

Following the nationwide ban of DDT in 1972 and the reforestation of fallow lands throughout the state, Cooper's hawk populations began to recover. Cooper's hawks experienced increases in New Jersey Christmas Bird Counts from 1959 to 1988 and Breeding Bird Surveys from 1980 to 1999 (Sauer et al. 1996, Sauer et al. 2001). Other recent surveys have also shown a substantial increase in the breeding population of Cooper's hawks in New Jersey. As a result, the status of the Cooper's hawk was reclassified from endangered to threatened in New Jersey in 1999. The loss of large, contiguous forests remains a threat to this species and warrants the continued protection of Cooper's hawk nesting habitats.

Grasshopper Sparrow, *Ammodramus savannarum*

Status:

State: Threatened

Federal: Not listed

Identification

A small, secretive songbird, the grasshopper sparrow is more often heard than seen as its insect-like melody emits from dense grasses. Its song consists of one to two chips followed by a buzzy trill reminiscent of a grasshopper. This sparrow also sings a series of buzzy notes.



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The grasshopper sparrow has a stocky body that is brown above with buff streaking. On adults, the breast and sides are solid buff and the belly is white. The buff breast and sides of juveniles are marked with dark brown vertical streaking. Grasshopper sparrows have flat heads with relatively large bills. The crown is dark brown with light central stripes atop the head and behind the eye. The lores (between the eyes and the bill) are orange or golden. The tail is short and brown.

Habitat

Grasshopper sparrows breed in grassland, upland meadow, pasture, hayfield, and old field habitats. Nesting grasshopper sparrows may occur on agricultural lands and airports where such habitats occur. Although grasshopper sparrows may use small grasslands, open areas of over 40 hectares (100 acres) are favored. Optimal habitat for these sparrows contains short- to medium-height bunch grasses interspersed with patches of bare ground, a shallow litter layer, scattered forbs, and few shrubs. Clumped grasses, such as poverty grass (*Danthonia spicata*) and broom-sedge (*Andropogon virginicus*), provide cover and foraging areas and are consequently favored over sod or matting grasses. In addition, orchardgrass (*Dactylis glomerata*), alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), lespedeza (*Lespedeza* spp.), and dewberry (*Rubus* spp.) provide sparrow habitat. Shrubs, fence posts, and tall forbs are used as song perches. However, habitats may become unsuitable for nesting grasshopper sparrows if shrub cover becomes too dense. Consequently, the presence and density of grasshopper sparrows at breeding sites varies annually due to habitat changes. Habitat use during the nonbreeding season is similar, although less restrictive, to that of the breeding season, as these sparrows may inhabit thickets, weedy lawns, vegetated landfills, fence rows, open fields, or grasslands.

Status and Conservation

In the eastern United States, the historic distribution of grasshopper sparrows was restricted to natural grasslands created by fires or flooding. However, the boom in agriculture during the late 1800s and early 1900s enabled this species to spread its range and increase in numbers, making it a fairly common breeder in New Jersey. By the 1950s and 1960s, expanding development of open areas, coupled with dwindling acreage of land devoted to farming or pasture, led to decreases in grasshopper sparrow populations. Continued declines in the northeast were noted in the 1970s and 1980s, when the species was considered locally distributed and uncommon. The number of grasshopper sparrows detected on Breeding Bird Survey routes in New Jersey, the eastern United States, and throughout the country declined from 1966 to 1999 (Sauer et al. 2000).

As the result of population declines and severe habitat loss, the grasshopper sparrow was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers this species to be “apparently secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1992). Currently, grasshopper sparrows occur in small, localized, and unstable populations in the Northeast. Consequently, other nearby states have listed this species as endangered (Maine, Connecticut), threatened (Massachusetts, Rhode Island), or of special concern (New York). In New Jersey, the survival of grasshopper sparrows is critically linked with management practices for grassland birds on airports, agricultural lands, and pastures.

Long-eared Owl, *Asio otus*

Status: *State:* Threatened *Federal:* Not listed

Identification

The long-eared owl is a slender, crow-sized owl with long “ear” tufts atop the head that are often visible when the owl perches. The ear tufts are not actual ears, but rather clusters of feathers that aid in camouflaging the bird. The true ears are located on either side of the head next to the round rusty-orange facial disk.

The breast of the long-eared owl is brown with irregular white spotting. The belly is buffy and crosshatched with dark brown markings. The upperparts are heavily marked with black and brown and have gray, buff, and white tones. The wings are long and rounded with a buff-orange patch at the base of the outer primaries on the upperwing. The flight feathers are grayish with dusky spots. The underwing shows a dark brown patch at the wrist. There is a small white patch on the throat below the black bill. The tail is buff colored with brown bands. The legs and feet are feathered to the talons, which are black.

The iris is yellow to golden-yellow. Sexes are alike in plumage, although males are often slightly paler than females.

The long-eared owl relies on its cryptic coloration to camouflage itself within its surroundings. When disturbed, the owl may elongate its body and raise its ear tufts to resemble a broken branch or part of a tree trunk. Long-eared owls also snap their bills if threatened. Vocal activity of the long-eared owl is primarily restricted to the breeding season when males emit a series of deep “hoo” notes during the nighttime hours. The call of the female is slightly higher pitched than that of the male. Both adults give a repeated barking “oo-ack” alarm call. Long-eared owls are skilled fliers that can maneuver among trees and migrate long distances.

The long-eared owl can be confused with other owl species. The great-horned owl (*Bubo virginianus*), which is similarly patterned and also has prominent ear tufts, can be distinguished from the long-eared owl by its larger size and stockier body. The eastern screech owl (*Otus asio*) is much smaller than the long-eared owl and differs in coloration, occurring in a rusty red or gray phase.



Habitat

Long-eared owls require a mosaic of wooded and open habitats. Both roosting and nesting sites may be located within dense stands of either natural or ornamental evergreens, such as Scotch pine (*Pinus sylvestris*), Austrian pine (*P. nigra*), Virginia pine (*P. virginiana*), eastern red cedar (*Juniperus virginiana*), Norway spruce (*Picea abies*), arborvitae (*Thuja orientalis*), eastern hemlock (*Tsuga canadensis*), red pine (*Pinus resinosa*), and white pine (*P. strobus*) (Bosakowski et al. 1989). Deciduous trees and impenetrable tangles of vines also provide cover for these owls. High foliage density is required at nesting and roosting sites to provide camouflage and protection from wind, cold temperatures, and precipitation. Roosting and nesting woodlots are located adjacent to upland or wetland open terrain. Open areas, such as fallow fields, farm fields, and marshes, are used for hunting and are integral components of long-eared owl habitat. Marshes may contain reed grass (*Phragmites australis*), cattail (*Typha spp.*), or sedges.

Status and Conservation

Prior to the 20th century, the clearing of eastern forests for agriculture resulted in a mosaic of farm fields and woodlands and may have enabled long-eared owl numbers to exceed pre-settlement populations. In the late 1800s and early 1900s, long-eared owls bred at scattered locations in New Jersey from Sussex County to Salem County. However, by the mid-1900s, vegetative succession, development of open and forested areas, and modern agricultural practices greatly reduced habitat for these owls in the state. The number of active long-eared owl winter roosts, as well as the number of birds per roost, has declined since the 1950s. Despite extensive surveys in the late 1980s, the number of known breeding pairs remained extremely low. Long-eared owls are currently absent from many nesting sites that were occupied prior to the 1960s. Expanding development has been responsible for the loss of traditional roosting and nesting sites. Due to population declines of breeding pairs and winter residents, habitat loss, and limited breeding distribution in the state, the long-eared owl was listed as a threatened species in New Jersey in 1991. The New Jersey Natural Heritage Program considers the long-eared owl to be “demonstrably secure globally,” yet “rare in New Jersey” (Office of Natural Lands Management 1992).

■ Sherry Liguori

MUSSELS

FRESHWATER MUSSELS:

Dwarf wedgemussel, *Alasmidonta heterodon*

Status: *State:* Endangered *Federal:* Endangered

Brook floater, *Alasmidonta varicosa*

Status: *State:* Endangered (pending) *Federal:* Species of Special Concern

Green floater, *Lasmigona subviridis*

Status: *State:* Endangered (pending) *Federal:* Species of Special Concern

Yellow lampmussel, *Lampsilis cariosa*

Status: *State:* Threatened (pending) *Federal:* Species of Special Concern

Eastern lampmussel, *Lampsilis radiata*

Status: *State:* Threatened (pending) *Federal:* Not listed

Eastern pondmussel, *Ligumia nasuta*

Status: *State:* Threatened (pending) *Federal:* Not listed

Tidewater mucket, *Leptodea ochracea*

Status: *State:* Threatened (pending) *Federal:* Not listed

Triangle floater, *Alasmidonta undulata*

Status: *State:* Threatened (pending) *Federal:* Not listed

Identification

All freshwater mussels have a calcium carbonate bivalve shell that is divided into a left and right half. The shell consists of three layers; the outer periostracum, the middle calcium carbonate, and the inner nacre. The periostracum (or epidermis) protects underlying calcium carbonate from the corrosive action of low pH water and damage from moving sand and gravel. A thin prismatic layer of crystalline calcium carbonate lies beneath the periostracum. The nacre or mother-of-pearl is the innermost and often thickest layer of the shell. It is comprised of thin, stacked calcium carbonate plates that lie parallel to the shell's surface. In many species, the color and texture of the nacre are important for identification.

Lateral and pseudocardinal teeth, separated by an interdentum, are located dorsally inside the shell. Lateral teeth are elongated and raised interlocking structures along the hinge line of a valve, whereas pseudocardinal teeth are triangular-shaped hinge teeth near the shell's anterior-dorsal margin. The interdentum is a flattened area of the hinge plate between the lateral and pseudocardinal teeth. The three points of apposition, which are taxonomically important in most species, serve to hold the two valves together. Some groups entirely lack lateral and pseudocardinal teeth. The umbo or beak is the dorsally raised, inflated area of the bivalve shell. Representing the oldest part of the shell, umbones appear as external swellings and are often points of taxonomic significance.

The valves are held closed by internal muscles. Empty shells show scars of former mussel attachment areas. Freshwater mussels have a large, muscular foot that extends between the valves and functions in locomotion and anchorage. The anterior and posterior retractor muscles draw the foot into the shell, while the anterior protractor helps in foot extension. Large anterior and posterior abductors draw the shell together.

Habitat

New Jersey's Endangered and Threatened Freshwater Mussel Species:

The **dwarf wedgemussel** is a rare freshwater mussel with a trapezoid-to-ovate or "humpbacked" shell rarely exceeding 1.5 in. in length. It is characterized by having two lateral teeth on the right valve of the shell, but only one on the left (thus the species name *heterodon*). The ventral margin is mostly straight. The beaks are low and rounded, projecting only slightly above the hinge line. The periostracum, or outer shell, is dark brown or yellowish brown and often exhibits greenish rays in young mussels. The nacre, or inner shell, is bluish or silvery white.

The dwarf wedgemussel once existed in 70 localities within 15 major Atlantic slope drainage basins from New Brunswick, Canada to North Carolina (U.S. Fish and Wildlife Service 1993). Today however, this species is thought to be extirpated from all but approximately 30 small sites in New Hampshire, Vermont, Maryland, North Carolina, New York, Connecticut, Virginia, and New Jersey.

In New Jersey, the dwarf wedgemussel historically inhabited areas of the Delaware, Hackensack, and Passaic rivers. These populations, however, are thought to

be extirpated because of water quality degradation and other factors. There are only three known active state occurrences of this elusive species; the Paulins Kill, Pequest River, and a portion of the upper Delaware River.

Preferred habitat of the dwarf wedgemussel ranges from muddy sand to sand and gravel/pebble bottoms in rivers and creeks with slow to moderate current. Favoring clean and relatively shallow water with little silt deposition, this species is known to co-occur with other freshwater mussels such as the eastern elliptio (*Elliptio complanata*), triangle floater (*Alasmidonta undulata*), creeper (*Strophitus undulatus*), eastern floater (*Pyganodon cataracta*) and eastern lampmussel (*Lampsilis radiata*).

Fish species identified as suitable hosts for the dwarf wedgemussel include the tessellated darter (*Etheostoma olmstedi*), mottled sculpin (*Cottus bairdi*) and Johnny darter (*Etheostoma nigrum*, not found in N.J.) (Michaelson and Neves 1995).

The **brook floater** has a small, kidney-shaped shell that is slightly thicker towards the anterior. There is a conspicuous posterior slope with wavy ridges perpendicular to the growth lines. The ventral margin is straight and slightly concave centrally. The outer shell color ranges from yellowish brown to dark brown and the nacre is a glossy bluish-white to orange in the umbo region. The pseudocardinal teeth exist as weak knobs and lateral teeth are absent. The species has a bright orange to pinkish foot.

The brook floater ranges from the Savannah River Basin in South Carolina north to the St. Lawrence River Basin in Canada and west to the Ohio River Basin of West Virginia. In New Jersey, there are reported occurrences in the Stony Brook, Musconetcong, Raritan, Lamington and upper Delaware rivers.

Habitat of the brook floater includes rapids or riffles on rock and gravel substrates. The species prefers small streams and is commonly associated with the eastern elliptio (*Elliptio complanata*) (Clarke 1981). Reported host fishes for the species that occur in New Jersey include the slimy sculpin (*Cottus cognatus*), longnose dace (*Rhinichthys cataractae*), golden shiner (*Notemigonus crysoleucas*) and pumpkinseed (*Lepomis gibbosus*).

The **green floater** is a small, rare mussel with an ovate trapezoid shell that is fragile and thin. The posterior ridge is rounded. The outer shell is light yellow or brown with many green rays, especially in juveniles. The pseudocardinal and lateral teeth are small and delicate. The beak cavity is shallow. The nacre can be white to blue and is iridescent towards the posterior end.

The green floater can be found from the Cape Fear River Basin in North Carolina north to the Hudson River Basin and westward to St. Lawrence River Basin in New York. In New Jersey, the species once occurred in the Passaic, Raritan, Delaware, and Pequest rivers, but is now represented by a single known individual in the Stony Brook in Mercer County.

This species can be found in smaller streams, most often in pools and eddies with gravelly and sandy bottoms (Ortmann 1919). It is averse to strong currents (Clarke



Photo courtesy North Carolina
Wildlife Resources Commission

1985). The host fish is not known. There is some evidence that the green floater may not require a host fish in order to complete its life cycle (Barfield and Watters 1998, Lellis and King 1998).

The **yellow lampmussel** has a medium-sized shell, with males elliptical and somewhat elongate and females more ovate. Shells are moderately inflated and thick. The anterior margin is rounded and the ventral margin is slightly curved. The umbos are swollen and raised above the hinge line. The pseudocardinal teeth are compressed and the beak cavity is somewhat deep. The periostracum is smooth, shiny and usually yellow with brown patches.

The nacre is white to bluish white. There may be green or black rays on the posterior slope.

The species ranges from Georgia to the Lower Ottawa River Canada and eastward to Nova Scotia. New Jersey occurrences of the yellow lampmussel are restricted to the Delaware River.

The yellow lampmussel prefers large rivers that drain more than 1,200 sq. Km (Strayer 1993), and is often found in sand/silt substrates. Although the host fish has not been identified, a migratory species such as the alewife is the suspected host.

Shells of the **eastern lampmussel** are elliptical and have a rounded posterior ridge. The posterior and anterior ends are rounded and swollen umbos extend above the hinge line. The periostracum is brown and extensively rayed. The nacre is white and may be tinged with pink or salmon. This species has long lateral teeth and two pseudocardinal teeth on the left and right valves.

The eastern lampmussel ranges from South Carolina north to the St. Lawrence River Basin. In New Jersey, the species is known from locations in the Ramapo, Pequannock, and Wallkill rivers.

The eastern lampmussel is found in a variety of habitats. It is reported to prefer medium to coarse sands. The host fish is unknown.

The **eastern pondmussel** can be distinguished by its bluntly pointed posterior and distinctive posterior ridge. The shells are elongate and twice as long as wide. The dorsal margin is straight and the ventral margin (the side that opens) is curved. The beaks are low and located in the anterior quarter of the shell. The lateral teeth are long and straight. The pseudocardinal teeth are compressed. The nacre is white, but can also vary



Photo courtesy North Carolina
Wildlife Resources Commission



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from an iridescent blue to salmon. The periostracum is greenish yellow to dark olive or brown.

The eastern pondmussel occurs from Cape Fear River Basin, North Carolina, to the St. Lawrence River Basin, Canada, and westward through northern parts of the continent's Interior Basin. In New Jersey, the species can be found in the Delaware River and several of its tributaries.

The eastern pondmussel is often associated with tidewaters. The host fish is unknown.

The **tidewater mucket** appears similar to the yellow lampmussel. The shell is small; males are elliptical and females are ovate, subinflated and thin. The anterior end is rounded; the posterior margin is evenly rounded, somewhat pointed in males and truncated in females. The beaks are moderately swollen, raised above the hinge line, and are located near the middle of the shell. The periostracum is yellow to brown or olive green and is often covered with fine green rays. The pseudocardinal teeth are compressed; the lateral teeth are short and curved. The beak cavity is shallow and the nacre is bluish-white and sometimes pink.

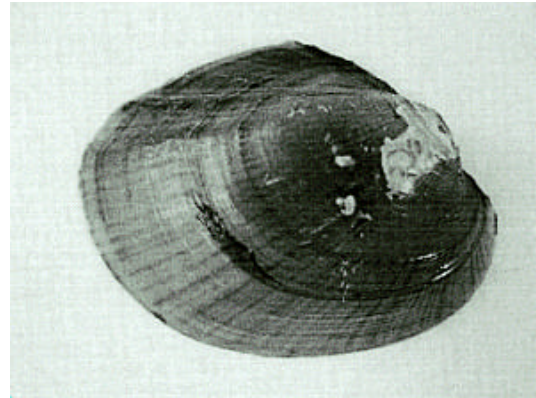


Photo courtesy North Carolina
Wildlife Resources Commission

The tidewater mucket ranges from the Savannah River Drainage Basin in Georgia north into Nova Scotia. In New Jersey, the species occurs in the Delaware River.

This species is associated with tidewaters and can be found in sand/silt substrates. The host fish is undetermined.

The **triangle floater** is a small, ovate to triangular shaped mussel. The lateral teeth are absent, but there is an interdental projection in the left valve. The pseudocardinal teeth are large and well-developed. The periostracum is yellowish-green to black and is extensively rayed. The nacre is pinkish-salmon posteriorly and whitish on the anterior portion.

The triangle floater is a generalist and can be found in a variety of stream and river habitats. The host fish is not determined.

Status and Conservation

The dwarf wedgemussel is afforded protection through federal and state Endangered Species acts, federal and state Clean Water acts, Flood Hazard Area Control Act rules (stream encroachment), and environmental reviews of proposed development projects. The other species listed above are scheduled to be listed as state endangered or threatened in late 2001/early 2002. Federal and state Clean Water acts, stream encroachment rules, environmental reviews of proposed development projects and the state Endangered Species Act will serve to help protect existing populations.

Osprey, *Pandion haliaetus*

Status:

State: Threatened

Federal: Not listed

Identification

The osprey is a large raptor with a wingspan of 4.5 ft. to 6 ft. When gliding, the osprey's long, narrow wings are pulled towards the body and its silhouette is analogous to an "M" shape, closely resembling a gull in flight. In a shallow glide or full soar, the wings are bowed downwards. Ospreys fly with stiff and shallow wing beats, pumping the head and body up and down while flapping.



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The adult osprey is dark brown above and light below. The underside is white with contrasting dark carpal ("wrist") patches and barred flight feathers. The head is white with a broad, black eye stripe that extends to the back of the neck. The tail and flight feathers are dark brown with faint white bands. Adult females and juveniles of both sexes exhibit a "necklace" of dark feathers contrasting with the white feathers of the upper breast. The intensity of this necklace varies among individuals, with some adult males also displaying this trait. Females are only slightly larger than males and, excluding the necklace, the plumage of both sexes is identical. Juvenile ospreys closely resemble adults. However, juveniles exhibit buffy tips to the upperwing coverts, a more heavily streaked crown, mottled carpal patches, and a tawny wash to the underwing that fades by the following spring.

On all ages, the osprey has a pale blue-gray cere (fleshy area behind the base of the bill) and legs. Their toes are equipped with tiny spines, or spicules, that enable them to grasp slippery fish. The bill is black and strongly hooked with a sharp tip for piercing the skin of fish. The osprey's eye color changes from blood red in nestlings to orange-yellow in juveniles to yellow in adults. The osprey's call is a high-pitched, down-slurred whistle that is often repeated in a short series.

Habitat

As a piscivorous species, the osprey is strictly associated with bodies of water that support adequate fish populations. Consequently, ospreys inhabit coastal rivers, marshes, bays, and inlets as well as inland rivers, lakes, and reservoirs. Ospreys nest on live or dead trees, man-made nesting platforms, light poles, channel markers, abandoned duck blinds, or other artificial structures that are in close proximity to fishing areas and offer an unobstructed view of the surrounding landscape. Infrequently, ospreys nest on the ground within coastal marshes. Territories typically contain poles, snags, or structures near the nest on which the ospreys perch.

Status and Conservation

In the 1800s, the osprey was an abundant breeding species along the New Jersey coast. In 1884, there were 100 nests at Seven Mile Beach, currently Avalon/Stone Harbor, alone. However, by 1890, the number of ospreys nesting at Seven Mile Beach shrank to only 25 pairs, and similar declines were evident throughout the state. These early population declines are attributed to habitat loss, eradication of nest trees, egg collecting, and shooting. Further declines in the osprey population continued through the turn of the century and into the 1930s and 1940s. As human settlement along the coast increased during this time, trees that were used by ospreys as nesting sites were destroyed.

The pesticide DDT was first used to control mosquitoes in Cape May County marshes in 1946 and was applied at increasing rates until 1964. When introduced into the environment, DDT enters the food chain and bioaccumulates at each trophic level, contaminating top level predators such as the osprey with high doses of this biologically harmful pesticide. DDT contamination inhibits calcium metabolism in birds, reducing the thickness of the eggshell. When an adult bird attempts to incubate an egg with a thinned shell, the egg will break under the weight of the bird. Because DDT contamination may remain within an adult osprey's body for years, pairs can continue to experience reproductive failure over a long period of time.

Following the use of DDT, osprey populations in New Jersey plummeted due to several decades of poor productivity. Prior to the 1950s, the osprey population in New Jersey was estimated at 500 pairs (Leck 1984). In 1950, there were 253 nesting pairs along the Atlantic Coast of New Jersey south of Barnegat Light. By 1975, only 53 pairs remained in this area and a total of only 68 pairs remained statewide.

Due to its disastrous environmental impacts, the use of DDT was banned in New Jersey in 1968 and in the United States in 1972. However, because of its persistence in biological systems, contamination from DDT and its metabolite, DDE, continued to impair osprey productivity. Ospreys in areas that experienced the most severe population declines and the lowest productivity in the state were also found to contain the highest DDT levels in their eggs. Osprey eggs collected in New Jersey during the early 1970s yielded much higher DDT and DDE concentrations than those from other states. In addition, analysis of eggs from New Jersey ospreys also revealed contamination from PCBs.

Pesticide contamination and habitat loss had reduced New Jersey's osprey population to a tiny fraction of its former level. Consequently, the osprey was one of the first species to be included on the New Jersey Endangered Species List when the New Jersey Endangered Species Conservation Act passed in 1974. With this legislation came the establishment of the New Jersey Endangered and Nongame Species Program (ENSP), a team of biologists dedicated to the conservation of New Jersey's imperiled wildlife. In 1979, the ENSP began an osprey reintroduction program in which biologists transplanted eggs from healthy nests in the Chesapeake Bay area into active, but unsuccessful, New Jersey nests. In addition, biologists erected nesting platforms to support a growing population and began annual surveys to monitor osprey productivity.

Slowly, the osprey population began to recover, as nesting success improved and the number of nesting pairs increased each year. The state population grew from a low of 68 pairs in 1975 to 87 pairs in 1981. Productivity had improved from 0.42 young per active nest in 1968-1972 to 0.97 in 1979 and to 1.18 in 1982-1984. Due to its improved reproductive success, its acceptance of man-made nesting structures, and the decline of persistent pesticides, the status of the osprey was changed from endangered to threatened in New Jersey in 1985. The osprey, brought back from the brink, was the first to be removed from the endangered species list in New Jersey. The New Jersey Natural Heritage Program considers the osprey to be “demonstrably secure globally” yet “rare in New Jersey” (Office of Natural Lands Management 1992).

After 1985, New Jersey’s osprey population grew beyond 200 pairs and productivity was stable at around 1.3 to 1.5 young per active nest. The ban of DDT, the reintroduction of healthy eggs, and the ospreys' acceptance of artificial nest sites are largely responsible for this species’ recovery.

However, despite increases in productivity along the Atlantic Coast, osprey production along the Delaware Bay Coast, particularly in Salem County, remained low throughout the 1980s. Productivity in Salem County, which averaged 0.63 young per active nest from 1974 to 1984, was well below productivity in other areas of the state, which often exceeded one young per active nest. In addition, the number of active nests in Salem County declined from 1984 to 1987. In 1987, ENSP biologists initiated an investigation into the poor productivity of this population. Contaminant analysis revealed that Delaware Bay ospreys experienced more severe eggshell thinning and higher levels of contaminants such as DDE, DDD, PCBs, and dieldrin heptachlor epoxide than Atlantic Coast ospreys. In addition, fish samples collected from Delaware Bay in 1990 contained higher contaminant levels than those from the Atlantic Coast. Osprey eggs and blood collected from Salem County nests from 1991 to 1994 were compared to samples taken from declining populations around the Great Lakes. The analysis revealed that ospreys nesting along Delaware Bay had higher organochlorine and PCB levels than Great Lakes osprey populations. However, by the late 1990s, organochlorine pesticide levels had declined in osprey eggs and fish collected along the Delaware Bay, allowing for improved nesting productivity in this area. Productivity among Delaware Bay nests averaged a very healthy 1.78 young per nest in 2001.

Ospreys nesting along the Atlantic Coast of New Jersey experienced a dramatic reduction in productivity in 1997 and 1998, possibly due to a scarcity of prey. But productivity, which averaged only 0.6 young per nest along the Atlantic Coast during these years, returned to a normal average of 1.3 young per nest in 1999 and 2000, and increased to nearly 1.6 in 2001. The biennial aerial osprey survey in 2001 tallied 340 pairs in the state, the majority of which were located along the Atlantic Coast.

Red-headed woodpecker, *Melanerpes erythrocephalus*

Status:

State: Threatened

Federal: Not listed

Identification

The red-headed woodpecker is a robin-sized bird, readily distinguished by its vibrant black, white, and red plumage. Brilliant red cloaks the head, neck, and throat and is separated from the white breast by a thin black border. The belly, undertail coverts, and rump are white, contrasting with the black tail, back, and upperwing coverts. White inner secondaries and tertials adjacent to black outer secondaries and primaries (flight feathers) form a white patch on the inner wing that is conspicuous in flight.

Though they lack the striking plumage of adults, juvenile red-headed woodpeckers are similarly patterned. The head and wings of juveniles are brown and the white belly has a variable amount of brown streaking. The back is brown with dark brown barring and the white wing patch is also marked with dark barring. During their first fall and winter, juveniles molt into adult plumage.

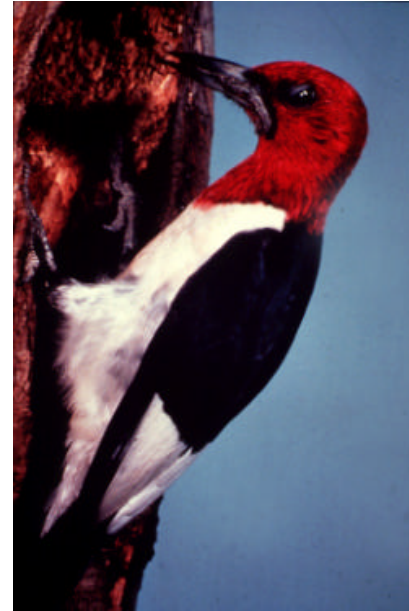


Photo courtesy NJ ENSP

Although the male is slightly larger, the sexes are indistinguishable by plumage. On all ages and sexes, the iris is brown and the legs are gray. The chisel-shaped bill is heavy and colored blue-gray. Like other woodpeckers, the red-headed has zygodactyl feet, in which two toes point forward and two point backward, enabling it to cling vertically to trees. In addition, the tail feathers are stiff and pointed, serving to prop the woodpecker up against a tree. Red-headed woodpeckers fly low over the ground in an undulating manner. The call of the red-headed woodpecker is a repeated “qweer”.

Habitat

Red-headed woodpeckers inhabit open woods, both upland and wetland, that contain dead or dying trees and sparse undergrowth. Such habitat is often created by disturbances such as fire, flooding, or insect outbreaks. A sparse understory is favored for foraging and dead or dying trees are required for nesting. Red-headed woodpeckers occupy similar habitats throughout the year, seeking wintering sites such as open riparian or pine forests and orchards that contain nut and mast producing trees.

In southern New Jersey, typical red-headed woodpecker nesting sites include upland oak or mixed oak/pine forests that contain both living and dead trees. Pitch pine (*Pinus rigida*), white oak (*Quercus alba*), and red oak (*Q. rubra*) are often found in the overstory and lowbush blueberry (*Vaccinium vacillans*) or huckleberry (*Gaylussacia spp.*) dominate the ground cover. In northern New Jersey, red-headed woodpeckers breed in open upland forests, beaver marshes, or wetland forests associated with floodplains or

swamps. Such wetland habitats, which often provide an abundance of dead trees, may contain oak (*Quercus spp.*), hickory (*Carya spp.*), elm (*Ulmus spp.*), and hackberry (*Celtis occidentalis*) in the overstory and sedge (*Carex spp.*) on the ground.

Status and Conservation

During the late 1700s and 1800s, the red-headed woodpecker was a common and widespread species in the Northeast. In the 1870s and 1880s, large concentrations of these birds, including flights of several hundred, were observed during fall migration at New York and Long Island, where it is now an uncommon migrant. Stone (1965) stated that the red-headed woodpecker was a rare fall migrant at Cape May, with only one to two records, on average, per year. Currently, an average of eight per season is observed each fall at Cape May (Sibley 1997). This apparent increase in the number of birds recorded at Cape May is likely due to increased coverage by birders rather than an actual increase in red-headed woodpecker populations. Stone (1908) also described the red-headed woodpecker as a rare breeder in south Jersey that was “never found in the Pine Barrens.” However, this again may reflect a lack of coverage during historic times.

By the turn of the 20th century, red-headed woodpeckers had suffered population declines due to road mortality, competition with European starlings for nesting cavities, and harvesting for the millinery trade in which populations of many avian species were greatly reduced to provide feathers for women’s hats. Farmers at this time also killed red-headed woodpeckers because they damaged fruit and berry crops. Further population declines resulting from habitat loss, limited availability of nesting sites, and road mortality were noted from the 1930s to the 1970s. Red-headed woodpeckers experienced declines survey-wide on Christmas Bird Counts from 1959 to 1988 (Sauer et al. 1996). The Breeding Bird Survey detected annual declines of red-headed woodpeckers in New Jersey and the northeast from 1966 to 1999 (Sauer et al. 2001). Currently, the species is considered to be rare in the Northeast.

Due to population declines, the red-headed woodpecker was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the red-headed woodpecker to be “demonstrably secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1998). Loss of breeding habitat and regional population declines in areas such as New Jersey and New York led the National Audubon Society to include the red-headed woodpecker on its Blue List of Imperiled Species in 1972 and from 1976 to 1981 (Arbib 1975, Tate 1986). In addition, the National Audubon Society has recognized the red-headed woodpecker as a species of special concern since 1982 (Tate 1986).

Red-shouldered Hawk, *Buteo lineatus*

Status: *State:* Endangered (breeding population), Threatened (nonbreeding population)
Federal: Migratory Nongame Bird of Management Concern

Identification

The red-shouldered hawk is a crow-sized buteo, or soaring hawk. The adults are strikingly plumed, with rufous (brownish red) shoulder patches and a rufous barred breast. Rufous lesser and median upperwing coverts form the “red shoulders” evident on this species. The flight feathers of adults are barred black and white and show a white crescent-shaped window across the primaries,



which is visible in flight. The underparts, which are rufous with white barring, often exhibit thin, dark streaks on the chest. The head and back are dark brown. The black tail is bisected by several narrow white bands. Although females average slightly larger than males, plumage is similar for both sexes. The call of the red-shouldered hawk is a series of nasal drawn-out “aahhh” cries.

Juvenile red-shouldered hawks can be distinguished from adults by their overall browner, less brilliant plumage. The shoulder patches of juveniles are paler rufous and the crescents across the primaries are tawny. The underparts are whitish with variable amounts of brown streaking. The tail is brown with several thin pale bands. Adult plumage appears in the second year.

The red-shouldered hawk is a long-tailed buteo with squared-off wings and a protruding head. Characterized by quick choppy wingbeats interspersed with short glides, the flight style of this hawk is similar to that of an accipiter. When soaring, most buteos hold their wings straight out, whereas the red-shouldered hawk bows its wings forward.

Habitat

Mature wet woods such as hardwood swamps and riparian forests typify red-shouldered hawk breeding habitat. Nesting territories, which occur in deciduous, coniferous, or mixed woodlands, are typically located within remote and extensive old growth forests containing standing water. Consequently, breeding barred owls (*Strix varia*) and Cooper’s hawks (*Accipiter cooperii*) are often found in habitats containing red-shouldered hawks.

Red-shouldered hawks select large deciduous and, to a lesser extent, coniferous trees for nesting. Nests have been documented in oak (*Quercus spp.*), pine (*Pinus spp.*), maple (*Acer spp.*), ash (*Fraxinus spp.*), beech (*Fagus grandifolia*), birch (*Betula spp.*),

basswood (*Tilia americana*), chestnut (*Castanea dentata*), hemlock (*Tsuga canadensis*), elm (*Ulmus spp.*), cherry (*Prunus spp.*), hickory (*Carya spp.*), and tulip poplar (*Liriodendron tulipifera*). Forest characteristics include a closed canopy of tall trees, an open subcanopy, and variable amounts of understory cover.

Red-shouldered hawks inhabit wetland forest types unique to the different physiographic regions throughout northern and southern New Jersey. In north Jersey, they occupy riparian forests, wooded wetlands, beaver meadows, and mesic (slightly moist) lowland forests. Within the Pequannock Watershed, red-shouldered hawks are found in stream bottomlands and coniferous or mixed forests containing eastern hemlock or white pine (*Pinus strobus*). Nests are predominately located in wilderness areas where there are abundant wetlands, small forest openings, and limited areas of large open water such as lakes. In the Pequannock Watershed, red-shouldered hawks avoid areas of human inhabitation, steep uplands, dry slopes, open water, areas with limited conifers, and areas with too many or too few forest openings. Although red-shouldered hawks require extensive tracts of forested habitat for nesting, territories may also contain edges where the birds forage.

The majority of red-shouldered hawk nests in southern New Jersey are contained within vast contiguous freshwater wetlands. Hardwood or mixed hardwood/cedar swamps containing red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), sweetbay magnolia (*Magnolia virginiana*), and Atlantic white cedar (*Chamaecyparis thyoides*) are occupied by red-shouldered hawks. Often, such large forested tracts are surrounded by oak/pine forests or agricultural fields. Although red-shouldered hawks nest in large contiguous tracts of wet old growth forests in Cumberland County, they occupy younger wet woods, often on private property safeguarded from high levels of human activity, in Cape May County.

An-area sensitive species, the red-shouldered hawk typically nests away from residences, roads, and development. In the Pequannock Watershed, red-shouldered hawk nests were located an average of 1,013 m and a standard deviation of plus or minus 614 m ($3,324 \pm 2,014$ ft.) from the nearest building; and an average of 812 m and a standard deviation of plus or minus 634 m ($2,664 \pm 2,080$ ft) from the nearest road (Bosakowski et al. 1991). Red-shouldered hawks avoid small fragmented woodlots and forests that do not contain trees large enough for nesting.

Red-shouldered hawks require large contiguous wooded tracts of 100 to 250 hectares (250 to 620 acres) (Johnsgard 1990). Eastern populations occupy breeding home ranges of 109 to 339 hectares (270 to 838 acres) (Crocoll 1994). In the Pequannock Watershed, red-shouldered hawk breeding densities were estimated at one nest per 450 hectares (1,112 acres) with an average distance of 1.2 to 1.6 km (0.75 to 1.0 mi.) between nests in areas containing the highest breeding concentrations (Bosakowski et al. 1991). Home range sizes of males exceed those of females, during both the breeding and nonbreeding seasons. Individuals of either sex may expand their home ranges while rearing young or throughout the winter months.

During the nonbreeding season, red-shouldered hawks are less restrictive in their habitat use. They inhabit the traditional wetland forests occupied during the breeding season as well as uplands, fragmented woods, smaller forests, open areas, and edges.

Status and Conservation

The red-shouldered hawk was once considered a common resident of wet lowland forests in New Jersey. Only a century ago, bounties were placed on birds of prey, which were accused of poultry and game predation. This unfortunate practice, coupled with egg collecting and the placement of wild red-shouldered hawks in captivity, may have caused initial population declines. The clearing of forests and filling of wetlands exacerbated red-shouldered hawk declines, which were noted as early as the mid-1920s. Reduced numbers of red-shouldered hawks wintering in New Jersey were documented from the early 1950s to the 1970s, as development increased and forest contiguity and patch size decreased. As a result, the red-shouldered hawk, with an estimated 100 breeding pairs in the state, was listed as a threatened species in New Jersey in 1979. In 1982, the U.S. Fish and Wildlife Service listed the red-shouldered hawk as a Migratory Nongame Bird of Management Concern due to population declines and restricted habitat requirements. In addition, the red-shouldered hawk was included on the National Audubon Society's Blue List of Imperiled Species from 1972 to 1986, the final year of the list.

During the 1980s, habitat loss continued to pose an increasing threat, causing red-shouldered hawk populations to decline ever further. By the late 1980s and early 1990s, the state's breeding population was estimated at only 36 pairs, nearly one-third the population size at the time of original listing. As a result, the breeding population of the red-shouldered hawk was reclassified as endangered in 1991. The nonbreeding population remained listed as threatened. The New Jersey Natural Heritage Program considers the red-shouldered hawk to be "demonstrably secure globally," yet "imperiled in New Jersey because of rarity" (Office of Natural Lands Management 1992). Habitat loss and declines of red-shouldered hawks in the Northeast have resulted in the listing of this species as threatened in New York and of special concern in Connecticut.

Shortnose Sturgeon, *Acipenser brevirostrum*

Status:

State: Endangered

Federal: Endangered

Identification

The shortnose sturgeon has a short and bluntly rounded snout, wide mouth, barbels, numerous dorsal, lateral and ventral scutes (bony or horny plates), and a heterocercal tail (the upper lobe of the tail fin is larger and contains the upturned end of the spinal column). Typically, the body is yellowish brown to nearly black on the head, back and sides level to lateral plates, and whitish to yellowish below. Length at initial



Joshua D. Ingram, courtesy John C. O'Herron, II

maturity for this species occurs between 45-55 cm fork length, from the snout to the middle of the tail (18-22 in.) for males and females (Dadswell *et al.* 1984). Maximum known fork lengths are nearly 49 in. for a female and nearly 39 in. for a male. In New Jersey, 28 tagged males ranged between 21 in. to nearly 35 in. fork length.

Habitat

River mouths, tidal rivers, estuaries, and bays serve as prime habitat for the shortnose sturgeon. In addition, individuals occasionally enter the open ocean. A significant portion of New Jersey's shortnose sturgeon occurs in the upper tidal Delaware River (Dadswell *et al.* 1984).

Status and Conservation

The shortnose sturgeon has been federally listed as endangered since the inception of the Endangered Species Act in 1973, when it was also considered endangered in New Jersey. The Office of Natural Land's Management ranks the species as "rare in N.J." and "either very rare and local throughout its range or found locally in a restricted range or because of other factors making it vulnerable to extinction throughout its range."

This species is afforded protection under both federal and state Endangered Species acts, Clean Water acts, fishing regulations, and environmental review of proposed development projects.

Wood Turtle, *Clemmys insculpta*

Status:

State: Threatened

Federal: Not listed

Identification

As the taxonomic name insculpta indicates, the wood turtle is distinguished by the sculpted or grooved appearance of its carapace, or upper shell. Each season a new annulus, or ridge, is formed, giving each scute (a scale-like horny layer) a distinctive pyramid-shaped appearance. As the turtle ages, natural wear smooths the surface of the shell. While the scutes of the carapace are brown, the plastron, or underneath shell, consists of



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yellow scutes with brown or black blotches on each outer edge. The legs and throat are reddish-orange. The male wood turtle has a concave plastron while that of the female is flat or convex. The male also has a thicker tail than the female. Adult wood turtles measure 14 to 20 cm (5.5 to 8.0 in.) in length (Conant and Collins 1991).

Habitat

Unlike other turtle species that favor either land or water, the wood turtle resides in both aquatic and terrestrial environments. Aquatic habitats are required for mating, feeding, and hibernation, while terrestrial habitats are used for egg laying and foraging. Freshwater streams, brooks, creeks, or rivers that are relatively remote provide the habitat needed by these turtles. Consequently, wood turtles are often found within streams containing native brook trout (Salvelinus fontinalis). These tributaries are characteristically clean, free of litter and pollutants, and occur within undisturbed uplands such as fields, meadows, or forests. Open fields and thickets of alder (Alnus spp.), greenbrier (Smilax spp.), or multiflora rose (Rosa multiflora) are favored basking habitats. Lowland, mid-successional forests dominated by oaks (Quercus spp.), black birch (Betula lenta), and red maple (Acer rubrum) may also be used. Wood turtles may also be found on abandoned railroad beds or agricultural fields and pastures. Nevertheless, wood turtle habitats typically contain few roads and are often over one-half of a mile away from developed or populated areas (Zappalorti et al. 1984). Individuals from relict or declining populations are also sighted in areas of formally good habitat that have been fragmented by roads and development.

Status and Conservation

Historically, the wood turtle was a fairly common species within suitable habitat in New Jersey. By the 1970s, however, declines were noted as wood turtles were absent from many historic sites due to habitat loss and stream degradation. Consequently, the wood turtle was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the wood turtle to be “demonstrably secure globally,” yet “rare in New Jersey” (Office of Natural Lands Management 1992).

Since the late 1970s, biologists have monitored and surveyed wood turtle sites in New Jersey, providing valuable data regarding the life history, reproduction, and habitat use of these turtles in the state. There is, however, a continuing need to examine the productivity and juvenile survival of wood turtles, which may be threatened by disturbance or predation.

In 1995, the wood turtle was proposed for inclusion on the federal endangered species list. Despite declines in several northeastern states, populations were considered stable enough throughout the species’ entire range to deny listing. However, the wood turtle was considered by the U.S. Fish and Wildlife Service as a species that, “although not necessarily now threatened with extinction may become so unless trade in them is strictly controlled” (U.S. Fish and Wildlife Service 1995). As a result, international trade of these turtles is strictly monitored and regulated through the CITES Act (Convention on International Trade in Endangered Species of Wild Flora and Fauna Act). The New Jersey Endangered Species Act prohibits the collection or possession of wood turtles.