The Reptiles and Amphibians of the Savannah River Plant

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INTRODUCTION

The objective of this report is to provide taxonomic, distributional, and ecological information on the reptiles and amphibians of the Savannah River Plant (SRP), located on the Atlantic coastal plain, south of Aiken, South Carolina. The purpose of such a presentation is to give a professional biologist an initial familiarity with herpetology on the SRP. The foundation of herpetological information is based on general and regional publications and on extensive research by local or visiting investigators. Much of the site-specific research has been published in the open scientific literature or written up as theses, dissertations, or reports. Our report attempts to consolidate the findings from all of these efforts in order to present, as cohesively as possible, our present understanding of the ecology of local species of reptiles and amphibians. The intent is to provide sufficient comprehensive information to an ecologist, regardless of his experience in herpetology, to permit him to undertake studies that in some manner incorporate the herpetofauna of the SRP.

An account of the state herpetofauna of South Carolina has not been published. A thorough consideration of South Carolina amphibians will be given by Harrison (in preparation), but no presentation of the reptiles of South Carolina has been undertaken. Checklists of coastal species have been presented (Gibbons, in press; Harrison, in press). General herpetofaunal accounts applicable to South Carolina have been published in accounts of all eastern reptiles and amphibians (Conant, 1975; Cochran and Goin, 1970), specific accounts of U.S. turtles (Carr, 1952; Ernst and Barbour, 1972), snakes (Schmidt and Davis, 1941; Wright and Wright, 1957), lizards (Smith, 1946), alligators (Neill, 1971), salamanders (Bishop, 1947), and frogs and toads (Wright and Wright, 1949). The most pertinent regional work is Mount's (1975) Reptiles and Amphibians of Alabama. Martof's (1956) Amphibians and Reptiles of Georgia, a Guide is outdated in many respects and is of limited value. The most thorough account of the status of SRP herpetology is presented by Gibbons, et al. (in press).

HABITATS

Regional Aspects

The SRP is located in the westcentral portion of South Carolina and encompasses portions of Aiken, Barnwell and Allendale counties (Map 1). The site's southwest boundary is the Savannah River, a typical large southern river with extensive flood plains and oxbows. The northern boundary is 20-30 miles (32-48 km) south of the Fall Line, and its biological influence is evident in some species on the SRP. Throughout a major portion of the Southeast the Fall Line represents the transitional zone between montane or piedmont and coastal plain environments. It also forms a range boundary for numerous species found on the SRP and is a zone of intergradation for many others. The entire SRP site lies within the Atlantic coastal plain geologic province. Two physiographic subregions are included within the site boundaries: the Aiken Plateau (82-122 m elev.) and the Pleistocene Coastal Terraces (30-82 m elev.) (Map 2).

The SRP acreage is comprised of five major soil types: Vaucluse and Blarney soils, Dothan and Norfolk soils, Fuguay and Wagram soils, Troup sand, and Gunter sand. All are composed of sand overlying sandy clay loam.

The summer climate of South Carolina is generally warm and wet. The winters are normally mild. Normal January temperatures for the upper coastal plain region, including the SRP, are lows of 38-42 F (3-6 C) and highs of 58-62 F (14-17 C). Normal July temperatures are lows of 70-74 F (21-23 C) and highs of 92-96 F (33-36 C). Normal yearly precipitation is 36-44 in (91-112 cm). Snow is uncommon.

Local Aspects

The SRP has an area of approximately 300 sq mi (780 sq km). A major portion of the tract is protected from public intrusion and has the typical array of habitats characterizing non-urban, non-agrarian portions of the upper coastal plain of South Carolina.

Predominant aquatic habitats include the Savannah River and five tributary streams, a 3000 acre (1200 ha) reservoir system, numerous Carolina bays, several
abandoned farm ponds and minor impoundments. The cypress-gum and lowland hardwood swamps bordering the river and its tributaries comprise 10-15% of the site. Pine plantations and natural pine stands make up about 40% of the present area. Several upland hardwood stands are scattered throughout the SRP but constitute less than 2% of the site. The remainder of the SRP is composed of mixed hardwood and pine, abandoned old-fields, industrial complexes, and an extensive highway system (Map 3).

The SRP was acquired from public lands in 1951 by the U.S. Government. At the time of acquisition, 30-40% of the area was farmed (primarily cotton and corn) and the remainder was mostly second-growth pine or hardwood forests. During the 25 years since establishment of the site, the most extensive environmental impact has resulted from U.S. Forest Service programs. Most of the abandoned farmland has been planted in pine or is undergoing natural succession toward turkey oak-longleaf pine associations, an edaphic climax community in this region.

Extensive draining has not been done on the site and most lowland areas have remained undisturbed for a quarter of a century. Major aquatic alterations have resulted from thermal releases into three of the five tributary streams and from construction of the Par Pond reservoir system (Gibbons and Sharitz, 1974). Selected habitats deserve specific mention because of their uniqueness to the site or region and their importance to the herpetofauna.

Carolina Bays—These unique aquatic environments, confined to a band across the piedmont and coastal plain region of Georgia and the Carolinas, are the primary lentic habitats occurring naturally on the SRP. More than a score are present on the site. The geologic origin of Carolina bays is unknown but all are characteristically egg-shaped, oriented in a northwest-southeast direction and have highly fluctuating water levels. These habitats are extremely productive from a herpetofaunal standpoint and have been the focal point of many SRP studies.

Thermally Altered Areas—The five plutonium-production reactors on the SRP have created a variety of unusual aquatic thermal situations. A major influence of the reactor effluents on streams and ponds has been the increase in productivity in those and contiguous areas. Two of the reactors were placed on standby several years ago and are not operating. The resulting termination of heated effluent to some aquatic areas has created lentic and lotic post-thermal habitats. Influences of both thermal and post-thermal environments on the biology of reptiles and amphibians have been studied.

Par Pond Reservoir System—An extensive reservoir environment was created by damming three stream systems, resulting in more than 3000 acres (1200 ha) of open water. Some reptile (e.g. alligator) and amphibian (e.g. lesser siren) species apparently occur in higher population densities in this system than in other habitats on the SRP.

Upper Three Runs Creek—Pristine blackwater streams were once characteristic of the coastal plain of South Carolina. Today most such streams carry industrial, domestic, or agricultural pollutants. Upper Three Runs Creek has most of its headwaters on the site and is essentially unaffected by agricultural runoff and industrial or domestic sewage inputs. This major tributary to the Savannah River originates in upland hardwood habitats on the SRP and traverses about 20 miles (32 km) of mostly undisturbed terrestrial habitat including a mile (1.6 km) or more of cypress-gum swamp adjacent to the river. This habitat has received little study from a herpetological standpoint (with a few exceptions) but aquatic and semi-aquatic reptile and amphibian species undoubtedly constitute a major animal component of the stream community.

Farm Ponds—One- to three-acre (2.5 to 7.4 ha) holding ponds are characteristic of the region for use as stocked, warm-water fishing lakes. A dozen such habitats exist on the SRP as holdovers from public ownership and are focal points for many aquatic and semi-aquatic species. Several SRP studies have concentrated on such sites.

Abandoned Old-Fields—Several hundred acres of previous crop fields have not been disturbed since the development of the site and have thus undergone 25 years of secondary succession. A few species, mostly reptiles, are characteristically associated with such successional habitats.

Pine Management Areas—A major program of pine planting and harvesting has resulted in a complex array of pine and open habitats. These range from several acre clear-cut areas to mature pine plantations with limited undergrowth. Herpetofaunal studies in these areas have been minimal and the species composition and abundance of reptiles and amphibians is poorly known.

Natural Habitats—With the exception of Carolina bays, the natural aquatic and terrestrial habitats on the SRP are characteristic of the coastal plain. No extensive virgin forest is present on the site. All natural areas are presumably second-growth pine or hardwood.
COLLECTING METHODS

Most of the reptiles and amphibians of the SRP have been collected with the use of three techniques: terrestrial drift fences, aquatic traps, and road collecting. Specialized techniques have been used on a number of occasions for specific purposes or particular species, but these three techniques have yielded the majority of specimens.

The terrestrial drift fence and pit fall trap method has been described in the literature (Gibbons and Bennett, 1974; Gibbons, 1970) and used extensively at certain locations on the SRP. Sites where terrestrial drift fencing has been used for periods of two or more years are Pond C, Risher Pond, Ellenton Bay, the SREL food field and Karen's Pond.

Aquatic trapping has predominated as the major source of aquatic specimens because of intensive efforts to obtain information on turtle populations. Numerous other aquatic species besides turtles were incidentally trapped during these studies.

Road collecting has been a particularly rich source of specimens, both reptiles and amphibians, and has yielded representatives of almost every species known from the SRP. Two primary reasons for the success of this technique are the numerous blacktop highways passing through relatively undisturbed habitats and the limited traffic flow during all times of the year and throughout the day. Many other techniques have been used to collect reptiles and amphibians on the Savannah River Plant but each does not deserve detailed description or discussion. Local conditions and needs will necessarily dictate what the most appropriate approach is and can be selected by the investigator at the time of study.

Map 1. The State of South Carolina showing the location of the Savannah River Plant in Aiken, Barnwell and Allendale counties (33° 00' 00" N - 33° 25' 00" N, 81° 25' 00" W - 81° 47' 30" W).

Map 2. The state of South Carolina divided into physiographic regions. The location of the Fall Line is indicated.
Map 3. The Savannah River Plant with major collecting sites identified.
A CHECKLIST OF THE AMPHIBIANS
AND REPTILES OF THE SRP

Several species whose SRP status is unknown or which are otherwise unusual are noted in subsequent tables and are not included in this list. Species whose presence on the SRP has been reported but not recently confirmed or species with which taxonomic problems are associated are indicated by an asterisk (*).

CLASS AMPHIBIA

Order Caudata—Salamanders

Family: Proteidae
Necturus punctatus
dwarf waterdog

Family: Ambystomatidae
Ambystoma opacum
*A. maculatum
A. t. tigrinum

Family: Salamandridae
Notophthalmus v. viridescens
red-spotted newt

Family: Plethodontidae
*Desmognathus f. fuscus
northern dusky salamander

*D. auriculatus
southern dusky salamander

Plethodon g. glutinosus
slimy salamander

*Pseudotriton m. montanus
eastern mud salamander

*P. ruber vioscai
southern red salamander

Eurycea bistlineata cirrjera
southern two-lined salamander

E. longicauda guttigseineta
three-lined salamander

E. quadrigradigita
dwarf salamander

Family: Microhylidae
Gastrophryne carolinensis
eastern narrow-mouthed toad

Family: Ranidae
*Rana catesbeiana
bully frog

R. virgatipes
carpenter frog

R. c. clamitans
bronze frog

R. utricula (= sphenoecephala)
southern leopard frog

R. palustris
pickerel frog

R. aroleata capito
Carolina gopher frog

*R. grylio
pig frog

Class Reptilia

Order Crocodilia—Crocodilians

Family: Alligatoridae
Alligator mississippiensis
American alligator

Order Chelonia—Turtles

Family: Chelydridae
Chelydra s. serpentina
common snapping turtle

Family: Kinosternidae
Stemotherus odoratus
stinkpot

Kinosternon s. subrubrum
eastern mud turtle

*C. bauri palmarum
striped mud turtle

Family: Emydidae
Clammys guttata
spotted turtle

Terrapene c. carolina
eastern box turtle

Chrysemys s. scripta
yellow-bellied turtle

*C. c. concinna
river cooter

*C. f. floridana
Florida cooter

Deirochelys r. reticularia
eastern chicken turtle

Family: Trionychidae
Trionyx spiniferus asperus
Gulf Coast spiny softshell

Order Squamata—Snakes and lizards

Suborder Lacertilia—Lizards

Family: Iguanidae
Anolis c. carolinensis
green anole

Sceloporus u. undulatus
southern fence lizard

Family: Teiidae
Cnemidophorus s. sextineatus
six-lined racerunner

Family: Scincidae
Leiocephala laterale
ground skink

*Eumeces fasciatus
five-lined skink

E. talceps
broad-headed skink

E. ineptus
southeastern five-lined skink

Family: Anguidae
Ophisaurus ventralis
eastern glass lizard

O. attenuatus longicudus
slender glass lizard
1. No hind limbs; 2 forelimbs only; external gills present ........................................2
Class Amphibia ..................................................2

2. Tail absent ..................................................4
Order Anura (frogs; toads) ........................................4
Tail present ..................................................3

3. Body elongate; forelimbs present; aquatic or terrestrial .......................................3
Order Caudata (salamanders) ....................................3
Body globular; limbless or only hind limbs visible; strictly aquatic ................................5
IJarval Anura (tadpoles) ........................................5

4. With bony or leathery shell ..................................5
Order Chelonia (turtles) ...........................................5
Without a bony or leathery shell ................................5

5. Cloacal opening a longitudinal slit; limbs present ..............................................5
Order Crocoddilia (alligators) ....................................5
Cloacal opening a transverse slit; limbs present or absent ....................................6
Order Squamata (snakes and lizards) ................................6

6. No eyelids or external ear opening; limbs absent ................................................6
Suborder Serpentes (snakes) .......................................6
Eyelids and external ear openings present; limbs present or absent ..............................6
Suborder Lacertilia (lizards) .......................................6

KEY TO THE SALAMANDERS OF THE SRP*

1. Scales absent; skin smooth in most species; if limbs present no claws .................2
Class Amphibia ..................................................2

2. Tail absent ..................................................4
Order Anura (frogs; toads) ........................................4
Tail present ..................................................3

3. Body elongate; forelimbs present; aquatic or terrestrial .......................................3
Order Caudata (salamanders) ....................................3
Body globular; limbless or only hind limbs visible; strictly aquatic ................................5
IJarval Anura (tadpoles) ........................................5

4. With bony or leathery shell ..................................5
Order Chelonia (turtles) ...........................................5
Without a bony or leathery shell ................................5

5. Cloacal opening a longitudinal slit; limbs present ..............................................5
Order Crocoddilia (alligators) ....................................5
Cloacal opening a transverse slit; limbs present or absent ....................................6
Order Squamata (snakes and lizards) ................................6

6. No eyelids or external ear opening; limbs absent ................................................6
Suborder Serpentes (snakes) .......................................6
Eyelids and external ear openings present; limbs present or absent ..............................6
Suborder Lacertilia (lizards) .......................................6

Family: Colubridae
- Natrix cycligopion floridana Florida green water snake
- N. taxispilota brown water snake
- N. e. erythrogaster red-bellied water snake
- N. fasciata banded water snake

and/or
- N. sipedon pleuralis midland water snake
- N. r. rigida eastern glossy water snake
- Seminatrix pygaea paludis Carolina swamp snake
- Storeria d. dekayi northern brown snake
- S. o. occipitomaculata red-bellied snake
- Thamnophis s. sirtalis eastern garter snake
- T. s. sirtalis eastern ribbon snake
- Virginia v. valeriae eastern earth snake
- Heterodon platyrhinos eastern hognose snake
- H. simus southern hognose snake
- Diadophis p. punctatus southern ringnose snake
- Farancia a. abacura eastern mud snake
- F. e. erythrogramma rainbow snake
- Coluber constrictor priapus southern black racer
- Masticophis f. flagellum eastern coachwhip
- Opheodrys aestivus rough green snake
- Elaphe g. guttata corn snake
- E. o. obsoleta black rat snake
- Pituophis m. melanoleucus northern pine snake
- Lampropeltis g. getulus eastern kingsnake
- L. triangulum elapsoideis scarlet kingsnake
- Cemophora coccinea copelandi southern scarlet snake
- Tantilla coronata southeastern crowned snake

Family: Elapidae
- Micrurus f. fulvius eastern coral snake

Family: Viperidae (= Crotalidae)
- Agkistrodon c. contortrix southern copperhead
- A. p. piscivorus eastern cottonmouth
- Sistrurus m. miliarius Carolina pygmy rattlesnake
- Crotalus horridus canebrake rattlesnake
- atricaudatus

KEY TO THE ORDERS OF REPTILES AND AMPHIBIANS OF THE SRP

1. Scales absent; skin smooth in most species; if limbs present no claws .................2
Class Amphibia ..................................................2

2. 31-34 costal grooves (Fig 1); total length seldom reaching 20 cm; solid color ...... Siren intermedia (lesser siren)
39-39 costal grooves; total length often above 20 cm; yellow flecks on back and sides... Siren lacertina (greater siren)

3. Nasolabial groove present (Fig 1) ..............................................4
Nasolabial groove absent ..................................................4

4. Four toes on hind foot; dark dorsolateral stripes; often a middorsal row of small dark spots; 14-17 costal grooves; seldom reaching 5 cm in total length ... Eurycea quadridigitata (dwarf salamander)
Five toes on hind foot ..................................................5

5. Body red or reddish brown .....................................6
Body yellow, brown or black ........................................6
6. Body bright red with distinct black spots  
   ...Pseudotriton m. montanus (eastern mud salamander)*
   Body reddish with muted dark spots; body and head with white flecks  
   ...Pseudotriton ruber vinosus (southern red salamander)*
7. White line behind eyes  
   ...Desmodonatus l. fuscus (northern dusky salamander)* or  
   ...D. aquaticus (southern dusky salamander)*
   No white line behind eye  
8. Body black, flecked with silver, white or brass; ventral plain slate colored with chin and throat dark  
   ...Plethodon g. glutinosus (slimy salamander)
9. Body light with dark markings  
   Eurycea longicauda guttolineata (three-lined salamander)
   Two dark lines bordering light middorsal stripe often continuing  
   to tip of tail; row of light circular spots along side; yellow venter;  
   tail less than ½ total length  
   ...E. bislineata ciriugera (southern two-lined salamander)
10. Body eel-like; legs appear too small for body; 2 toes on each foot; gill openings behind head  
    Amphiuma means (two-toed amphiuma)  
    Body not eel-like; legs proportional to body; 4-5 toes on each foot  
11. Gills absent  
   ...Ambystoma maculatum (spotted salamander)  
   No spots on dorsum  
12. Aquatic; skin rough; costal grooves indistinct; olive-green to olive-brown dorsum with black-bordered red spots; yellow venter with black spots  
    ...Notophthalmus v. viridescens (red-spotted newt)*
    Terrestrial; skin rough; dorsum bright orange to dull red with  
    black-bordered red spots . . N. v. viridescens (red eft stage)  
    Skin smooth  
13. Dorsum dark; yellow and/or orange spots arranged in 2 irregular rows down back; costal grooves 12  
    ...Ambystoma tigrinum (tiger salamander)  
    Dorsum dark with light or white markings  
14. Dorsum dark with yellow or yellowish-brown irregular splotches or bands; belly with olive-yellow and dark markings  
    ...Ambystoma tigrinum (tiger salamander)  
    Dorsum dark with light or white markings  
15. Body dark with distinct white or silvery crossbands; costal grooves 11-12  
    ...Ambystoma opacum (marbled salamander)  
    Body black, brown or gray with pale bluish flecks; costal grooves 10-11  
    ...Ambystoma talpoideum (mole salamander)
16. Four toes on hind foot; no nasolabial groove; dorsum dark with pale speckling  
    Necturus punctatus (dwarf waterdog)  
    Five toes on hind foot or four toes on hind foot and nasolabial groove present  
    ...a larval salamander of any of several species  
   3. Adults never more than 4 cm SVL; background color gray with  
      clearly defined, white median stripe down back  
      ...Bufo bufo (oak toad)  
      Adults reddish, light brown, or dark brown  
      ...Bufo americanus (eastern narrow-mouthed toad)
4. Parietal cranial crests ends in a conspicuous knob; dorsal spots  
    usually have 1-3 warts  
    ...Bufo americanus (eastern narrow-mouthed toad)  
    Parietal cranial crest present but not with a pronounced knob;  
    dorsal spots often with more than 3 warts  
    ...Bufo woodhousii (Fowler's toad)*
5. Tymanum absent; head pointed with transverse fold behind eyes; no toe webbing; color gray or brownish; size never exceeding 30 mm  
   ...Gastrophryne carolinensis (eastern narrow-mouthed toad)  
   Tymanum present; no transverse fold head; at least partial  
   webbing between some toes  
6. Hind foot with minimal webbing; tips of toes expanded into small  
    disks in most species; size seldom > 60 mm SVL . . .  
    Hind foot with extensive webbing; adult size usually > 50 mm  
   ...Rana pipiens (northern spring toad)  
   Adult size > 20 mm SVL  
7. Adult size < 17 mm SVL; dark stripe through eye  
   ...Limenaeus calcarius (little grass frog)  
   Adult size > 20 mm SVL  
8. Dark stripe on rear of thigh; dark triangle usually present  
    between eyes . . .  
   ...Pseudacris regilla (red-striped tree frog)  
   No dark stripe on rear of thigh . . .  
9. Dark stripe distinct  
    ...Acris gryllus (southern cricket frog)  
    Dark stripe with ragged edges  
   ...Acris crepitans (northern cricket frog)  
10. Tips of toes expanded only slightly, less than one-half diameter  
    of tympanum  
   ...Bufo americanus (eastern narrow-mouthed toad)  
   Tips of toes larger than one-half diameter of tympanum  
   ...Bufo americanus (eastern narrow-mouthed toad)  
11. Very distinct, unbroken black stripe from snout, through eye, to  
    base of thigh; underside yellow, usually with dark spots  
    ...Pseudacris nigriventris (Blimley's chorus frog)  
    Not as above  
12. Light bordered dark spots or blotches on sides  
    ...Pseudacris regilla (red-striped tree frog)  
    No blotches on sides  
13. Dark triangle between eyes  
    ...Pseudacris regilla (red-striped tree frog)  
    No dark triangle between eyes  
   ...Pseudacris nigriventris (Blimley's chorus frog)  
14. A dark x-shaped figure across back; size < 35 mm SVL  
    ...Hyla chrysoscelis (gray treefrog)  
    No x-shaped figure on back  
15. Rear of thigh with light-colored green, yellow or orange  
    spots  
    ...Hyla chrysoscelis (gray treefrog)  
    Rear of thigh without conspicuous colored markings  
16. Rear of thigh greenish; light-colored spot below each eye  
    ...Hyla chrysoscelis (gray treefrog)  
    No spot below eye; back smooth; distinct yellow-gold spots on  
    rear of thigh  
   ...Hyla c. chrysoscelis (pine woods treefrog)  
18. Body bright, solid green with no large spots although bright  
    yellow flecks may be present; distinct yellowish stripe along  
    sides  
   ...Hyla chrysoscelis (gray treefrog)  
    No distinct, clearly defined stripe along sides  
19. Markings along side absent or inconspicuous; size always <  
    45 mm  
    ...Hyla chrysoscelis (gray treefrog)  
    Markings along side present or inconspicuous; size always >  
    50 mm  
   ...Hyla gratiosa (barking treefrog)
20. Dorsolateral ridges present; distinct spots may be present on back ........................................ 21
21. Dorsolateral ridges absent; spots inconspicuous or absent .......................................................... 24
22. Square spots in 2 parallel rows down back; orange or yellow markings in groin area ........... 23
23. Snout pointed; belly usually light in color ..................................................................................... 23
24. Four distinct longitudinal lines down back .................................................................................. 24
25. Web on hind feet extending to tip of the 4th (longest) toe; snout pointed ........................................ 25
26. Tail musculature of tail musculature of plumage ................................................................. 26
27. Papillary border extends to lateral tips of P-2, although a single papilla may occur at each end of P-3; P-1 with a median gap; P-3 short; tail musculature bicolored and often with dorsal light saddles ........................................ Bufo quercicus (oak toad)
If not B. quercicus continue to couplet 6
6. Upper and lower fins equal to musculature height; dorsal fin open higher than ventral; dorsum dark brown to black, with a light oblique mark behind each eye in life ........................................ Bufo terrestris (southern toad)
6. Upper and lower fins lower than musculature height; fins subequal in height; dorsum dark commonly with light mottlings in life; snout rounded in lateral view; eyes large; tail length/tail height 2.8 or more; musculature often not distinctly bicolored; tail height/musculature height 2.0 or more .................................. Bufo woodhousei (Fowler's toad)
7. Two rows of labial teeth on posterior labium .............................................................................. 8
8. Three labial teeth on posterior labium ......................................................................................... 12
9. A-2 gap wide; spiracular tube at least partially free from body wall; tail tip often black; dorsum of tail musculature frequently banded; body slightly depressed; eyes dorso-lateral; nostrils large; fins without bold markings ......................................................... Acris gryllus (southern cricket frog)
Free section of spiracular tube short, one-half or less of the length of the tube; throat light; tail musculature motiled or reticulated ........................................ Acris crepitans (northern cricket frog)
10. Tail musculature striped in lateral view; light stripe extends forward to eye from dorsal musculature stripe; throat and chest motiled; dorsum of tail musculature often banded; small size Limnaeodius ocularis (part) (little grass frog)
Tail musculature not striped in lateral view; light stripes from tail to eye absent; throat and chest light; dorsum of tail not banded; larger size ........................................ 11
11. Tail musculature unicolored or bicolored; one row of marginal papillae; fins clear with some stellate melanophores; A-2 subequal to A-1 Pseudacris triseriata (part) (upland chorus frog)
Tail musculature motiled; two rows of marginal papillae; fins clear with or without large black blotches, if present, a clear area near musculature; A-2 longer than A-1 Hyla crucifer (part) (spring peeper)

KEY TO THE TADPOLES OF THE SRP*

1. Jaws without keratinized sheaths; oral disc and labial teeth absent (Fig 2); dorsum dark brown to black; tail stripe usually distinct; underside of labial flap without excrescences; total length/body length 2.1 or more (Fig 3); light ventral markings generally large ... Gastrophyne carolinensis (eastern narrow-mouthed toad)
Jaws with keratinized sheaths; oral disc and labial teeth present ................................................... 2
2. Vent medial; eyes dorsal (Fig 4) .................................................................................................... 3
3. Vent dorsal; eyes dorsal or lateral .................................................................................................. 4
4. Papillary border with a wide dorsal gap about equal to A-1 and a ventral gap equal to or larger than P-3; oral disc emarginate; labial tooth row formula 1-2(2)/3(1), (Fig 2) ........................................... 4
Papillary border without a ventral gap, dorsal gap present or not; oral disc not emarginate; body somewhat depressed, typically wider posteriorly than anteriorly; to 35 mm total length; dorsum usually dark brown to black; jaws narrow; labial tooth row formula 4-6 (2-6)/3-6(3-1); spiracle equidistant between eye and vent; interspace distance/internarial distance 1.8 or less; tail height/musculature height 2.5 or less; last posterior tooth row longer than upper jaw and ≤ 50 or more times next anterior row; A-2 normally with a median gap ... Scaphiopus holbrooki (eastern spadefoot toad)
4. Eyes lateral or dorsal; oral disc not emarginate; papillary border commonly reaches considerable distance above lateral tips of A-1; labial tooth row formula 2(2)/2-4(1) ................................................................ 7
Eyes dorsal; oral disc emarginate; papillary border does not or barely reaches above lateral tips of A-1; labial tooth row formula 1-7 (2-7)/2-6(1); commonly 2-3/3-4; labial tooth row formula rarely 2/2; papillary border without a posterior gap; marginal papillae common ..................................................... 27

*Adapted from: R. Altig, 1970. A key to the tadpoles of the continental United States and Canada, Herpetologica 26:180-207, with permission of the author.

Fig. 2 Body size measurements of tadpole. BL = body length. TL = total length. SP = spiracle opening. TH = tail height. MH = musculature height.
1. Tail musculature not striped. Fin with red or without. Jaws wide; upper jaw angulate; dorsal fin high: terminating to about midlength. Tail musculature often banded to 25 mm tail length: ventral musculature not banded.

2. Tail height/body height ratio: 1.5 or less; dorsal fin_pattern: straight or indistinct. Tail musculature striped in ventral view: reddish in life.

3. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

4. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

5. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

6. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

7. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

8. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

9. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

10. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

11. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

12. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

13. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

14. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

15. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

16. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

17. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

18. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

19. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

20. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

21. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.

22. Tail musculature striped in ventral view: reddish in life. Tail height/body height ratio: 1.5 or more; dorsal fin_pattern: indistinct or indistinct. Tail musculature striped in ventral view: reddish in life.
21. Total length less than 30 mm; fins clear; light stripe extends from tail musculature forward to eye; dorsum of tail musculature with a black saddle slightly anterior to midlength

Hyla gratiosa (part) (barking treefrog)

Total length more than 30 mm; fins clear, black or mottled; stripe from tail to eye absent; black saddle on tail musculature present

Hyla gratiosa (part) (barking treefrog)

22. Fins and tail musculature typically mottled or reticulated without a clear area near musculature; A-2 gap ratio 3 or more; light orbitalonals stripe present at least in life; small specimens with two light body blotches that form an incomplete transverse body band (usually lost in preservative); dorsal fin variable

Hyla cinerea (green treefrog)

Fins not mottled or reticulated, sometimes blotched; if blotched, a clear area present near musculature; A-2 gap ratio 3 or less; light orbitalonals stripe absent; light body blotches absent; dorsal fin variable

23. Fins commonly blotched with a clear area remaining near musculature; tail musculature mottled; dorsal fin higher than ventral; P-3 very short

Hyla crucifer (part) (spring peeper)

Fins not blotched, either clear or with a few stellate melanophores; tail musculature mottled, unicolor, bicolored or striped; dorsal fin variable

24. Throat pigmented; A-2 gap relatively wide; tail musculature striped and dorsal light stripe extends forward to eye; P-1 with a median gap; to 21 mm

Pseudacris verrucosa

Throat not pigmented; A-2 gap relatively narrow; tail musculature not striped; no light stripe from tail to eye; P-1 with or without median gap; to 35 mm total length

25. Dorsal fin high, extending anterior of spiracle; tail musculature distinctly bicolored; P-1 indented or with a narrow median gap; tail height/musculature height 3.5 or more

Pseudacris ornata (ornate chorus frog)

Dorsal fin high or low, usually extending no further than to spiracle; tail musculature unicolor or indistinctly bicolored, i.e., not for full length of tail or with considerable pigment in lower half; P-1 with or without a median gap; tail height/musculature height 3.2 or less

26. Chest pigmented; dorsum uniform black to dark brown without small black dots; fins subequal and both lower than tail musculature

Pseudacris nigrila (southern chorus frog)

Chest not pigmented; dorsum black to dark brown and typically with small black dots; dorsal fin higher than ventral and about equal to tail musculature

Pseudacris triseriata (upland chorus frog)

27. Tail and body greenish, unicolor or more commonly patterned with distinct black dots; fins similarly patterned with more dots in dorsal fin than in ventral; venter clear to white depending on size, with or without a contrasting pattern; proximal portion of tail often more opaque than remainder; live small specimens (less than 25 mm total length) black with transverse gold bands on snout and body; tail appears bicolor due to pigment around caudal blood vessels

Rana catesbeiana (bullfrog)

Tail and body greenish or not, seldom with black dots; fins variously patterned; venter clear, white or dark, seldom with a contrasting pattern

28. Lower jaw wide; nostrils medium-sized; skin thin; gut usually visible

Lower jaw narrow; nostrils small to medium; skin thick or not; gut usually not visible

29. A-2 gap ratio 2.0 or more; marginal papillae below P-3 large, 10 or less present; fins usually heavily marked, often with dark suffusion; P-1/P-3 1.3 or more; gut often only slightly visible

Rana palustris (pickerel frog)

A-2 gap ratio less than 2.0; marginal papillae below P-3 small, more than 10 present; fins heavily marked or not, speckled or spotted; P-1/P-3 1.5 or less, gut visible or not

30. Gut usually visible; unpigmented throat patch with contrasting margins often present; tail marked, usually not with large spots; dorsi mottled; dorsal fin rounded; keratinized areas at medi al tips of P-1 absent

Rana utricularia (southern leopard frog)

Gut visible or not; throat unpigmented without contrasting margins or evenly pigmented; if tail marked, usually with large spots; dorsi mottled; dorsal fin frequently triangular; keratinized areas at medi al tips of P-1 present on large specimens

Rana aurora (Carolina gopher frog)

31. Stripe in dorsal fin and stripe on tail musculature absent; light spots surrounded by dark pigment at fin edges absent or indistinct; gut visible or not; A-2 gap ratio 5.0 or more; dorsi mottled; row of submarginal papillae absent between P-3 and marginal papillae

Rana clamitans (bronze frog)

stripe or rows of spots formed by pigment around lateral lines present in dorsal fin and a less prominent stripe usually present on tail musculature; light spots surrounded by dark pigment present near edge of f in; gut not or slightly visible

32. Dorsum brown with black dots; venter brown in preservative; yellow to buff in life; tail musculature stripe typically present; gut slightly or not visible; ro w of submarginal papillae present between P-3 and marginal papillae; tail length/tail height 2.0 or less; acid swamps

Rana irgalectes (carpenter frog)

Dorsum brownish to greenish with black dots or mottled; venter white, often with a contrasting pattern; tail musculature stripe typically indistinct to absent; gut slightly or not visible; ro w of submarginal papillae absent between P-3 and marginal papillae; tail length/tail height 2.2 or more

Rana grylio (pig frog)

KEY TO TURTLES OF THE SRP

1. Shell leathery, flat, and light brown in color; similar to a pancake in appearance

Trionyx spiniferus (spiny softshell) Shell bony and dome shaped

2. 4 toes on hind foot; plastron large with 1 transverse hinge, capable of sealing entire shell; yellowish or orange spots usually present on head, limbs and shell

Terrapene carolina (eastern box turtle)

5 toes on hind foot

3. Plastron with 2 transverse hinges; head and carapace solid black; pectoral scutes triangular

Kinosternon subrubrum (eastern mud turtle)

Plastron with 2 transverse hinges; carapace with three light yellow, longitudinal lines; pectoral scutes triangular

Kinosternon bauri (striped mud turtle)

Plastron with 1 or no transverse hinge; pectoral scutes quadrangular

4. Tail greater than ½ the carapace length and sawtoothed along upper side; barbels on chin, head solid black

Chelydra serpentina (common snapping turtle)

Tail less than ½ the carapace length; head with yellow stripes

5. Plastron with 1 transverse hinge; barbels on chin and throat; shell solid black or brown with no yellow markings

Sternoterus odoratus (stinkpot)

Plastron without a hinge; no barbels; shell usually with yellow markings
Fig. 5. Carapace of Chrysemys concinna or C. floridana (left) and C. scripta (right) showing distinction between marginal spotting.

Fig. 6. Comparative carapace shapes of Deirochelys reticularia (right) and Chrysemys scripta.
Fig. 7. Underside of tail indicating scales uniform (A) as in Eumeces inexpectatus and medial scales wider than long (B) as in E. fasciatus and E. laticeps.

6. Carapace, head, and neck black with scattered, conspicuous yellow or orange dots …….. Cleemys guttata (spotted turtle)
   Carapace without conspicuous yellow or orange dots; head and neck with yellow stripes …….. 7
7. Carapace with concentric light and dark markings on scutes and the figure “C” on the second costal scute; dark spots with light centers along underside of marginals (Fig 5) …….. Chrysemys concinna (river cooter)
   Carapace without a “C” on the second costal scute …….. 8
8. Skin between hind legs marked irregularly with yellow and black; dark spots with light centers on underside of marginals …….. Chrysemys floridana (Florida cooter)
   Skin between hind legs marked with uniform vertical yellow and black stripes …….. 9
9. Broad yellow stripe on forelimbs; carapace distinctly longer than wide (Fig 6); head with yellow stripes …….. Deltochilus reticularis (chicken turtle)
   Narrow yellow stripes on forelimbs; yellow blotch behind eye; carapace round or nearly so …….. Chrysemys scripta (yellow-bellied turtle)

Fig. 8. Labial pattern of E. laticeps showing 8 upper labials and no post-labial scales. E. fasciatus has 7 labials and 2 post-labials.

KEY TO THE LIZARDS OF THE SRP

1. Limbs absent ........................................... 2
   Limbs present ........................................... 3
2. No dark horizontal stripes below lateral groove; no distinct dark middorsal stripe ........................................... 3
   Middorsal stripe ........................................... 4
   Narrow dark horizontal stripes below lateral groove; dark middorsal stripe or broken stripe …….. Ophisaurus attenuatus (slender glass lizard)
3. Dorsal scales shiny and smooth …….. 4
   Dorsal scales not shiny; scales granular or rough …….. 7
4. Transparent disc in lower eyelid; dorsal color brown without conspicuous light stripes; belly white or yellowish; size small, never exceeding 4 cm in snout-vent length …….. Leiolepis laterale (ground skink)
   No transparent disc in lower eyelid; if less than 4 cm in SVL, then conspicuous light stripes present on black body; tail of all small and some large individuals blue……….. 5
5. Scales on underside of tail uniform in size (Fig 7); 5 light dorsal stripes; the middorsal one narrow …….. Eumeces inexpectatus (southeastern five-lined skink)
   Scales on underside of tail not uniform in size …….. 6
6. 8 upper labials; no enlarged postlabials; body brown and head reddish in adult males (Fig 8) …….. Eumeces laticeps (broad-headed skink)
   7 upper labials; 2 enlarged postlabials …….. Eumeces fasciatus (five-lined skink)
7. Belly scales rectangular in 8 longitudinal rows; 6 light longitudinal stripes dorsally …….. Cnemidophorus sexlineatus (six-lined racerunner)
   Belly scales not rectangular and in 8 longitudinal rows; no stripes …….. 8
8. Dorsal scales keeled and pointed; color grayish …….. Sceloporus undulatus (southern fence lizard)*
   Dorsal scales keeled and not pointed; toe pads present; dorsal color variable green to brown …….. Anolis carolinensis (Carolina anole)
KEY TO THE SNAKES
OF THE SRP

1. Pit between eye and nostril; most scales on underside of tail in a
   single row (Fig 9) .............................................. 2
   No pit between eye and nostril; scales on underside of tail in
double row .................................................. 5

2. Top of head with many small scales (Fig 10); rattles or button on
tail; last few inches of tail velvety black (Fig 11); basic color gray
with black, chevron-like bands across back; pinkish to yellow
stripe down center of back ...................................... Cratalus horridus
    (canebrake rattlesnake)—POISONOUS
   Top of head with large scales; rattles present or absent ... 3

3. Rattles (or button) on tail; size small, seldom exceeding 60 cm;
basic color gray with dark blotches along back and sides ...
   Sistrurus miliarius (Carolina pygmy rattlesnake)—POISONOUS
   No rattles; basic color brown or reddish ................. 4

4. Dorsal scale rows 23 at midbody (Fig 12); basic color light
   brown or reddish with darker crossbands along body ...
   Agkistrodon contortrix (southern copperhead)—POISONOUS
   Dorsal scale rows 25 at midbody; basic color brown in speci-
   mens over 45 cm long; sometimes reddish with crossbands in
   smaller specimens ............................................. 5
   Agkistrodon piscivorus (eastern cottonmouth)—POISONOUS

5. Scale rows at midbody 15-19 ............................... 6
   Scale rows at midbody 21 or more ......................... 23

Fig. 9. Underside of tail of non-poisonous colubrid (A; double
row posterior to vent) and poisonous crotalid (B; single row pos-
terior to vent).

Fig. 10. Head of Crotalus indicating numerous small scales.

Fig. 11. Solid black tail of Crotalus horridus.

Fig. 12. Counting system for dorsal scale rows.
6. All scales smooth (Fig 13) ........................................ 7
   All scales distinctly keeled ..................................... 18
7. Basic color solid black or solid light brown above, except for
   head and neck region in some instances ...................... 8
   Not solidly black or brown above; with some form of markings
   on back (blotches, rings, stripes) or with basic color grading
   from black head to light brown tail .......................... 13
8. Basic color light brown; length seldom exceeding 30 cm ....9
   Basic color black ................................................. 10
9. Head black; black ring around neck ........................... 19
   Tantilla coronata (southeastern crowned snake)
   Body uniform brown above from head to tail
   Virginia valeriae (smooth earth snake)
   Shiny black above; gray belly; white chin; no red or yellow color
   on any part of body .............................................. 11
   Coluber constrictor (black racer)
   Black above; belly yellow, orange or red ........................ 12
10. Dull black above; yellow ring around neck; yellow or orange
    belly with black spots; length seldom exceeding 30 cm .......
    Diadophis punctatus (southern ringneck snake)
    Uniform black above from snout to tail; belly with red or
    orange ................................................................. 13
11. Belly solid orange or red; length seldom exceeding 50 cm ...
    Seminatrix pygaea (black swamp snake)
    Belly checkered in appearance with alternating bright red
    and black ............................................................ 14
    Farancia abacura (eastern mud snake)
12. Body markings including red, orange, or yellow .............
    Body markings not including red, orange or yellow ..... 15
13. Body shiny black above with thin red stripes; belly red, orange
    or yellow with black spots ......................................
    Farancia erytrogramma (rainbow snake)
    Body with transverse bands or rings of red, black and yellow or
    white ................................................................. 16
14. Body rings continuing across belly; encircling body; nose
    black ................................................................. 17
    Micrurus fulvius (eastern coral snake)—POISONOUS
    Belly white or gray; nose red ....................................
    Cerrophis coccinea (scarlet snake)
15. Head and front half of body velvety black; posterior half of body
    brown .................................................................
    Masticophis flagellum (eastern coachwhip)
    Head not black; length usually not exceeding 50 cm ...... 18
16. Row of dark gray or brownish blotches down back; small dark
    spots on sides and belly ........................................
    Coluber constrictor (juvenile black racer)
    Light brown or tan above with thin dark crossbands; eyes
    noticeably larger than other snakes ...........................
    Masticophis flagellum (juvenile eastern coachwhip)
17. Body solid green above; belly yellow ...........................
    Opheodrys aestivus (green snake)
    Body not solid green above ..................................... 19
18. Three light yellow or greenish stripes down center of back and
    sides; belly yellowish ............................................ 20
    Body black or brownish above without yellow stripes ...... 21
19. Side stripes confined to scale rows 3 and 4 on each side (Fig
    14); lip scales yellowish without dark markings ...........
    Thamnophis sauritus (eastern ribbon snake)
    Side stripes confined to scale rows 2 and 3 on each side; lip
    scales interspersed by dark markings ........................
    Thamnophis sirtalis (eastern garter snake)
20. Body black or dark brown above; belly white or yellowish with
    2 dark stripes or rows of dots; scale rows 19 .............
    Natric rigida (glossy water snake)
    Body dark or light brown above, belly red or light-colored
    without stripes; scale rows 15 or 17 ......................... 22
21. Belly dark red; scale rows 15 ..................................
    Storeria occipitomaculata (red-bellied snake)
    Belly grayish; scale rows 17 .................................
    Storeria dekayi (brown snake)
Fig. 13. Comparison of keeled (A) and smooth (B) scales.
Fig. 14. Lateral line pattern of Thamnophis sauritus (A); yellow
line on 3rd and 4th scale rows and T. sirtalis (B).
23. All scales smooth; color pattern includes yellow rings encircling body ........................................24
   Scales keeled (weakly keeled only on sides in some forms); color dark or patterned with bands or blotches but not with yellow crossbands or rings ..................................................25
24. Body completely encircled by red, black and yellow rings; length seldom exceeding 60 cm ..........24
   Lampropeltis triangulum (scarlet kingsnake)
   Body shiny black with yellow rings or crossbands; no red present ..................Lampropeltis getulus (eastern kingsnake)
25. Basic color light gray above with dark blotches; head always grayish; entire belly and underside of tail white with no markings .................Pituophis melanoleucus (eastern pine snake)
   Basic color patterns darker than light gray; parts of underside dark or patterned ..................26
26. Rostral scale (at tip of nose) distinctly pointed or upturned (Fig 15) ........................................27
   Rostral scale rounded ..................................................28
27. Underside of tail darker than, or same shade as, belly; patterned above with dark blotches on light tan or brownish body; length seldom exceeding 50 cm .................27
   Heterodon simus (southern hognose snake)
   Underside of tail noticeably lighter in color than belly; may be patterned above or may be black .............................................28
   Heterodon platyrhinos (eastern hognose snake)
28. Scales along center of back weakly keeled or smooth; scales feel smooth when rubbed transversely ..................29
Scales strongly keeled; scales are noticeably keeled when rubbed transversely ..................................30
29. Basic pattern of blotching primarily orange and red; belly black and white checkerboard pattern; light colored stripes form a "V" on top of head (Fig 16) ..........Elaphe guttata (corn snake)
   Basic pattern of blotching primarily gray or brown; no "V" on top of head ..........Elaphe obsoleta (black rat snake)
30. Scale rows 27-33; belly plain white or yellow or with brown markings .......................................31
   Scale rows 23-25; belly solid red or with extensive brown and reddish markings ..................32
31. Basic color brown with darker brown or black squares on the back and sides; belly with brown markings ..................Natrix taxispilota (brown water snake)
   Basic color dark gray or olive above; sometimes with lighter mottling but no distinct pattern; belly gray or yellowish and unmarked except under tail ......................................33
   Natrix cyclopion (green water snake)
32. Black or dark gray above; solid color with no pattern in adults; dark blotches apparent on back and sides of juveniles (less than 45 cm in length); belly usually solid orange or pink and always without markings ..............................................32
   Natrix erythrogaster (red-bellied water snake)
   Series of reddish and brown crossbands above; belly yellowish with reddish or brown markings ...............33
   Natrix fasciata (banded water snake)
PROBLEM SPECIES

Certain species of reptiles and amphibians can create special problems for the local investigator. These include poisonous species, unresolved records and unverified reports or sightings, possibilities of encountering endangered species or introduced species, and the possibility that edible species of the region could have individuals contaminated by local pollutants including radionuclides.

Unresolved Records

Reports of some species of reptiles and amphibians from the SRP over the past 25 years have not been confirmed by subsequent investigators. Possible reasons include misidentifications or cataloging errors, the existence of earlier populations which are no longer present locally, inadequate sampling in particular habitats or sites in recent times, or problems associated with taxonomic assignment and interpretation. The following SRP species or species combinations are presently held in question:

* Kinosternon bauri*—The presence of this species on the SRP was based on 4 specimens from the Steel Creek-Road A vicinity. Three of the specimens (preserved in formalin) have subsequently been identified by herpetologists familiar with Kinosternon systematics as *K. subrubrum*. The remaining specimen has characteristics that qualify it as either species. (The distinguishing characteristics between *K. bauri* and *K. subrubrum* are often subtle and overlap between the species.)

Collections of several hundred *Kinosternon* since the 1970’s have revealed no *K. bauri* in the samples, some of which were from the Steel Creek area.

* Pseudotriton ruber*—Although numerous specimens have been referred to this species, its similarity in appearance to *P. montanus* makes the identification questionable.

* A. maculatum*—The records of *A. maculatum* from the SRP rest only on a few specimens collected in the late 1960’s from the Risher Pond area. Some questions arise as to whether they were correctly identified because *A. tigrinum* also occurs at Risher Pond and throughout the SRP.

* Bufo woodhousei*—A single SRP specimen in the Charleston Museum collection has been positively identified as belonging to this species (J. Harrison, pers. comm.). No other individuals or choruses have been reported subsequently.

Fall Line Subspeciation

The northern border of the SRP is only a few miles south of the Fall Line, the zone of intergradation of many species of reptiles and amphibians. Most species are probably represented by a single subspecies on the site; however, because of individual variation or inadequate sampling, subspecific assignments have often been made arbitrarily on the basis of geographic range information for the following: *Sceloporus undulatus*, *Storeria dekayi*, *Pituophis melanoleucus*, *Agkistrodon contortrix*, *Pseudotriton ruber*, *Desmognathus fuscus*, *Notopthalmus viridescens*, and *Rana clamitans*.

Poisonous Species

Five species of poisonous snakes occur on the SRP. Cottonmouths (*A. piscivorus*) are most frequently encountered in aquatic situations. Canebreaks (*C. horridus*) and copperheads (*A. contortrix*) are the most common terrestrial. The potential for serious snakebite exists anywhere on the site. Because of the proximity of the SRP to medical facilities in Augusta or Aiken, professional medical attention is recommended in lieu of extensive first-aid measures.

Edible Species

The combination of a species edible by humans and a source of contamination and potential uptake by the species could result in unfortunate consequences. It is not the intent of this report to indicate where on the SRP such situations might arise, if at all, but instead, only to indicate the species in the region which are generally considered edible. These include one amphibian, the bullfrog (*R. catesbeiana*), and four reptiles, all turtles (*C. serpentina*, *C. scripta*, *C. floridana*, and *D. reticularia*). Although it is true that many of the snakes are large enough, as well as palatable, no species in this region is characteristically used as a source of food.

Introduced Species

The practice of keeping and eventually releasing exotic pets has led to the introduction of new species in many areas. The horned toad (*Phrynosoma cornutum*) is now an established species in some sections of the South Carolina coastal plain. It has not been found on the SRP, but the possibility exists that it could become established because of the abundant sandy habitats.

Endangered Species

Special state and federal regulations protect species with declining or small populations. These animals can not be intentionally killed and can be collected only by permit from the federal government. Only one endangered reptile species, the American alligator (*A. mississippiensis*) is known to occur on the SRP, being found in the Par Pond reservoir system, many lakes, and the Savannah River swamp.

An endangered amphibian species, the pine barrens treefrog (*H. andersoni*) has not been reported from the SRP but the site is within the general range of the species.

No reptiles or amphibians can be collected on the SRP without a permit issued by the South Carolina Wildlife and Marine Resources Department.
SPECIES ACCOUNTS

The following is intended to give a brief description of pertinent ecological features of each species occurring on the SRP and to present information that might be helpful to an investigator who is unfamiliar with the species in this area. Our impression of the ecological status of each species is based on our own experiences and those of colleagues who have conducted research on the SRP. Specific locations are indicated on the map of the SRP (Map 3).

The following terminology will be used in assignment to abundance categories:

**Abundant**—Species is seen so frequently on the SRP or can be found with such assurance that the absence of specimens in appropriate seasons and locations would be cause for question.

**Common**—Species is no surprise when encountered, but the absence of specimens in certain locations or for long periods of time is considered inconsequential.

**Uncommon**—Species is noteworthy when found and is usually represented by single specimens.

**Rare**—Species is seen so seldom that questions can usually be raised as to whether sizable populations actually exist.

**Locally**—This term, used in conjunction with one of the above, indicates that the species occurs in concentrated pockets on the SRP with hiatuses between; the abundance designation indicates the commonness within such pockets.

Salamanders

*Ambystoma talpoideum*—Abundant. Adults can be seen in large numbers on SRP highways during rainy nights in late fall and winter as they migrate to breeding sites; larvae or neotenic adults occur in many aquatic sites and can be collected by seine, dipnet, or minnow trap.

*Ambystoma opacum*—Common. Adults are seen on SRP highways during rainy periods in the fall and winter. Several dozen juveniles were captured with pitfall traps around Risher Pond during summer. Occasional individuals are recovered under litter along woods bordering the Savannah River swamp.

*Ambystoma maculatum*—Rare. The only record of this species on the SRP is a handful of individuals reported from Risher Pond over a two year period.

*Ambystoma tigrinum*—Common. This species would be considered uncommon in this region if only road collecting or other observations were used. However, drift fences and pitfall traps have revealed that tiger salamanders do breed in many aquatic sites, usually in small numbers. They have been found throughout the SRP.

*Neoceratodus punctatus*—Locally common. Specimens have been found in tributaries of Upper Three Runs Creek but may also occur in other small streams; effective capture methods are minnow traps and dipnetting.

*Ampliuma means*—Uncommon. Single specimens have been collected in a variety of aquatic habitats including Risher Pond and Steel Creek Bay; the largest numbers have been collected in the North Cove area of Par Pond by means of minnow traps.

*Siren lacertina*—Locally common. Several have been collected in turtle traps in Dry Bay; a few individuals emerged from the water adjoining Steel Creek at Road A after a rotenoning operation.

*Siren intermedia*—Locally common. A concentration of this species was observed during a period of flooding along the shoreline of an inlet in Par Pond; many captures have been made during the fall and winter in the North Cove area of Par Pond by means of baited minnow traps.

*Saproscapha viridecaenis*—Abundant. Adults can be found, at least in small numbers, in almost all lentic situations, particularly Carolina bays. Terrestrial stages are frequently encountered on highways during rainy periods in late fall, winter and spring.

*Desmognathus fuscus* and/or *D. auriculatus*—Locally common. Specimens can usually be readily obtained under leaf litter in seepage areas alongside small streams throughout the SRP.

*Plethodon glutinosus*—Abundant. This species is generally associated with woodland habitats (hardwood or pine) and can usually be found beneath leaf litter throughout the SRP.

*Pseudotriton montanus* and *P. ruber*—Common. Specimens are encountered on highways during rainy periods in late fall and winter and are associated primarily with wooded habitats bordering wet areas. Some uncertainty exists as to whether *P. ruber* is actually represented on the SRP.

*Eurycea bislineata* and *E. longicauda*—Common. Occasionally found under litter alongside stream or swamp margins throughout the SRP. Most specimens have come from the section of Road F crossing the Upper Three Runs Creek floodplain on rainy nights.

*Eurycea quadridigitata*—Abundant. This species is always captured in drift fences at aquatic areas on the SRP. Numerous individuals can be picked up during rainy nights on highways passing through low wooded areas (such as Road F at Upper Three Runs Creek). They become apparent during late summer and are active primarily in the fall.

Frogs and Toads

*Scaphiopus holbrookii*—Common and locally abundant. This species is found on roads at night throughout the SRP during late fall and early to late spring. Enormous choruses composed of thousands of individuals develop in the town of Aiken after heavy spring or summer rains. A small chorus has been noted at Karen’s Pond near the old SREL site.

*Bufo terrestris*—Abundant. This is the most apparent amphibian on the SRP throughout the warm periods of the year. Breeding seems to occur in every available body of standing water in early spring (late March or early April) after rainfall. Specimens can be picked up from highways on most warm nights of the year.

*Bufo quercicus*—Uncommon. Individuals of this species are seldom encountered. A few choruses have been observed, the largest being at Pump Station #1 in early summer. Despite the lack of heavy concentrations, individuals have been reported from throughout the SRP.

*Bufo woodhousei*—Rare. Five individuals were reported by Freeman (1956). Harrison (pers. comm.), upon reexamination of the preserved specimen has confirmed the species as *B. woodhousei*.

*Acris gryllus* and *A. crepitans*—Abundant. Most SRP specimens have been *A. gryllus* although some *A. crepitans* also occur on the site. *Acris* can be heard calling from almost all lake margins or Carolina bays from spring to late summer.

*Hyla crucifer*—Abundant. Specimens can be heard calling from most aquatic areas from November to March and occasionally at other times.
**Alligator**

**Alligator mississippiensis**—Locally common. American alligators on the SRP were spared the heavy poaching pressure of the 1950's and 1960's. Breeding adults are present on the site, particularly in the Par Pond system. Nests have been found at Upper Three Runs Creek, at Pond C, and at Steed Pond. Several successful hatches have been observed in the Par Pond system.

**Turtles**

**Chelydra serpentina**—Common. Although large numbers are unlikely to be found at any particular site, single specimens of this ubiquitous species may occur in any aquatic habitat on the SRP. Most effective capture method is with baited aquatic traps.

**Sternotherus odoratus**—Common. This species is almost exclusively aquatic, and is seldom encountered terrestrial. The most effective capture method is with baited aquatic traps.

**Kinosternon subrubrum**—Abundant. This species is characteristically associated with standing bodies of water, particularly those with fluctuating levels such as Carolina bays and cypress-gum swamps. Specimens have not been reported from Par Pond, the streams, or the river. Many captures are made terrestrially as individuals hibernate on land long distances from water. Aquatic trapping frequently yields specimens. Terrestrial drift fences and pitfall traps are extremely effective at appropriate sites.

**Kinosternon bauri**—Rare or absent. The presence of this species on the SRP is contested by the authors. Four individuals were reported by Duerer (1972). No additional specimens have been reported and the four individuals have the predominant characteristics of *K. subrubrum*.

**Clemmys guttata**—Rare. The handful of spotted turtles have come from specimens picked up on highways.

**Terrapene carolina**—Uncommon. Box turtles appear to be ubiquitous on the SRP but are seldom encountered except as solitary individuals. Most captures are on highways during the morning.

**Chrysemys scripta**—Abundant. This is the most frequently encountered turtle on the SRP and is usually the dominant species. Specimens have been found at practically every aquatic site. All means of trapping are effective but baited aquatic traps, trot lines, and pitfall traps have yielded the largest numbers.

**Chrysemys concinna**—Rare. The river cooter is represented on the SRP by a single specimen collected at the SRP river dock. The species may be common in the river itself but there are no supporting data.

**Chrysemys floridana**—Common. This species occurs in most large aquatic habitats including Carolina bays, streams, Par Pond, farm ponds and the river swamp but has never been found in large numbers. Aquatic traps and pitfall traps have yielded the most specimens but no one means has been highly effective. This species may occur in large numbers in river and stream systems, habitats that have received only cursory examination.

**Drechyleys reticularia**—Locally common. Chicken turtles occur most commonly in Carolina bay habitats but are found in small numbers in other aquatic areas. Males can be trapped effectively in aquatic areas but females are captured most frequently in terrestrial drift fences and pitfall traps.

**Trionyx spiniferus**—Rare. A single specimen was seen in Lower Three Runs Creek below the Par Pond outfall. Extensive trapping efforts in Par Pond and other lentic habitats have failed. Several individuals have been trapped on the Savannah River below the SRP.
Lizards

*Ophisaurus attenuatus* and *O. ventralis*—Uncommon. Little is known of the ecology or distribution of these species on the SRP. Drift fences near Richard Pond yielded a few individuals of each species. Occasional specimens are picked up on roads during daylight.

*Euenees laticeps* and *E. inequitaous*—Common. Both species can be found in small numbers in most wooded habitats on the SRP. Specimens have been found in pine and hardwood habitats in both dry or swampy areas.

*Euenees fasciatus*—Status unknown. Some question exists as to whether this species actually occurs on the SRP. Recent attempts to establish its presence have resulted only in numerous captures of the other two species of *Euenees*.

*Leioplosma laterale*—Common. Brown skinks apparently occur in all wooded habitats on the SRP or even in open areas if sufficient ground cover is available. Drift fences successfully capture specimens but the most effective technique seems to be searching beneath ground litter. Specimens are active during warm, sunny periods in winter.

*Sceloporus undulatus*—Common. Populations of fence lizards are generally restricted to disturbed areas particularly if ground cover is available. Small concentrations can be found at most old homesteads, brush piles, and bridges. Individuals can frequently be found in the turkey oak habitats.

*Anolis carolinensis*—Uncommon to common. This species is occasionally located in small populations where individuals can be seen regularly on suitable days. Preferred habitats appear to be similar to those of *Sceloporus*.

*Cnemidophorus sexlineatus*—Abundant. This species can generally be found in any sandy areas including road shoulders and adjoining habitat. Individuals are frequently seen crossing highways during daylight hours.

Snakes

*Natrix cyclopion*—Locally common. A large population occurs in Ellenton Bay and a few specimens have been reported from Par Pond. None have been collected in stream or swamp habitats on the SRP.

*Natrix taxispilota*—Abundant. Associated with most stream, river, and swamp habitats on the SRP but seldom reported from Carolina bays. Occasionally encountered in Par Pond. *Natrix erythrogaster*—Locally common. Usually associated with aquatic environments and occasionally encountered several hundred meters away from permanent water. Individuals have been found throughout the SRP.

*Natrix fasciata* and/or *N. sipedon*—Abundant. This is the most ubiquitous species of *Natrix* on the SRP and is found in all aquatic habitats, permanent or temporary.

*Natrix nigra*—Rare. Two specimens have been collected from the drift fence at Risher Pond.

*Seminatrix pygaea*—Locally uncommon. There is a concentration of this species at Ellenton Bay. Occasional specimens have been reported from other standing water habitats on the SRP.

*Storeria decayi*—Uncommon. Occasional individuals of this species are found in a diversity of habitats from moist to dry woodlands to swampy areas if abundant ground cover and litter are available.

*Storeria occipitomaculata*—Locally uncommon. Specimens are occasionally collected on SRP roads at night. Drift fences in most woodland areas with abundant ground litter around Pond C, Lost Lake, and the old SREL site revealed the presence of this species. Occasional individuals have been found in a diversity of SRP habitats, usually wet or damp, though not necessarily near permanent aquatic areas.

*Thamnophis sirtalis*—Uncommon. The few individuals reported have been found in association with aquatic areas in various parts of the SRP.

*Thamnophis sirtalis*—Uncommon. Occasional individuals have been found in a diversity of SRP habitats, usually wet or damp, though not necessarily near permanently aquatic areas.

*Virginia valeriae*—Uncommon. Most individuals have been collected with drift fences, the largest numbers having come from the east side of Pond C and from Lost Lake.

*Heterodon platyrhinos*—Common. Characteristically found in sandy habitats including abandoned old fields and scrub oak forests anywhere on the SRP. Frequently found on roads but during daytime only. Melanism is frequently observed in adults from the SRP.

*Heterodon simus*—Uncommon. Found in similar habitats as eastern hognose; sandy fields and wooded areas, but less often. Never melanistic.

*Dipsadophis punctatus*—Uncommon. Occasional specimens were collected with drift fences around Pond C. Otherwise, infrequently encountered on the SRP.

*Farancia abacura*—Uncommon. Primarily associated with the Savannah River swamp system and aquatic habitats in the vicinity. A few individuals have been collected in Par Pond.

*Farancia erythrogramma*—Uncommon. Found in or around various aquatic habitats. Most specimens have come from captures with minnow traps at Steel Creek or from Risher Pond and Ellenton Bay by means of drift fences.

*Coluber constrictor*—Abundant. Found in a wide variety of habitats, being particularly common in abandoned old fields, pine woods, and hardwood areas. Frequently seen crossing highways during daylight hours only. Probably the most apparent terrestrial snake species on the SRP.

*Masticophis flagellum*—Uncommon. Primarily associated with dry, sandy habitats such as abandoned old fields and scrub oak forest areas but reported from throughout the SRP; strictly diurnal; may occur in pine or hardwood areas on occasion.

*Ophisops aequalis*—Uncommon. Associated with thickly vegetated areas having vines, bushes, shrubs, etc., throughout the SRP.

*Elaphe guttata*—Common. Found throughout the SRP, generally associated with woodland habitats, including pine and hardwood areas; commonly collected at night on SRP highways.

*Elaphe obsoleta*—Uncommon. Found in a wide variety of habitats throughout the SRP but is most often encountered in wooded or swampy areas; often found in wood duck nest boxes.

*Platynops melanoleucus*—Uncommon. Restricted to sandy habitats whether abandoned old fields, scrub oak or pine forests. Most specimens are obtained as incidental captures on highways during daylight hours.

*Laemophis getulus*—Common. Occurs in wide variety of habitats on the SRP, often in the vicinity of permanent or temporary aquatic areas. Although large numbers are known to occur in selected areas, such as Ellenton Bay, normally no more than one or two individuals are encountered during a particular day.

*Laemophis triangulum*—Rare. Restricted to open pine woods on the SRP. Several individuals were collected on Road F at night during late summer of 1977. Three specimens were caught in drift fences around Pond C.

*Cemophora coccinea*—Common. Characteristically associated with sandy soil habitats, including pine woods, scrub oak forests, and abandoned old fields. Almost all individuals have been collected on SRP highways at night or in drift fences around Risher Pond, Karen's Pond, and Pond C. Few specimens are seen before May or after August.
Tantilla coronata—Uncommon. Found in a variety of habitats but mostly in wooded areas with abundant ground litter and debris. Most SRP captures have resulted from drift fences in wooded sites.

Micoirus fulvius—Rare. Fewer than a half dozen individuals of this species have been found on the SRP, all within the northwestern sector and mostly in the fall. All have been associated with turkey oak-pine habitats.

Agkistrodon contortrix—Uncommon. May be encountered in any terrestrial habitat on the SRP. Most specimens have been collected as a consequence of road collecting.

Agkistrodon piscivorus—Abundant. Found in association with almost every wet habitat on the SRP, with two notable exceptions: Ellenton Bay and Par Pond. Heavy concentrations are occasionally encountered in the Savannah River swamp area.

Sistrurus milius—Uncommon. Most SRP specimens have been encountered in scrub oak—longleaf pine forest habitats in the northern sector. Several individuals were captured by road collecting at night during late summer of 1977.

Crotalus horridus—Common. Found in association with a wide diversity of terrestrial habitats on the SRP. Most specimens have been collected on roads primarily in early evening or at night. Few Crotalus are seen before mid-May but individuals can be encountered moving overland as late as November.
Publications Based on SRP Research


SRP Theses and Dissertations


General Guides and Regional References


Harrison, J. R. Amphibians of South Carolina. (In prep.).


LITERATURE CITED IN TEXT


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Table 1. Total numbers of amphibian and reptile species on the SRP.

<table>
<thead>
<tr>
<th></th>
<th>Families</th>
<th>Genera</th>
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<tbody>
<tr>
<td><strong>Amphibians</strong></td>
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<tr>
<td>Salamanders</td>
<td>6</td>
<td>9</td>
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<td>Frogs and Toads</td>
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<td>Total Amphibians</td>
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<td>Crocodilians</td>
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<td>Turtles</td>
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<tr>
<td>Lizards</td>
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<td>Snakes</td>
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<td>Total Reptiles and Amphibians</td>
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Table 2. Reptile and amphibian species whose presence on the SRP has been reported or documented but whose presently reported range is (1) peripheral to or barely approaching the site boundaries or (2) characterized by widely disjunct populations.

<table>
<thead>
<tr>
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<th>Species</th>
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<tr>
<td><strong>Amphibians</strong></td>
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<tr>
<td>Salamanders</td>
<td>Pseudotriton ruber red salamander</td>
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<td>Frogs</td>
<td>Rana areolata gopher frog</td>
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<td>Rana palustris pickerel frog</td>
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<tr>
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<td>Rana virgatipes carpenter frog</td>
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<td></td>
<td>Pseudacris triseriata upland chorus frog</td>
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<td></td>
<td>Hyla avivoca bird-voiced treefrog</td>
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<tr>
<td><strong>Reptiles</strong></td>
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<tr>
<td>Snakes</td>
<td>Natrix erythrogaster red-bellied water snake</td>
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<td>Natrix cyclopion green water snake</td>
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<td>Natrix rigida glossy water snake</td>
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<td>Seminatrix pygaea black swamp snake</td>
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<td>Heterodon simus southern hognose snake</td>
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<td>Farancia erytrogramma rainbow snake</td>
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<td>Farancia abacura eastern mud snake</td>
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<td>Micrurus fulvius eastern coral snake</td>
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<tr>
<td>Turtles</td>
<td>Micrurus floridana Florida coral</td>
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<td></td>
<td>Deirocheilus reticulata chicken turtle</td>
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Table 3. Reptile and amphibian species whose geographic ranges encompass or closely approach the SRP but which have not been reported from the site.

<table>
<thead>
<tr>
<th>Amphibians</th>
<th>Reptiles</th>
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<td>Salamanders</td>
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<td>Pseudobranchus striatus</td>
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<td>Ambystoma cingulatum</td>
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<td>Rana heckscheri</td>
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