glass lizard differs from the mimic glass lizard and the island glass lizard, another rare species, in that it has numerous dark markings (dark spots, dashes or lines) below the lateral fold (Palmer and Braswell 1995). There is sufficient variation in the glass lizard species to make casual identification problematic.

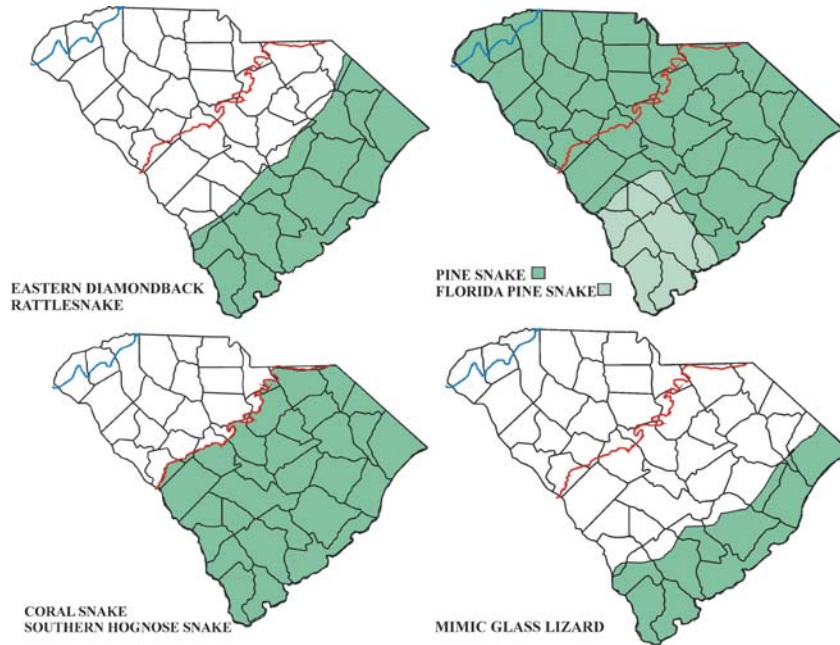
The pine woods snake is a small, secretive species that rarely exceeds 33 cm (13 inches) in length. This species varies from golden brown to light reddish-brown, becoming paler along the sides. There is a dark line through the eye; lip scales are white to yellowish in color (Conant and Collins 1991).

Status

The five primary members of this guild are listed as Species of Concern in South Carolina [by whom?]. A proposal to list the southern hognose snake as State Threatened has been submitted to the South Carolina Department of Natural Resources (SCDNR). The secondary members of the guild are species that have been identified as potentially requiring some conservation actions in South Carolina. The Heritage Trust Program currently ranks the species as follows: mimic glass lizard, S2/G3; northern pine snake, S3,S4/G4; Florida pine snake, S2/G4; southern hognose, S2/G2; eastern diamondback rattlesnake, not ranked; coral snake, S2/G5; slender glass lizard, not ranked; and pine woods snake, not ranked.

POPULATION DISTRIBUTION AND SIZE

Little is known of the actual population status of any of these guild members. The mimic glass lizard, possibly the most rare guild member, has only been reported once in South Carolina. The slender glass lizard is more widespread and better represented in collections than the mimic glass lizard, but no data exists on its population status. Glass lizards as a group are not well known in terms of their population status, life history or demography.



GENERALIZED RANGE MAPS FOR PRIMARY SPECIES

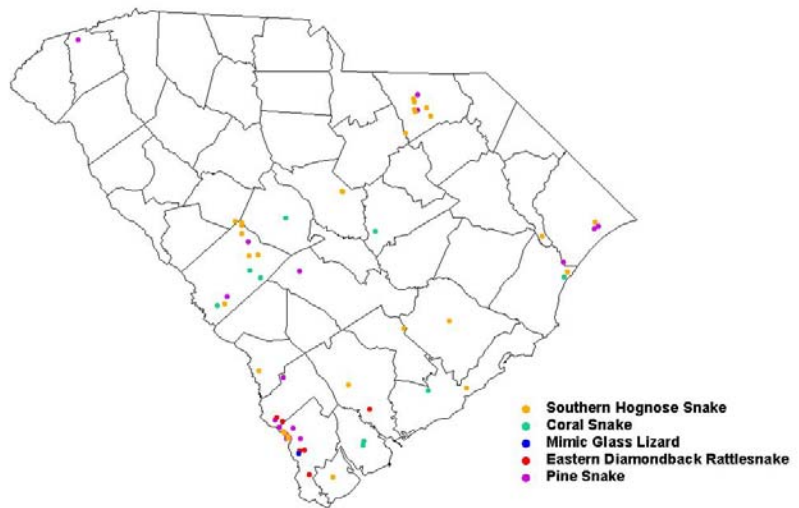
Adapted from Conant and Collins, 1991

The pine snake is widespread in South Carolina, but appears to be restricted to several specific habitat types that are either subsets of the longleaf pine ecosystem or share some of the characteristics of this system, primarily the relatively open canopy and xeric conditions. Pine snakes are not abundant in any particular area of the state, even where they are found with some regularity. There are records of pine snakes from public lands including: the Savannah River Site in Aiken and Barnwell counties; Tillman Sandridge Heritage Preserve

in Jasper County; Francis Marion National Forest in Berkeley County; Sandhills National Wildlife Refuge in Chesterfield County; and Lewis Ocean Bay Heritage Preserve in Horry County.

The southern hognose snake has been documented from 15 counties in South Carolina. The species appears to be stable on the Savannah River Site (SRS), where 193 specimens have been captured since the 1950's (Tuberville et al. 1998). In the past 15 years, the species has only been documented in 40 counties across its entire southeastern range; this represents 31.7 percent of its historical extent (Tuberville et al. 1998). This species is both fossorial and cryptic, making survey efforts difficult. Outside of the SRS, there is no population data for this species, and collections are infrequent.

Occurrence Records for Primary Members of Longleaf Pine Reptile Guild



The eastern diamondback rattlesnake is primarily restricted to the lower terraces of South Carolina's coastal plain. This species was once believed to be common and widespread, but is now thought to be declining range-wide (Martin and Means 2000; Timmerman and Martin

2003). In South Carolina, the species is still relatively common on large tracts of land in the southern portion of its range; however, this species is uncommon to rare north of the Santee River. Currently, a mark-recapture study of this species is underway at SCDNR's Webb Wildlife Center in Hampton County. The goal of this study is to establish a statistically viable population estimate for the species at this protected site.

The coral snake is one of South Carolina's least known reptile species. This fossorial, secretive species appears to be colonial in distribution. Coral snakes are found with some regularity in a few areas of the state including the Savannah River Site, the Aiken Gopher Tortoise Heritage Preserve in Aiken County, and Lady's Island in Beaufort County. No population data exists for this species and its fossorial habits make it a very difficult species to survey.

Little or no data on the distribution or status of the slender glass lizard and the pine woods snake exists for South Carolina. These species are not necessarily rare, but they are not frequently encountered.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Members of this guild are closely associated with, but not necessarily endemic to, natural communities that are part of the Longleaf Pine Ecosystem. The pine snake, southern hognose snake and coral snake are typically associated with the more xeric longleaf communities and can be found in the same habitat types that support gopher tortoise populations. The eastern diamondback rattlesnake, mimic glass lizard and slender glass lizard are more commonly associated with the mesic longleaf communities, including longleaf pine flatwoods. All species show some overlap in their particular habitat preferences and can be found in habitats other than longleaf.

The eastern diamondback rattlesnake is also found in coastal maritime communities such as maritime grassland and maritime forests, in particular on barrier or estuarine islands. The coral snake has been found in maritime forests and mesic hardwood forests in the coastal plain. The pine snake has been found in dry, rocky areas of South Carolina's Appalachian Mountains; in particular, near the area of Keeowee-Toxaway State Park. In general, these other habitat types share some characteristics in common with the longleaf pine habitats, including sandy soils, xeric conditions, open canopies and underground refugial sites like stump holes and rock crevices.

All members of this guild spend some portion of their life using underground shelters, such as stump holes, rodent burrows, root channels or gopher tortoise burrows. The eastern diamondback rattlesnake is typically found underground during the colder months. This ambush predator can, however, be found on the surface during warmer seasons. The other species spend far greater amounts of time underground, coming to the surface for only short periods of time.

Longleaf pine habitats provide open canopies with abundant stump holes. These are created when pine trees are blown over by storms or killed by lightning. In the case of lightning killed trees, the root ball is typically burned out by periodic fire, creating underground chambers. In addition to stump holes, this habitat typically features friable, sandy-loam soils that are easily

excavated by rodents and other animals. Many reptiles take advantage of these burrows, exploiting the food resource by eating the occupants and then using their burrows for refuge.

Numerous amphibian and reptile species are closely associated with some form of longleaf pine habitat. Several species of conservation concern in South Carolina, other than the primary guild members, would benefit from conservation efforts directed at this habitat type, including species that have been covered either individually or under another guild type. The following species are highly likely to benefit from such conservation efforts: gopher tortoise, flatwoods salamander, gopher frog and tiger salamander.

In addition, numerous species whose status is not fully understood, or are relatively common would also benefit from longleaf pine habitat conservation. Examples of such species include the coachwhip (*Masticophis flagellum*), scarlet kingsnake (*Lampropeltis triangulum elapsoides*), barking treefrog (*Hyla gratiosa*) and Mabee's salamander (*Ambystoma mabeei*).

CHALLENGES

The primary challenge confronting members of this guild is habitat loss. Longleaf pine habitat has been greatly reduced both in extent and in quality subsequent to European settlement of the southeast (Noss 1989). Vast acreages of longleaf pine have been converted to agriculture and/or loblolly pine plantation in South Carolina. The loss, or degradation of longleaf pine habitat results in the loss of key components, such as stump holes and open canopy conditions required by the guild members.

Certain guild members, such as the eastern diamondback rattlesnake and pine snake, may be under pressure from collection for the pet trade and venom research. The degree of this threat is unknown but it is believed to be far less than that of habitat destruction.

The large snakes are particularly vulnerable to habitat fragmentation and an increasing road network. Some of the large snakes, particularly pine snakes, are long-lived animals with large home ranges. Maintaining viable populations becomes more difficult when mortality from automobiles further reduces the number of individuals in a population.

Introduction of the nonnative fire ant throughout the southeastern United States has been implicated as a potential reason for the apparent decline of the southern hognose snake (Tuberville and Jensen, in press). Fire ants may also be adversely affecting populations of other fossorial and egg-laying snakes.

Intensive or chronic soil disturbance may also pose a threat to fossorial snake species (Tuberville and Jensen, in press). Fire suppression, stump removal and short timber rotations may limit population numbers by reducing availability of nesting sites and large stump holes for refugia (Tuberville and Mason, in press).

Persecution and direct killing of snakes by humans affects these populations. Many of the large snakes are long-lived species. Loss of individuals through human persecution can reduce

population numbers because such losses can significantly affect the ability of these species to reproduce.

CONSERVATION ACCOMPLISHMENTS

Several members of this guild have been the focus of research and survey either conducted by SCDNR personnel or funded by SCDNR in the past decade. Surveys for the pine snake, southern hognose snake and mimic glass lizard have been ongoing at several SCDNR owned and managed preserves. The eastern diamondback rattlesnake has been the subject of a mark-recapture study and a radio-telemetry study at SCDNR's Webb Wildlife Center in Hampton County. The goal of this study is to produce a statistically accurate population estimate and understand the population dynamics, demography, activity patterns and habitat use of this species at the site. To date, this research has documented differences in the movement patterns and home range size between male and female rattlesnakes (unpublished data).

Documented occurrences of the eastern diamondback rattlesnake, southern hognose snake, coral snake and pine snake are known from several publicly owned and managed sites including the Sandhills National Wildlife Refuge in Chesterfield County, Francis Marion National Forest in Berkeley and Charleston Counties, the Savannah River Site in Aiken and Barnwell Counties, the Tillman Sandridge Heritage Preserve in Jasper County, and the Webb Wildlife Center in Hampton County.

CONSERVATION ACTIONS:

- Because the mimic glass and slender glass lizards are frequently mistaken by the public as a snake, these species should be included in general education materials to illustrate the importance of protecting reptiles and their habitats.
- Survey for populations of the mimic glass and slender glass lizards to determine the distribution of this species. Due to their secretive nature, inventory techniques for these glass lizards need to be developed.
- Protect existing pine snake habitat. Large areas with suitable habitat and minimal fragmentation by highways and other roads should be a priority for protection. Collaborate with partners that hold large tracts of such habitat to encourage protection of this species.
- Create a program that encourages the public to report sightings of pine snakes, southern hognose snakes and other members of the longleaf pine guild that will aid biologists in the identification of these animals and areas of suitable habitat.
- Determine the effects of long-term chronic automobile mortality on members of the longleaf pine reptile guild. Collaborate with the South Carolina Department of Transportation (SCDOT) to determine ways to reduce road mortalities of reptiles.
- Determine the effect of fire ants on pine snakes, southern hognose snakes and other fossorial egg-laying species.
- Evaluate and monitor pine snake population in isolated mountain habitats in the Blue Ridge
- Determine taxonomic and potential habitat differences between the northern pine snake and the Florida pine snake.

- Determine the root cause of the decline of southern hognose snakes and monitor all known populations.
- Investigate life history, ecology, habitat requirements and distribution patterns of the southern hognose snake.
- Determine the best method for conservation of this rapidly declining species, including the feasibility of captive breeding should such measures
- Encourage protection of eastern diamondback rattlesnakes on large tracts of public land and private plantations, such as the Webb Wildlife Management Area, Francis Marion National Forest, coastal barrier islands and the Oketee Club.
- Include the importance of protecting all venomous snakes and their habitat in general education materials.
- Encourage restoration of large tracts of longleaf pine and wiregrass ecosystem, managed on long rotations and with large stumps remaining after harvest for underground refugia and hibernation sites. Such restoration would benefit eastern diamondback rattlesnakes, coral snakes and other members of the longleaf pine reptile guild.
- Determine and monitor locations of viable populations of eastern diamondback rattlesnakes in South Carolina.
- Investigate eastern diamondback rattlesnake life history, particularly adult sex ratios, recruitment, mortality and population genetics.
- Conduct more intensive coral snake surveys on SRS, Aiken Gopher Tortoise Heritage Preserve, and, if possible, on the Lady's Island population of these snakes; monitor these populations.
- Develop effective inventory techniques for coral snakes.
- Determine whether the pine woods snake is adversely affected by intensive timber management programs, especially bedding and disking.
- Investigate population abundance, life history and habitat requirements of pine woods snake; monitor populations.

MEASURES SUCCESS

As results from current research and surveys or future efforts are identified and analyzed, projects will be initiated to address specific needs that arise from these results. One preliminary result from the rattlesnake study indicates that the eastern diamondback rattlesnake requires a large home range. Habitat protection projects for this species must take this into consideration. Data from surveys will be used to make decisions concerning habitat protection. Protected populations of these species, on managed preserves will be considered a measure of success.

LITERATURE CITED

Bartram, W. 1791. Travels through North and South Carolina, Georgia, East and West Florida, the Cherokee Country, M. Van Doren (ed.). Dover Publishing, Inc. New York, New York. 414 pp.

- Conant, R.C. and J.T. Collins. 1991. A Field Guide to Reptiles and Amphibians: Eastern and Central North America. Peterson Field Guide Series. Houghton Mifflin Co. Boston, Massachusetts. 450 pp.
- Frost, C.C., J. Walker and R.K. Peet. 1986. Fire-dependent savannas and prairies of the Southeast: Original extent, preservation status and management problems. Pp. 348-357. *In: Wilderness and natural areas in the eastern United States: a management challenge*, D.L. Kulhavy and R.N. Conner (eds). Center for Applied Studies, School of Forestry, Stephen F. Austin St. Univ. Nacogdoches, Texas. 416 pp.
- Gibbons, J.W. and K.A. Buhlmann. 2001. Chapter 28: Reptiles and Amphibians. Pp. 372-390. *In: Wildlife of Southern Forests*, J.G. Dickson (Ed.). Hancock House Publishers. Blaine, Washington. 480 pp.
- Guyer, C. and M.A. Bailey. 1993. Amphibians and reptiles of longleaf pine communities. Pp 139-158. *In: The Longleaf Pine Ecosystem: Ecology, Restoration, and Management*, S.M. Hermann (ed.). Proceedings of the Tall Timbers Fire Ecology Conference. Tallahassee, Florida.
- Martin, W.H. 2000. Distribution and habitat relationships of the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*). *Herpetological Natural History*. 7(1):9-34.
- Martof, B.S., W.M. Palmer, J.R. Bailey and J.R. Harrison III. 1980. Amphibians and Reptiles of the Carolinas and Virginia. University of North Carolina Press. Chapel Hill, North Carolina. 264 pp.
- Noss, R.F. 1989. Longleaf pine and wiregrass: keystone components of an endangered ecosystem. *Natural Areas Journal*. 9(4):211-213.
- Palmer, W.A. and A.L. Braswell. 1995. Reptiles of North Carolina. The University of North Carolina Press. Chapel Hill, North Carolina. 412 pp.
- Timmerman, W.W. and W.H. Martin. 2003. Conservation guide to the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*), John Moriarity, editor. Society for the Study of Amphibians and Reptiles Circular No. 32. 55 pp.
- Tuberville, T.D., J.R. Bodie, J.B. Jensen, L. LaClaire and J.W. Gibbons. 2000. Apparent decline of the Southern Hognose Snake (*Heterodon simus*). *The Journal of the Elisha Mitchell Scientific Society*. 116(1):19-40.
- Tuberville, T.D. and J. Jensen. In press. *Heterodon simus*. Reptiles and Amphibians of Georgia.
- Tuberville, T.D. and P. Mason. In press. *Pituophis melanoleucus*. Reptiles and Amphibians of Georgia.