

Longleaf Pine Reptile Guild

Primary Species:

Mimic Glass Lizard (*Ophisaurus mimicus*)

Florida Pine Snake (*Pituophis melanoleucus melanoleucus*)

Northern Pine Snake (*Pituophis melanoleucus mugitus*)

Southern Hognose Snake (*Heterodon simus*)

Eastern Diamondback Rattlesnake (*Crotalus adamanteus*)

Coral snake (Harlequin) (*Micrurus fulvius*)

Secondary Species:

Slender Glass Lizard (*Ophisaurus attenuatus*)

Pine Woods Snake (*Rhadinea flavilata*)

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DESCRIPTION

This guild comprises 5 primary species and 2 secondary species. Five of the species are snakes and 2 are lizards, and 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 the Longleaf Pine Reptile 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 10% 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 in.). 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 any limbs and are also known as legless lizards. (Conant and Collins, 1991; Martof et al. 1980)

There are two subspecies of the pine snake, the Northern pine snake (*P. m. melanoleucus*) and the Florida pine snake (*P. m. mugitus*) found in South Carolina. The Florida pine snake is generally restricted to the southwestern-most counties of our state, primarily Jasper, Beaufort, Allendale and Hampton. 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. 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 (11 in.). This species can be variable in pattern. 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, and occasionally individuals occur that have red (erythristic) blotches or background colors (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. This species averages 36 to 51 cm (14-20 in.) in length. The Southern hognose Snake is typically a tan-brown snake 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 (96 in.). Most adult specimens, in South Carolina, are typically smaller than this, averaging approximately 84 to 183 cm (33-72 in.). The Eastern diamondback is a large-bodied snake, typical of pit vipers, 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).



The coral snake is the only member of the Family Elapidae (cobras and relatives) found in South Carolina. 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, the scarlet kingsnake and the scarlet snake, which are similarly patterned. 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 in.); however most specimens are typically in the range of 51-76 cm (20-30 in.), (Conant and Collins 1991; Martof et al. 1980).

The slender glass lizard is a moderately large lizard that can reach lengths from 56 to 106 cm (22-42 in.) (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, and the use of a good dichotomous key is typically required for accurate identification.

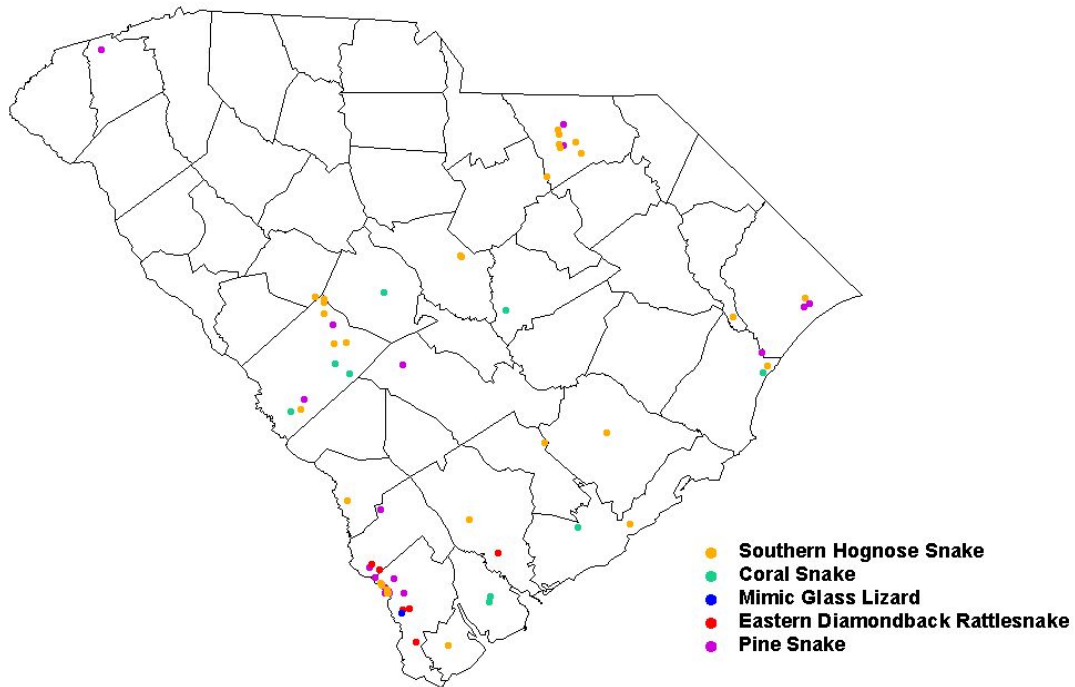
The pine woods snake is a small, secretive species that rarely exceeds 33 cm (13 in.) in length. This species varies from golden brown

to light reddish-brown, becoming paler along the sides. There is a dark line through the eye, and the lip scales are white to yellowish in color (Conant and Collins 1991).

Status

The 5 primary members of this guild are listed as Species of Concern in South Carolina. A proposal to list the Southern hognose snake as a Species in Need of Management (State Threatened) has been submitted to 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 (SNR/G3), northern pine snake (S3/S4,G4), Florida pine snake (S2/G4), Southern hognose (SNR/G2), Eastern diamondback rattlesnake (S3/G4), coral snake (S2/G5), slender glass lizard (S4/G5), and pine woods snake (SNR/G4). [NatureServe 2013]

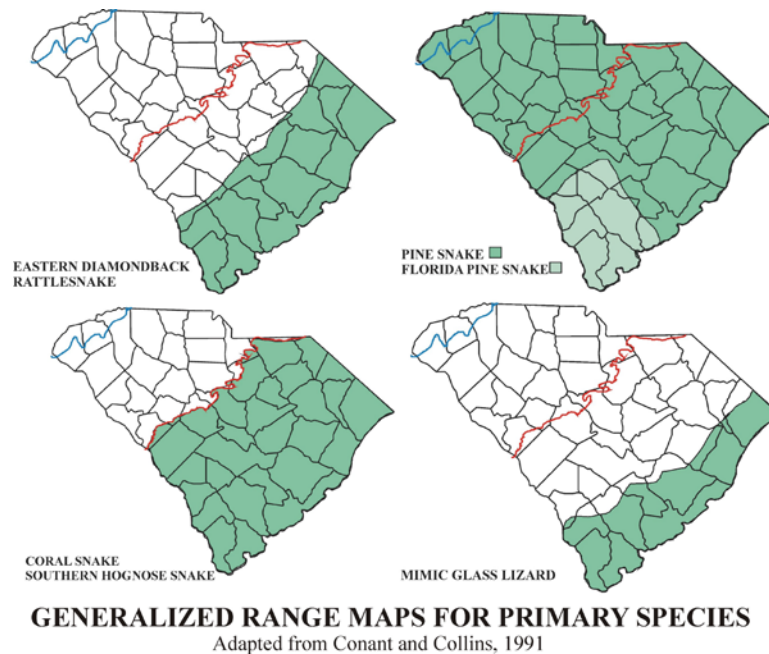
Occurrence Records for Primary Members of Longleaf Pine Reptile Guild



POPULATION SIZE AND DISTRIBUTION

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.



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). Within the past 15 year, the species has only been documented in 40 counties across its entire Southeastern range (31.7% 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.

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 north of the Santee River, this species is uncommon to rare. 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, and 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 (e.g. 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 the active (warmer) season. 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 threat 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 plantations in South Carolina. The loss, or degradation of longleaf pine habitat results in the loss of key components, such as stumpholes and open canopy conditions, required by the guild members.

Certain guild members, such as the Eastern diamondback rattlesnake and pine snake, may be under some pressure from take/collection for the pet trade and from 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 additive mortality from automobiles is factored into the equation.

The introduction of fire ants throughout the Southeastern United States has been implicated as a potential reason for the apparent decline of the Southern hognose snake (Tuberville and Jensen 2008). Fire ants may also be having unknown/unseen population effects on other fossorial and egg-laying snakes.

Intensive or chronic soil disturbance may also pose a threat to fossorial snake species (Tuberville and Jensen 2008). 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 2008).

Persecution and direct killing of snakes by humans affects these populations. Many of the large snakes are long-lived species whose life histories are not suitable for either harvest or additive mortality, such as occurs from human persecution.

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.

The results of a long-term State Wildlife Grant funded research project involving the Eastern diamondback rattlesnake were detailed in a project completion report submitted to USFWS in 2011. SCDNR and partners are contributing to a range-wide conservation plan for the Eastern diamondback rattlesnake which is being coordinated by Project Orrienne, a private, nonprofit organization dedicated to the conservation of the Eastern indigo snake and other reptiles that inhabit the longleaf pine ecosystem of the Southeastern US.

CONSERVATION RECOMMENDATIONS

SCDNR, along with partners from several academic institutions and conservation organizations, has been conducting research and surveys on members of this guild, in particular the Eastern diamondback rattlesnake, in the Coastal Plain of South Carolina since 1996. The most recent research has been supported by State Wildlife Grant funds and is documented in a project completion report submitted to USFWS in December 2011.

MEASURES OF 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.

LITERATURE CITED

- Bartram, W. 1791. Travels through North and South Carolina, Georgia, East and West Florida, the Cherokee Country. Mark Van Doren (ed.). Dover Publ., Inc. New York, NY. 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 D.L. Kulhavy and R.N. Conner (eds). Wilderness and natural areas in the eastern United States: a management challenge. Center for Applied Studies, School of Forestry, Stephen F. Austin St. Univ., Nacogdoches, TX. 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, WA. 480 p.
- Guyer, C., and M.A. Bailey. 1993. Amphibians and reptiles of longleaf pine communities. Pages 139-158 in, S.M. Hermann (ed.), The Longleaf Pine Ecosystem: Ecology, Restoration, and Management. Proceedings of the Tall Timbers Fire Ecology Conference. Tall Timbers, Tallahassee, FL.
- Martin, W.H. 2000. Distribution and habitat relationships of the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*). Herpetological Natural History, 7(1) p9-34. La Sierra University.
- 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. 264 pp.
- NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, VA. (On-line) Accessed Feb. 21, 2013 at <http://www.natureserve.org/explorer>.
- 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, N.C. 412 pp.

Timmerman, W. W. and W. H. Martin. 2003. Conservation guide to the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*). Society for the Study of Amphibians and Reptiles Circular No. 32. John Moriarity, Ed. 55 pp.

Tuberville, T. D., J. R. Bodie, J. B. Jensen, L. LaClaire, 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. B. Jensen. 2008. Southern Hognose Snake, *Heterodon simus*. In J. Jensen, C. D. Camp, J. W. Gibbons, and M. Elliot (eds.). *The Reptiles and Amphibians of Georgia*. University of Georgia Press, Athens, GA.

Tuberville, T.D. and P. Mason. 2008. Northern Pine Snake. *Pituophis melanoleucus*. In J. Jensen, C. D. Camp, J. W. Gibbons, and M. Elliot (eds.). *The Reptiles and Amphibians of Georgia*. University of Georgia Press, Athens, GA.