

Appendix 13.A. Wildlife of the St. Johns River Floodplain

SPECIES DIVERSITY

The St. Johns River is a diverse ecosystem with a variety of wildlife. The river's vertebrate wildlife classes (excluding fish) are the Amphibia (frogs and salamanders), Chelonia (turtles), Crocodylia (alligators), Reptilia (snakes and lizards), Aves (birds), and Mammalia (mammals) (Table 13.A-1). The faunal composition is dominated by birds.

Table 13.A–1. Estimated floodplain species composition of the St. Johns River with representation for the non-piscine vertebrate classes.

Vertebrate Class	Estimated Species Composition
Amphibia (frogs, toads, salamanders)	19
Chelonia (turtles)	11
Crocodylia (alligators)	1
Reptilia (snakes and lizards)	23
Aves (birds)	200
Mammalia (mammals)	32

Amphibians

The amphibians of the floodplain consist of frogs, toads, and salamanders. These small animals are important components of aquatic and wetland food webs during all their life stages. They are mid-level consumers of invertebrates. Likewise, amphibians are important prey for numerous predators, such as snakes and wading birds.

Twelve anuran (frog) species have range distributions that include the St. Johns River floodplain. Additional frog species occur in the larger St. Johns River basin. These species are not included in the wildlife inventory because they lack adaptive mechanisms for surviving the presence of fish, limiting their distributions to isolated wetlands or ephemeral ponds.

The vegetated littoral zones of fresh lentic waters are important to the life stages of floodplain frogs. All frogs need standing water for reproduction. Vegetated shallow waters function as sites for oviposition, external fertilization, and nursery areas for free-swimming tadpoles. Tadpoles require submerged and emergent vegetation where they can forage for food and hide from predators.

Of the frog species found in the floodplain, the ranid frogs (*Lithobates* spp.) are the most aquatic. These include the bullfrog (*Lithobates catesbeiana*), pig frog (*L. grylio*), and southern leopard frog (*L. sphenoccephala sphenoccephala*). Ranid frogs use habitats that are in close proximity to

permanent bodies of water (deep marshes, shallow littoral zones, emergent marshes, and floodplain swamps). Some frog species tolerate brackish conditions (e.g., southern leopard frog).

Compared to the ranids, the hylid tree frogs generally tolerate shorter annual inundation rates, but they need humid, moist, or saturated conditions to prevent skin desiccation. The native hylid tree frogs represent a diverse assemblage in terms of their habitat requirements. Floodplain species include the green tree frog (*Hyla cinerea*), squirrel tree frog (*H. squirella*), little grass frog (*Pseudacris ocularis*), and the Florida cricket frog (*Acris gryllus dorsalis*). The Cuban tree frog (*Osteopilus septentrionalis*), an exotic that has expanded its range from south Florida northward, does invade forested wetlands, specifically hydric hammocks (Maskell et al. 2003).

The microhylid eastern narrow-mouthed toad (*Gastrophryne carolinensis*) and the bufonid southern toad (*Bufo terrestris*) occur in infrequently flooded areas including hydric hammocks. Like the hylid Cuban tree frog, these toads are often found in upland habitats and will use wetlands opportunistically.

Seven caudate (salamander) species have distribution ranges that overlap the floodplain. The salamanders inhabit flooded wetlands and shorelines with muddy substrates, dense vegetation, or decaying plant material. Heavily vegetated areas are important particularly for juvenile development.

Four families of salamanders are represented for the floodplain—Amphiumidae, Sirenidae, Plethodontidae, and the Salamandridae. The two-toed amphiuma (*Amphiuma means*), greater siren (*Siren lacertina*), and southern dwarf siren (*Pseudobranchius axanthus*) prefer the shallow marshes, littoral zones, and deep marsh habitats of the floodplain. Amphiumas and sirens typically burrow in soft substrates during droughts or low water conditions (Weber 1944; Schalk et al. 2010). Southern dwarf siren individuals can be very abundant in the root mats of floating vegetation (Moler 2005). The dwarf salamander (*Eurycea quadridigitata*), southern dusky salamander (*Desmognathus auriculatus*), and mud salamander (*Pseudotriton montanus*) occur in forested wetlands and sloughs with wetted margins and organic substrates. The salamandrid peninsula newt (*Notophthalmus viridescens piaropicola*) occupies wetlands with wide range of inundation rates compared to the other floodplain salamanders. Newts have aquatic life phases and a terrestrial eft (juvenile) stage, which occurs in upland forests with landscape linkages to wetlands.

Turtles

Florida is one of the most important turtle areas in the world. The state ranks high in turtle species diversity, endemism, and density of taxa. Commercial exploitation and habitat losses threaten many wetland turtle populations in Florida (Rhodin 2006).

Top-down (predation) and bottom-up (forage abundance) environmental controls strongly affect turtle populations. Turtles are most abundant in Florida waters with high periphyton productivity and no alligators (Aresco and James 2005). Considering the alligator populations of the St. Johns River, turtle populations and diversity may be limited depending on the floodplain location. Vegetated littoral zones are important nursery areas for floodplain turtle hatchlings and juveniles.

Eleven turtle species have range distributions that overlap the St. Johns River floodplain: the Florida softshell (*Apalone ferox*), five species of mud turtles (*Kinosternon* spp. and *Sternotherus* spp.), Florida snapping turtle (*Chelydra serpentina osceola*), and four species of basking turtles (*Pseudemys* spp., *Deirochelys reticularia*, and *Clemmys guttata*). The Florida softshell, Florida snapping turtle, and the common musk turtle (*Sternotherus odoratus*) are the most aquatic of the floodplain turtles.

Alligators

The crocodylia class has one well-known species in the floodplain, the American alligator (*Alligator mississippiensis*). Alligators must have access to the open waters of river channels, lakes, or canals. Open waters are important for mobility because swimming conserves the metabolic energy of this ectotherm (Percival et al. 2000). Sufficient water depth is necessary to prevent over-heating in the summer (Delany and Abercrombie 1986; Mazzotti and Brandt 1994; Percival et al. 2000). Prolonged droughts can result in alligator die-offs (Percival et al. 2000).

As a keystone species, the alligator modifies marsh habitats by making gator holes, which also function as low-water refugia for many other species (Craighead 1968; Kushlan 1974a). The adult alligator physically wallows with a side-to-side motion to deepen a depression in the marsh surface creating an area of open water. The gator hole supports thermoregulation by the alligator during hot weather. During droughts, the gator holes attract prey (amphibians, snakes, turtles, wading birds, and ducks). Craighead (1968) and others have qualitatively described the biological diversity and productivity of gator holes.

A top carnivore, the alligator needs heterogeneous wetland environments that provide a variety of prey. Alligators partition their habitats by water depth to avoid competition. Mazzotti and Brandt (1994) described spatial and temporal separation of individuals based on gender and size classes. Juvenile alligators consume insects and other invertebrates, small fish, and frogs. As alligators mature, fish and other larger prey are added to the diet.

Snakes and Lizards

The floodplain provides wetland habitats for a variety of snakes beyond the well-known cottonmouth (*Agkistrodon piscivorus*). An additional 19 species, all colubrids, occur in a variety of floodplain wetlands. The majority are edge species that forage along shorelines and in aquatic habitats. Amphibians, juvenile turtles, small birds, and mammals are important prey for snakes. In turn, snakes are prey for larger animals such as alligators, predatory birds, and mammals. Examples of snake species in the floodplain are *Nerodia* water snakes (*N. fasciata*, *N. taxispilota*, and *N. floridana*), *Farancia* snakes (*F. erythrogramma* and *F. abacura abacura*), black swamp snake (*Seminatrix pygaea*), and *Regina* crayfish snakes (*R. alleni* and *R. rigida rigida*).

Three lizard species representing two families occur in the drier ecotones of the river floodplain: green anole (*Anolis carolinensis*), five-lined skink (*Platiodon fasciatus*), and southeastern five-lined skink (*Eumeces inexpectatus*). These animals prefer uplands, but will exploit forested wetlands (e.g., hydric hammocks), and areas where forested wetlands intergrade with upland forests (e.g., oak hammocks). Terrestrial invertebrates are important prey for lizards. Lizards, in turn, are prey for larger animals such as snakes.

Birds

An estimated 200 species, including seasonal migrants, have distributions that overlap the floodplain. Wetland obligates include resident species that nest in floodplain habitats. Examples include Florida mottled duck (*Anas fulvigula*), snowy egret (*Egretta thula*), white ibis (*Eudocimus albus*), and wood stork (*Mycteria americana*).

Migratory birds represent more than half of the river's avifauna. Examples of seasonal migratory species include sanderling (*Calidris alba*), dunlin (*Calidris alpina*), and dowitcher (*Limnodromus* spp.). These wetland obligate shorebirds reside in the floodplain except for the summer when they nest in far northern locations as distant as the Arctic tundra. Some birds from Central and South America (e.g., American swallow-tailed kite (*Elanoides forficatus*)) migrate to the floodplain to reproduce during the spring and summer. Migratory bird species that occur in the St. Johns River floodplain indicate the importance of the ecosystem to avifaunal populations within the Western Hemisphere.

Mammals

Of the floodplain wildlife, mammals rank second in species richness to birds. A variety of resource niches are represented from the aquatic herbivory of manatees to aerial foraging by insectivorous bats. The mammals of the floodplain vary in size from the 10-gram North American least shrew (*Cryptotis parva*) to the half-metric ton bottlenose dolphin (*Tursiops truncatus*). Other examples of floodplain mammals include the rice rat (*Oryzomys palustris*), southeastern shrew (*Sorex longirostris*), Rafinesque's big-eared bat (*Corynorhinus raafinesquii*), white-tailed deer (*Odocoileus virginianus*), northern river otter (*Lontra canadensis*), and marsh rabbit (*Sylvilagus palustris*).

One wetland mammal, the Florida round-tailed muskrat (*Neofiber alleni*), is a keystone species that is on the decline (FWC 2005). The Florida round-tailed muskrat depends on water level fluctuations for viable habitat conditions and reproductive success (Porter 1953; Birkenholz 1963). Appropriate hydrologic conditions support *Neofiber* marshes and prevent intense fires from destroying organic substrates (Porter 1953). Twenty-one commensal wildlife species that occur in the floodplain, including amphibians, turtles, snakes, and mammals, are described for *N. alleni* "houses" (platforms made from marsh grasses) and burrows (Porter 1953; Smith and Franz 1994).

SPECIES WITH COMMERCIAL AND RECREATIONAL IMPORTANCE

Wildlife species with commercial and recreational importance include the aquatic Florida softshell (*Apalone ferox*), which is harvested by a regulated commercial fishery in Florida. Some species of ranid frogs (e.g., *Lithobates s. sphenoccephala*) also have commercial and recreational importance. The white-tailed deer (*Odocoileus virginianus*) is a popular game species that is found in the marshes and forested wetlands of the St. Johns River floodplain. Limited seasonal trapping is allowed by permit for northern river otter (*Lontra canadensis*) and bobcat (*Lynx rufus*). Wintering ducks (Anatidae), such as lesser scaup (*Aythya affinis*), redhead (*A. americana*), and northern pintail (*Anas acuta*), are regulated for hunting. The American alligator (*Alligator mississippiensis*), formerly protected, has recovered sufficiently for harvest by permit, and aquaculture production by licensed commercial operations.

FORAGE GROUPS

The energy flows and trophic dynamics of the St. Johns River ecosystem are represented in part by the eight forage groups shown in Table 13.A-2 and Figure 13.A-1, excluding the passerine birds that are arboreal insectivores. About 32% of the river's wildlife are consumers of benthic macroinvertebrates. Piscivores represent about 15% of wildlife consumers. Foraging habits can vary by life stage depending on the species, and many wildlife species eat a variety of a variety of foods depending on the season and availability. As a result, forage groups may overlap.

Table 13.A-2. Forage groups and examples of wildlife consumers.

Forage Group (%)	Wildlife Examples
Invertivores (32%)	Amphibian and turtle species
Herbivores (25%)	Florida red-bellied turtle , lesser scaup, marsh rabbit, manatee
Carnivores (21%)	Bullfrog, Cuban treefrog, two-toed amphiuma, alligator, raptor species
Piscivores (15%)	Wading bird species, osprey, northern river otter, bottle-nosed dolphin
Omnivores (3%)	Florida snapping turtle, Peninsula cooter hatchlings, boat-tailed grackle, opossum, Florida black bear, raccoon
Carrion scavengers (2%)	Southern toad tadpoles, eastern mud turtle, Florida snapping turtle, crested caracara
Algivores (2%)	Tadpoles (bullfrog, southern leopard frog, southern cricket frog, little grass frog, southern toad)
Detritivores (0.5%)	Tadpoles (bronze frog, squirrel treefrog)

WETLAND WILDLIFE HABITATS

Floodplain wildlife habitats include the forested and non-forested wetlands of the river's fresh and estuarine environs. Plant compositions vary depending on location. Wetlands and their distributions along the river are described in Wetland Vegetation (see Chapter 10).

Freshwater wetlands common through most of the floodplain include deep and shallow marshes, shrub swamps, mixed hardwood swamps, cypress swamps, wet prairies, transitional shrub thickets, and hydric hammocks. Undeveloped private and public lands (e.g., Tosohatchee Wildlife Management Area, River Lakes Conservation Area, and Lake Woodruff National Wildlife Refuge) represent discontinuous wildlife corridors that function as landscape linkages from floodplain to upland communities and peripheral isolated wetlands.

Estuarine wetlands include the tidal swamps and saltmarshes of the lower river from Jacksonville to the Atlantic Ocean inlet east of Mayport. These provide food and cover for an array of wildlife species that use coastal habitats (e.g., black skimmer, brown pelican, and least tern). Upstream at several inland locations, the upwelling of relict seawater supports brackish marshes of sand cordgrass (*Spartina bakeri*).

The horizontal heterogeneity of wetland mosaics in the floodplain determines the beta diversity of a locality. Whittaker (1972) defines beta diversity as between-habitat diversity, or how species are distributed as habitats change along an environmental gradient, such as one related to hydrologic regime. In the floodplain, local wildlife distributions are generally associated with

hydrology and the microtopographic variations that determine vegetation, soil moisture, salinity, and the extent of open water.

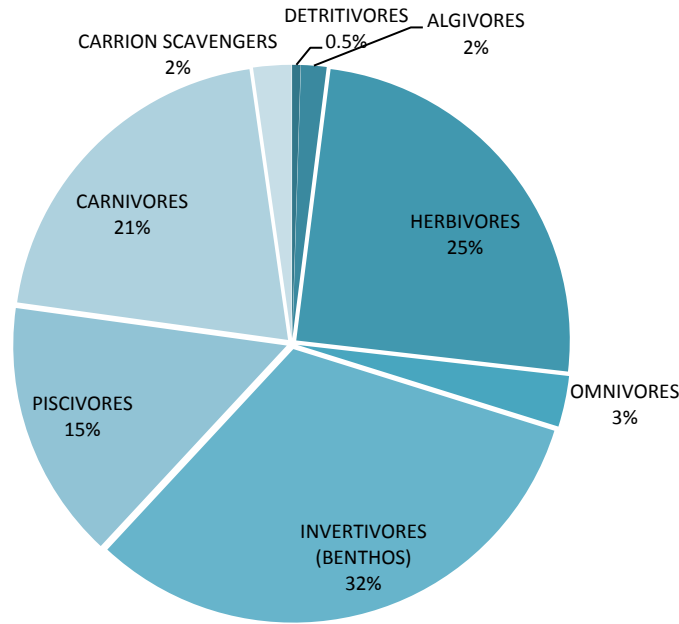


Figure 13.A-1. Forage groups for the St. Johns River floodplain.

Wetland habitat features are not static, but can change spatially and temporally. The wildlife populations of the St. John River floodplain depend on local wetland conditions and the quality of the river’s littoral zones and aquatic habitats. Patchy distributions, season, and resource availability combine with water quantity, quality, and salinity regimes to determine the faunal composition of a locality within the floodplain. Faunal distributions and seasonal occurrences can vary considerably.

WILDLIFE IMPAIRMENT

This evaluation of water withdrawal effects on floodplain wildlife recognizes that pre-existing conditions have affected the diversity and persistence of the river’s fauna. Numerous changes, most of which resulted in habitat losses, have caused cumulative impairments to wildlife. Wildlife responses to these and other systemic changes mostly occurred in the first half of the twentieth century and went unmonitored. Examples of floodplain species extinction include the ivory-billed woodpecker (*Campehilus principalis*), Bachman’s wood warbler (*Vermivora bachmanii*), and dusky seaside sparrow (*Ammodramus maritimus nigrescens*). Species that have incurred population reductions in the floodplain include the Florida snail kite (*Rostrhamus sociabilis plumbeaus*), limpkin (*Aramus guarauna*), Florida sandhill crane (*Grus canadensis pratensis*), and Florida manatee (*Trichechus manatus latirostris*).

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