



Mid-America Bigfoot Research Center
Project Endangered Species
Oklahoma Edition

Updated April 22, 2010

AMERICAN BURYING BEETLE
(*Nicrophorus americanus*)



Species Range

Description

Burying beetles are generally black, with red, yellow or orange markings on the elytra , or wing covers. The American burying beetle is easy to separate from the common burying beetles. It is larger, measuring up to 1.5 inches (30-35 mm) in length. The major distinguishing feature, other than size, is the large red or reddish-orange spot on the pronotal disk covering the thorax.





American Burying Beetle Larval Stage

Distribution

Formerly, this species was widespread and common throughout Eastern North America. Currently, wild populations are known only from Block Island in Rhode Island, Eastern Oklahoma and on the Valentine National Wildlife Refuge in Nebraska. This species, when present, is easy to collect and is found in many older insect collections.

Natural History

Preferred habitat of the American burying beetle is not well documented, but areas of mixed woodlands and grasslands with soils suitable for burying carcasses seem to meet the species' habitat requirements. The beetles are active at night, with peak activity occurring when nighttime temperatures remain above 60 degrees F (15 degrees C).

The habits and reproductive activities of the American burying beetle are similar to other burying beetles. Both males and females have highly sensitive chemical receptors in their antennae. These receptors allow the beetles to locate decomposing carcasses from long distances. A carcass may provide food for the adults or it may be used for the reproductive effort.

Reproduction occurs in June or July. A carcass of suitable size must be located. A carcass weighing from 2 to 7 ounces (50-200 grams) is preferred. An adult male and female will bury the carcass and form a chamber around it. Typical carcass species include mice, snakes, fish, and other small animals. The pair will remove feathers, fur or fly eggs and shape the carcass into a ball. A preservative in the anal and oral secretions of these insects retards decomposition of the carrion. Thirty or more eggs are laid near the preserved carcass. When the eggs hatch, the young are fed by the adults until they are able to feed themselves from the preserved carcass (see Figure 1). Burying beetles are among the few insects that provide parental care for their young. Parental care by at least one adult continues until the larvae disperse to pupate. The larvae burrow into the soil, pupate and emerge as adults. The entire process of brood rearing and pupation occurs over a period of 48 to 56 days. The new adults will spend the winter in the soil and breed the following summer. The older adults usually do not survive another winter.

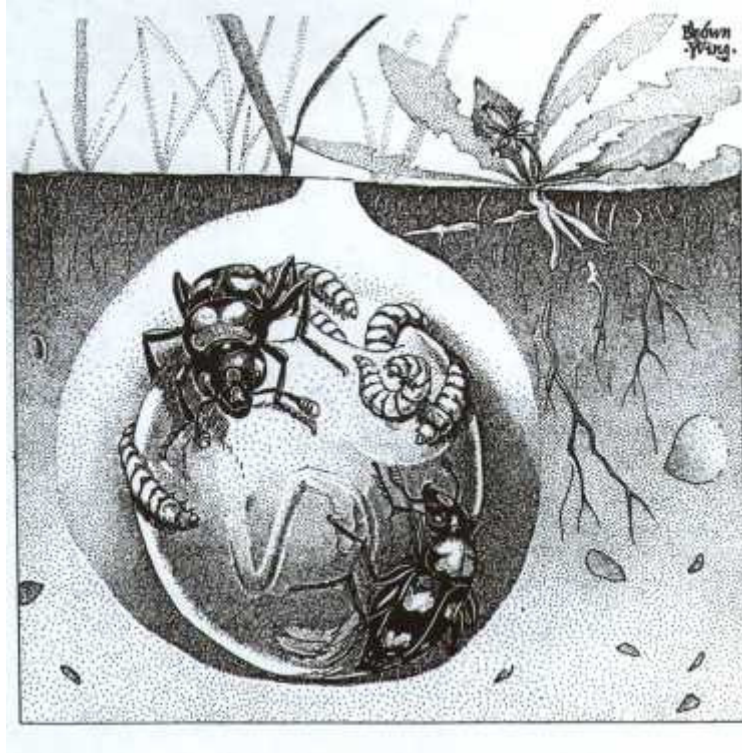


Figure 1: Adult And Larval Burying Beetles With Carrion

Burying beetles have a symbiotic (mutually beneficial) relationship with a group of mites of the genus *Poecilochirus*. As many as 14 species of these mites are known to be carried by burying beetles, including the American burying beetle. The beetles provide the mites with a means of dispersal and access to food while the mites clean the beetles of microbes and fly eggs that are picked up from carrion.

Significance

Burying beetles are important recyclers of nutrients in terrestrial ecosystems. By burying and eating carrion, they remove a source of food from flies, which are often pests and health threats. Burying beetles also feed on fly eggs and larvae, helping to reduce their numbers.

Very little is known about the decline of the American burying beetle. The factor(s) responsible for its near extinction apparently have not affected other closely related species. For this reason, the usual causes of declines or

extinctions, such as habitat loss, do not seem to be valid. Some experts hypothesize that the American burying beetle's decline began with the loss of the huge numbers of passenger pigeons and other formerly numerous birds such as prairie chickens, wild turkeys, and possibly waterfowl. The young of these species would have provided the preferred carcass size at the optimum time for burying beetle reproduction. An understanding of the cause or causes for the decline of this formerly common species may be important in preventing similar declines of other related species.

Conservation Measures

The former abundance and widespread distribution of the American burying beetle is documented in the numerous specimens in older insect collections. Entomologists noticed that specimens were very rare in recent collections and petitioned the U.S. Fish and Wildlife Service to list the species under the Endangered Species Act. Further field investigations confirmed that the species was near extinction. The American burying beetle was listed as endangered in 1989.

Conservation measures are difficult to plan because little is known about the habitat requirements and the reasons for the decline of this species. It may be possible to reintroduce the species into some of its former habitat. Captive populations have produced enough beetles for reintroduction to occur on one island off the coast of Massachusetts. This reintroduction appears to be successful so far. Before reintroductions can successfully occur inland in South Dakota, biologists need to know more about the causes of the decline of the American burying beetle, to insure that the same fate doesn't befall reintroduced populations.

Individuals can help by removing electronic bug-zappers, which provide insignificant control of the mosquitoes for which they are intended. These devices attract and kill burying beetles, as well as many other kinds of beneficial insects.

Glossary

Carrion - decaying flesh of a dead animal.

Chemical receptors - sensory cells that detect small concentrations of molecules from some chemical stimuli, such as carrion or sex pheromones, used to attract members of the other sex.

Elytra - the hardened front wings of insects, such as beetles, that act as a protective covering for the rear wings.

Entomologists - scientists who study insect biology.

Genus - a group of species that are closely related.

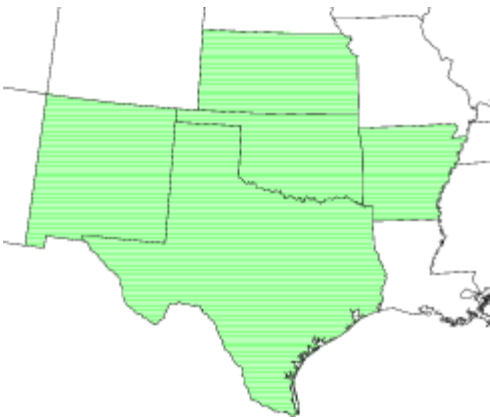
Hypothesize - to make an interpretation or assumption that has not been tested.

Pupate - entering the stage of life of an insect, between the larval and adult stage, when metamorphosis occurs. This usually occurs in a cocoon or case.

Pronotum - a hard covering over the thorax of some insects.

Thorax - the middle section of the three basic body sections of an insect: head, thorax , abdomen.

Arkansas River shiner
(*Notropis girardi*)



Species Range



Kingdom: Animalia **Class:** Actinopterygii **Order:** Cypriniformes **Family:** Cyprinidae

Listing Status: Threatened

The Arkansas River shiner *Notropis girardi* is a small, heavy-bodied minnow with a rounded snout and small mouth. Its coloration tends to be sandy above and silver laterally, grading to white on the belly. Dorsal scales are typically outlined with dark pigment. The shiner feeds mostly on aquatic invertebrates. It is believed to spawn during the months of May, June and July in conjunction with flows following heavy rains. Eggs drift with the current during high flows until hatching occurs. If conditions are favorable, the shiner may reproduce several times during this period.

The shiner is native to wide, sandy-bottomed streams of the Arkansas River drainage in Arkansas, Kansas, New Mexico, Oklahoma, and Texas. Historically, it was abundant throughout these portions of the Arkansas River and its major tributaries. The shiner is presently almost entirely restricted to the Canadian/South Canadian River in Oklahoma,

Texas, and New Mexico, a distance of about 508 river miles. A small, relict population is believed to remain in the upper Cimarron River in Kansas and Oklahoma. A remnant population also may persist in the Beaver/North Canadian River of OK, based on collection of only four individuals since 1990. However, in 2001, biologists conducted an extensive survey on the Beaver/North Canadian River and failed to find Arkansas River shiners.

Surveys in the Arkansas River Basin from 1976 to 2002 documented that the shiner has disappeared from more than 80 percent of its historic range in the last 40 years. The species is threatened by habitat destruction and modification from stream dewatering or depletion due to diversion of surface water and groundwater pumping, construction of impoundments, and water quality degradation.

Competition with introduced fishes contributed to diminished distribution and abundance of the shiner in the Cimarron River. Incidental capture of the shiner and potential introductions of non-native minnows during pursuit of commercial baitfish species also may contribute to reduced population sizes. The adverse effects of drought and other natural factors are only exacerbated by the impacts mentioned above.

The Arkansas River shiner first received consideration as a candidate for listing under the Endangered Species Act after a nationwide review of vertebrate species was conducted by the U.S. Fish and Wildlife Service in 1985. Mr. Jimmie Pigg with the Oklahoma Department of Environmental Quality first provided detailed information on the status of the species in Oklahoma to the Service in 1989. Additional information on the shiner was obtained by the Service and presented in a status report published in 1990.

A survey, funded by the Service in 1989 and published in the summer of 1991, provided status information on the Arkansas River shiner throughout its historic range. In November 1991, the shiner was reclassified as a category 1 candidate. Category 1, at that time, comprised those taxa for which the Service had substantial information on biological vulnerability and threat to support proposals to list the taxa as endangered or threatened. On February 28, 1996 (61 FR 7596), the Service published regulations in the *Federal Register* discontinuing candidate category 2 status and recognizing only category 1 species as candidates for listing purposes.

A proposed rule to list the shiner as endangered was published on August 3, 1994. Three

public hearings were held in January 1995. Processing of the proposed rule was subsequently delayed by a congressional moratorium on activities associated with final listings from April 1995 to April 1996. At that time, the Service was prohibited from making final determinations on listing proposals.

On December 5, 1997, the Service reopened the comment period on the proposed rule to ensure that all relevant data were provided to the Service, and to allow the public to review and comment on information the Service had obtained since August 1994. New information received during the comment periods suggested that some threats to this species were less severe than initially presented in the proposed rule. Based on this new information, the Service determined that listing as threatened was more appropriate. The final rule listing the Arkansas River basin population of the ARS as a threatened species was published on

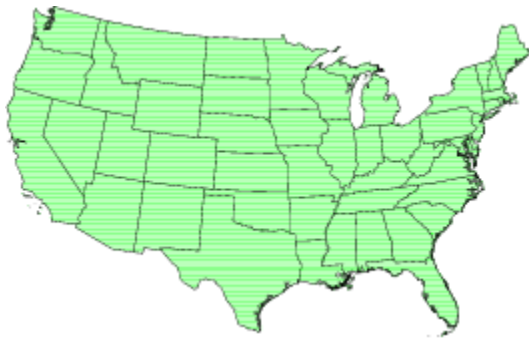
November 23, 1998. Critical habitat was determined to not provide any benefit to the shiner beyond listing the species as threatened, therefore was not included in the final rule.

On February 16, 2000, responding to a lawsuit, Center for Biological Diversity v. Bruce Babbitt, et al. C99-3202 SC, the Service negotiated a settlement order in which we agreed to reconsider the question of whether critical habitat would be prudent; and, if designation of critical habitat is prudent, we agreed to subsequently propose designation of critical habitat for the Arkansas River Basin population of the Arkansas River shiner by June 23, 2000.

Prior to this agreement a series of court decisions had overturned Service not prudent determinations regarding for a variety of species that designation (for example, Natural Resources Defense Council v. U.S. Department of the Interior 113 F. 3d 1121 (9th Cir. 1997); Conservation Council for Hawaii v. Babbitt, 2 F. Supp. 2d 1280 (D. Hawaii 1998)). Based on the standards applied in those judicial opinions, the Service re-examined the question of whether designation of critical habitat for the Arkansas River Basin population of

the Arkansas River shiner was prudent. Subsequently, in June of 2000, the Service published the proposed rule to designate critical habitat for the Arkansas River shiner. Following public comment and further analysis, critical habitat was designated April 4, 2001.

Bald Eagle
(*Haliaeetus leucocephalus*)



Species Range



The bald eagle (*Haliaeetus leucocephalus*), our national bird, is the only eagle unique to North America. The bald eagle's scientific name signifies a sea (*halo*) eagle (*aeetos*) with a white (*leukos*) head. At one time, the word "bald" meant "white," not hairless. Bald eagles are found throughout most of North America, from Alaska and Canada to northern Mexico. About half of the world's 70,000 bald eagles live in Alaska. Combined with British Columbia's population of about 20,000, the northwest coast of North America is by far their greatest stronghold for bald eagles. They flourish here in part because of the salmon. Dead or dying fish are an important food source for all bald eagles.

Eagles are a member of the **Accipitridae family**; which also includes hawks, kites, and old-world vultures.

Scientists loosely divide eagles into four groups based on their physical characteristics and behavior. The bald eagle is a sea or fish eagle.

There are two subspecies of bald eagles. The "southern" bald eagle, *Haliaeetus leucocephalus leucocephalus*, is found in the Gulf States from Texas and Baja California across to South Carolina and Florida, south of 40 degrees north latitude.

The "northern" bald eagle, *Haliaeetus leucocephalus alascanus*, is found north of 40 degrees north latitude across the entire continent. The largest numbers of northern bald eagles are in the Northwest, especially in Alaska. The "northern" bald eagle is slightly larger than the "southern" bald eagle. Studies have shown that "northern" bald eagles fly into the southern states and Mexico, and the "southern" bald eagles fly north into Canada. Because of these findings, the subspecies of "northern" and "southern" bald eagles has been discontinued in recent literature.

Bald eagles were officially declared an endangered species in 1967 in all areas of the United States south of the 40th parallel, under a law that preceded the Endangered Species Act of 1973.

Until 1995, the bald eagle had been listed as endangered under the Endangered Species Act in 43 of the 48 lower states, and listed as threatened in Wisconsin, Minnesota, Michigan, Washington and Oregon. In July of 1995, the US Fish and Wildlife Service upgraded the status of bald eagles in the lower 48 states to "threatened."

On June 28, 2007 the Interior Department took the American bald eagle off the Endangered Species List. The bald eagle will still be protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Bald Eagle Protection Act prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a permit. Native Americans are able to possess these emblems which are traditional in their culture.

Black-capped Vireo
(*Vireo atricapilla*)



Species Range



The black-capped vireo breeds in a relatively narrow area of the south-central United States and north-central Mexico. It was likely extirpated from Kansas by the 1930's and is now gravely endangered in Oklahoma and much of the northern, eastern, and central portions of its range in Texas. Among the most influential factors contributing to its decline are: nest parasitism by the brown-headed cowbird, habitat deterioration through destruction, and natural successional changes resulting from fire suppression.

The black-capped vireo has been designated an endangered species by the U.S. Fish and Wildlife Service, and is a major component of wildlife management interests on the Wichita Mountains Wildlife Refuge. Unlike other vireos, this species shows distinct plumage differences in cap color between the sexes. In addition, males exhibit delayed-plumage maturation (first-year males have gray napes). During the breeding season, male black-capped vireos sing persistently well into the heat of the day, the intensity of their singing seeming to increase after singing by other local species has waned.

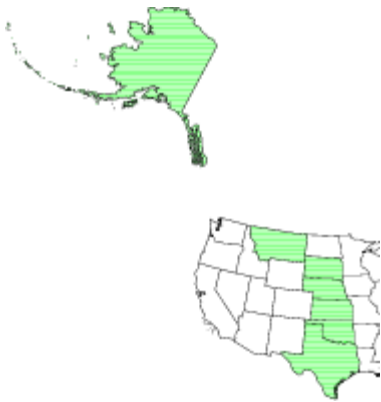
This species' songs with alternating phrases are typical of those of many other vireo species, but they are unusual in being derived from a large syllable repertoire, an order of magnitude greater than that of other vireos. (Excerpts from the Birds of North America, No. 181, 1995).

Standardized survey areas for the black-capped vireo territories run this year between May 5th and June 19th. The eleven standardized search areas established last year, included portions of the core colony, the primary satellite colonies, and new expansion areas. A total of 914 territories were identified. Vireos were most often detected from vocalizations of males. Taped songs were replayed at times in areas where no vireos had yet been heard to stimulate response of males potentially present. Surveys generally began no earlier than 2 hour after sunrise and could be conducted until approximately mid-afternoon. Because of the persistent song patterns of vireos, males can routinely be detected within this time. Where vireo territories were adjacent to each other, detections would only be counted as separate from others if an adjacent male could be heard simultaneously or was substantially separated from other detections. Because of the rate of travel of the observer, and previously estimated detection probabilities, the number of territories mapped is expected to represent about 85% of the total males present in the search areas. Because about 88-90% of the males are mated, the number of territories detected through this survey process can be utilized as a conservative estimate of the number of pairs present within the search areas.

The 2005 Black-capped vireo population is in excess of 1250 birds. This represents a realistic minimum population Refuge wide, as there are more than

8,000 acres of suitable habitat that is not within the standardized areas sampled. Fort Sill, adjacent to the Refuge, also has suitable habitat and an expanding vireo population. This year, in excess of 500 birds were located on the Fort. A true endangered species success story.

Eskimo Curlew
(*Numenius borealis*)



Species Range



Family:

SCOLOPACIDAE

Order:

Charadriiformes

Before the arrival of European settlers, the Eskimo Curlew was one of the most abundant shorebirds in the Western Hemisphere. By the late 1880s, the Eskimo Curlew had disappeared almost completely. It is now feared extinct. Its plight serves as a tragic example of the devastating potential of human impact upon the environment.

Appearance: The smallest of North America's curlews, the Eskimo Curlew is about 14 inches in length, with a wingspan of 27 inches. It probably weighs between 10 and 12 ounces, though exact weights have never been obtained. Its long legs, brownish plumage and long, de-curved bill are typical of all curlews. Observers must take great care to eliminate similar species before positively identifying this bird. Of the regularly occurring North American curlews, the Eskimo most closely resembles the fairly common Whimbrel, but is at least one-quarter smaller than this shorebird. The Eskimo Curlew's bill is about a third shorter, and has a less dramatic downward curve. Also, the Eskimo Curlew's head is less boldly striped, and has a less distinctive eye stripe and its plumage—particularly the cinnamon wing linings—are warmer in tone than the Whimbrel's. The Eskimo Curlew may also be confused with its closest relative, the Little Curlew, a Siberian species which is slightly smaller, and rarely found on North America's west coast.

Range & Distribution: A denizen of the far north, the Eskimo Curlew is known to have bred in at least two locations within Canada's northwest territories. A more widespread breeding range, including a vast swath of northern Alaska and a portion of eastern Siberia, is suspected. The Eskimo Curlew also bred on the Arctic tundra. Prior to its decline, it was probably the most common Arctic summer bird.

Habitat: The Eskimo Curlew utilizes a variety of habitats throughout the year. In spring, it settles mainly on tall grass prairies from Texas north across the Midwest. Its summer, its Arctic breeding habitat is a vast region of soggy, treeless tundra, nearly inaccessible to humans. This complicates the search for possible remaining populations, which must be done either by air, or on marginally accessible areas. During fall migration, the Eskimo Curlew relies upon the North Atlantic coast, where it was formerly found in great numbers, foraging in marshes, meadows, fields, sand dunes, and tidal areas. From here, the Eskimo Curlew makes its way to its wintering grounds on wide open, flat, wet, grassy areas in Argentina, similar to its Arctic breeding grounds.

Feeding: Historic accounts indicate that the Eskimo Curlew has a varied diet throughout its annual cycle. In spring, large flocks gorged on grasshoppers, crickets, and other prairie insects. During fall migration, the species reportedly relied heavily upon coastal berries, particularly crowberry patches along the Labrador coast. The birds also consumed prey such as insects, crabs, and other aquatic invertebrates.

Reproduction: Breeding, since it occurs within North America's least accessible regions, has rarely been observed closely. The Eskimo Curlew's nest sites were described by early ornithologists as crude shallow scrapes lined with down and other nesting material, similar to nests constructed by other curlews. Historic descriptions of the species' breeding behavior are also consistent with the behavior of related species. Both parents brood and care for the chicks, which are able to follow the parents and find their own food soon after hatching. In most curlew species, parental care decreases quickly once the young birds fledge.

Migration: The annual migration undertaken by the Eskimo Curlew was known to involve a 20,000-mile round trip. After wintering in southern Argentina and Uruguay, Eskimo Curlews began to move slowly north in February or early March. Most birds crossed the formidable Andes, then flew up the Pacific coast of South America, arriving at staging areas along the Gulf Coast and southern Midwest by May. Moving northward across the prairies in

huge flocks, they fed heavily on insects such as the now-extinct Rocky Mountain grasshopper. By June, the birds arrived on the northern tundra.

Following the relatively short breeding season, Eskimo Curlews moved east to the north Atlantic coast, particularly Labrador, where they gorged on crowberries, crabs, and insects in preparation for the long flight back to South America. Once properly fattened, large flocks of Eskimo Curlews embarked on a nonstop, two- to three-day flight over the Atlantic Ocean. Once out over the ocean, most would not see land again until they arrived, weak and starving, on the northern coasts of South America. Here the Eskimo Curlews gorged once again, then worked their way 2,000 miles further south, to wintering grounds at the end of the continent.

Additional Information

Until the 1870s, immense flocks of Eskimo Curlews migrating in fall through the Canadian Maritime provinces and New England fattened up on blueberries and fruits of other heath land shrubs before heading south over the Atlantic Ocean to South America. Similarly sized flocks en route north in the spring fed upon grasshoppers and other insects in the Great Plains.

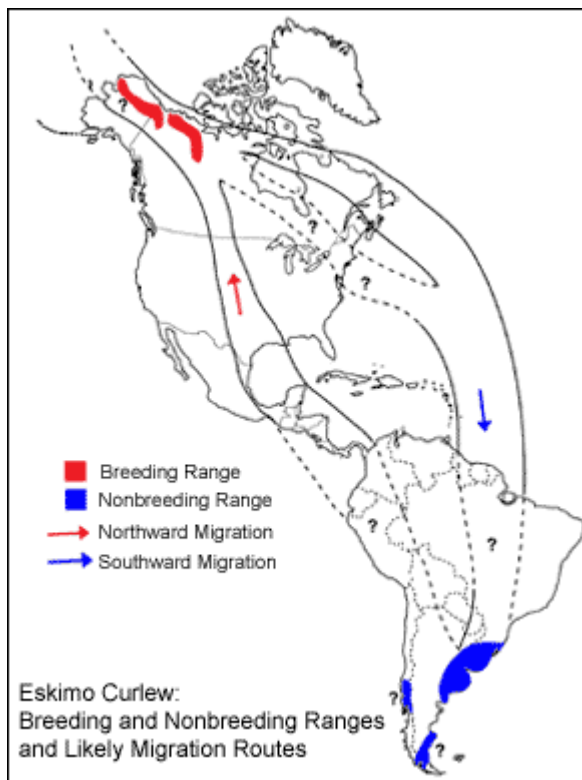
Despite its vast numbers, the Eskimo Curlew population was devastated over just a 20-year period, and was rarely seen after 1890. Now it is almost certainly extinct. Such a swift disappearance can be explained by a lethal combination of three simultaneous events.

After Passenger Pigeons disappeared, the Eskimo Curlew became the target of choice for market hunters in search of new foods to exploit.

During its migration northward in April and May, the Eskimo Curlew depended almost exclusively on the abundant insect foods of native tall grass and mixed grass prairies. In the late 1800s, these critical habitat patches were virtually eliminated by wholesale conversion of prairies to agricultural fields and by widespread suppression of wildfire. Extinction of the Eskimo Curlew's primary spring food item, the Rocky Mountain grasshopper. In the mid-to-late 1800s, North American sport and market hunters followed the vast migrating flocks

during spring flights in the Great Plains and fall flights in Labrador and New England. Often thousands of birds were killed at a single location within a few days. This uncontrolled shooting -- combined with the loss of native prairies, the source of the bird's springtime food -- caused the species to disappear. Each spring, birders in coastal Texas still hope for a sighting to confirm that the Eskimo Curlew is not completely extinct, but the prospect is bleak.

Before its demise in the late 19th century, the Eskimo Curlew nested in the High Arctic (red areas on map) and wintered in the southern extremes of South America (purple areas on map). Although its complete migration routes are not known, the bird apparently took an elliptical route as shown on the map. The red arrow indicates the likely northbound leg; the purple arrow shows the probable southbound route. Question marks denote regions where the likely route is unknown.

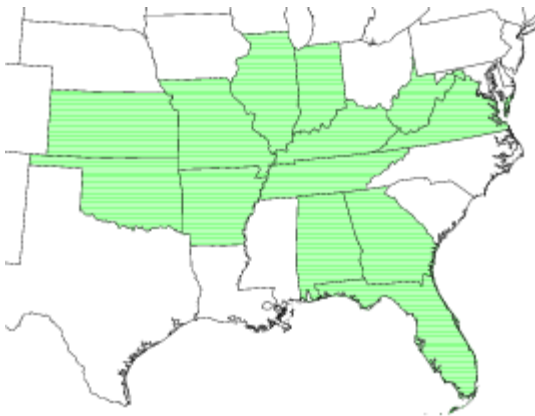




Gray bat
(*Myotis grisescens*)

Kingdom: Animalia **Class:** Mammalia **Order:** Chiroptera **Family:**
Vespertilionidae

Listing Status: Endangered



Species Range



Female Gray Bat

The gray bat is an endangered species. Endangered Species are animals and plants that are in danger of becoming extinct. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting, and restoring, endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is the Gray Bat?

Appearance

Gray bats are distinguished from other bats by the uni-colored fur on their back. In addition, following their molt in July or August, gray bats have dark gray fur which often bleaches to a chestnut brown or russet. They weigh 7-16 grams. The bat's wing membrane connects to its ankle instead of at the toe, where it is connected in other species of *Myotis*.

Habitat

With rare exceptions, gray bats live in caves year-round. During the winter gray bats hibernate in deep, vertical caves. In the summer, they roost in caves which are scattered along rivers. These caves are in limestone karst areas of the southeastern United States. They do not use houses or barns.

Reproduction

Females give birth to a single young in late May or early June.

Feeding Habitats

The bats eat a variety of flying aquatic and terrestrial insects present along rivers or lakes.

Range

The gray bat occupies a limited geographic range in limestone karst areas of the southeastern United States. They are mainly found in Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. A few can be found in northwestern Florida, western Georgia, southeastern Kansas, southern Indiana, southern and southwestern Illinois, northeastern Oklahoma, northeastern Mississippi, western Virginia, and possibly western North Carolina.

Why Is the Gray Bat Endangered?

Human Disturbance

Gray bats are endangered largely because of their habit of living in very large numbers in only a few caves. As a result, they are extremely vulnerable to disturbance. Arousing bats while they are hibernating can cause them to use up a lot of energy, which lowers their energy reserves. If a bat runs out of reserves, it may leave the cave too soon and die. In June and July, when

flightless young are present, human disturbance can lead to mortality as frightened females drop their young in the panic to flee from the intruder.

Habitat Loss or Degradation

Many important caves were flooded and submerged by reservoirs. Other caves are in danger of natural flooding. Even if the bats escape the flood, they have difficulty finding a new cave that is suitable.

Cave Commercialization and Improper Gating

The commercialization of caves drives bats away. Any gating on the cave that prevents access or alters the air flow, temperature, humidity, and amount of light is harmful.

What Is Being Done to Prevent Extinction of the Gray Bat?

Listing

The gray bat was added to the U.S. List of Endangered and Threatened Wildlife and Plants on April 28, 1976.

Recovery Plan

The U.S. Fish and Wildlife Service has developed a recovery plan that describes actions needed to help the bat survive.

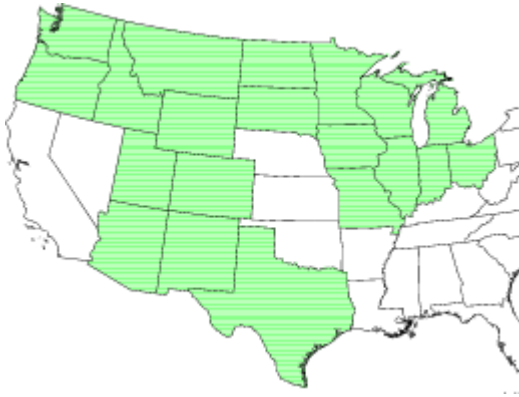
Habitat Protection

A variety of government and private conservation agencies are all working to preserve gray bats and their caves.

Gray wolf **(*Canis lupus*)**

Kingdom: Animalia **Class:** Mammalia **Order:** Carnivora **Family:** Canidae

Listing Status: Endangered



Species Range



Second only to humans in adapting to climate extremes, gray wolves once ranged from coast to coast and from Alaska to Mexico in North America. They were absent from the East and the Southeast, which were occupied by red wolves (*Canis rufus*), and from the large deserts in the southwestern States.

By the early 20th century, government-sponsored predator control programs and declines in prey brought gray wolves to near extinction in the lower 48 States.

Wolf groups, or packs, typically include a breeding pair (the alpha pair), their offspring, and other non-breeding adults. Wolves are capable of mating by age two or three and sometimes form a lifelong bond. Wolves can live 13 years and reproduce past 10 years of age. On the average, five pups are born in early spring and are cared for by the entire pack. For the first six weeks, pups are reared in dens. Dens are often used year after year, but wolves may also dig new dens or use some other type of shelter, such as a cave.

Pups depend on their mother's milk for the first month, then are gradually weaned and fed regurgitated meat brought by pack members. By seven to eight months of age, when they are almost fully grown, pups begin traveling with the adults. After they are a year or two, wolves may leave and try to find a mate and form a pack. Lone, dispersing wolves have traveled as far as 600 miles in search of a new home.

Wolf packs live within territories, which they defend from other wolves. Their territories range in size from 50 square miles to more than 1,000 square miles, depending on the available prey and seasonal prey movements. Wolves travel over large areas to hunt, as far as 30 miles in a day. Although they usually trot along at five miles per hour wolves can run as fast as 40 miles per hour for short distances.

Studies at Yellowstone National Park indicate that wolves support a wide variety of other animals. Ravens, foxes, wolverines, coyotes, bald eagles, and even bears feed on the carcasses of animals killed by wolves. Antelope are swift, elk are alert, and mountain goats are adept at climbing steep cliffs, in

part because of the long-term effects of wolf predation. Wolves also help maintain the balance between these ungulates (hoofed animals) and their food supply, making room for other plant-eaters such as beavers and small rodents.

Wolves use their distinctive howl to communicate. Biologists have identified a few of the reasons that wolves howl. First, they like to howl. They also howl to reinforce social bonds within the pack, to announce the beginning or end of a hunt, sound an alarm, locate members of the pack, or warn other wolves to stay out of their territory. Wolves howl more frequently in the evening and early morning, especially during winter breeding and pup-rearing.

Settlers moving westward depleted most populations of bison, deer, elk, and moose – animals that were important prey for wolves. Wolves then increasingly turned to sheep and cattle as a replacement for their natural prey. To protect livestock, ranchers and government agencies began an eradication campaign. Bounty programs initiated in the 19th century continued as late as 1965, offering \$20 to \$50 per wolf. Wolves were trapped, shot, dug from their dens, and hunted with dogs. Poisoned animal carcasses were left out for wolves, a practice that also killed eagles, ravens, foxes, bears, and other animals that fed on the tainted carrion.

By the time wolves were protected by the Endangered Species Act of 1973, only a few hundred remained in extreme northeastern Minnesota and a small number on Isle Royale, Michigan. Gray wolves were listed as endangered* in the contiguous 48 States and in Mexico, except that in Minnesota they were listed as threatened. ** Alaska wolf populations number 7,700 to 11,200 and are not considered endangered or threatened.

The wolf's comeback nationwide is due to its listing under the Endangered Species Act, resulting in increased scientific research and protection from unregulated killing, along with reintroduction and management programs and education efforts that increased public understanding of wolf biology and behavior. Wolf recovery has been so successful that the U.S. Fish and Wildlife Service is proposing to remove the gray wolf in the western Great Lakes area

from the list of threatened and endangered species. Today about 2,922 wolves live in the wild in Minnesota, 24 on Lake Superior's Isle Royale, about 580 in Michigan's Upper Peninsula, and at least 626 in Wisconsin.

In the northern Rocky Mountains, the U.S. Fish and Wildlife Service reintroduced gray wolves into Yellowstone National Park and U.S. Forest Service lands in central Idaho in 1995 and 1996. The reintroduction was successful, and the recovery goals for this population have been exceeded. By December 2008 there were about 1,360 wolves in the Yellowstone area and Idaho; in total, at least 1,645 live in the northern Rocky Mountains of Montana, Idaho, and Wyoming. Wolf recovery has been so successful that the Service removed the gray wolf in the northern Rocky Mountains from the threatened and endangered species list, except in Wyoming.

The Mexican gray wolf, a subspecies, *Canis lupus baileyi*, has also been reintroduced into Arizona and New Mexico. Native to the Southwest, the wolves existed only in zoos until 1998, when 13 of the animals were released in Arizona. By the end of 2008, there were 52 wolves in the wild in Arizona and New Mexico with another 300 in zoos and other facilities. Since 2002, wolf packs have produced pups in the wild. The goal is to establish a self-sustaining wild population of at least 100 wolves in their historical range.

Gray wolf populations fluctuate with food availability, strife within packs, and disease. In some areas wolf populations may change due to accidental or intentional killing by people.

There is some concern that wolf recovery may pose a threat to human safety. However, wolf attacks on humans are extremely rare in North America, even in Canada and Alaska where there are consistently large wolf populations. Most documented attacks have been in areas where wolves habituated to people when they were fed by people or attracted to garbage.

Special features of the Endangered Species Act have been used in parts of the wolf range to allow the removal of wolves that prey on livestock. There are programs to compensate for the loss of livestock and pets in most of the

recovery areas.

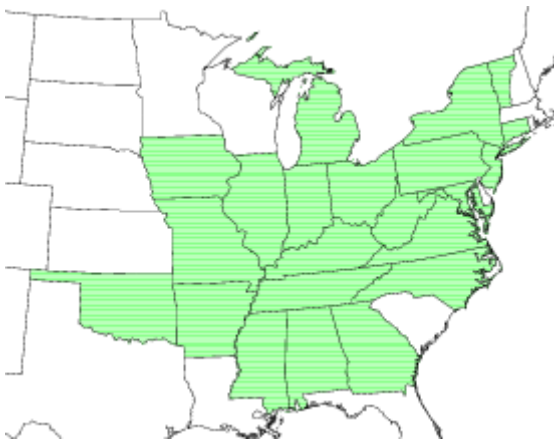
The Mexican wolves in the southwestern United States are designated as non-essential, experimental populations under the Endangered Species Act. This designation allows more management flexibility while contributing to recovery.

Wolf recovery efforts have restored a top predator to its ecosystem, and improved our understanding of the complex interactions among species in their natural environments.

Indiana bat
(*Myotis sodalis*)

Kingdom: Animalia **Class:** Mammalia **Order:** Chiroptera **Family:** Vespertilionidae

Listing Status: Endangered



Species Range





The Indiana bat is an endangered species. It was first listed in 1967 primarily due to episodes of large numbers of Indiana bat deaths caused by human disturbance during hibernation. Indiana bats are extremely vulnerable to disturbance because they hibernate in large numbers in only a few caves (the largest hibernation caves support from 20,000 to 50,000 bats). Other threats that have contributed to the species decline include commercialization of caves, loss of summer habitat, pesticides and other contaminants, and most recently, the disease white nose syndrome.

Indiana bats are found over most of the eastern half of the United States. Almost half of all Indiana bats hibernate in caves in southern Indiana. Other states within the current range of the Indiana bat include Alabama, Arkansas, Connecticut, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia. The 2005 population estimate is about 457,000 Indiana bats, half as many as when the species was listed as endangered in 1967.

Indiana bats are quite small, weighing only one-quarter of an ounce (about the weight of three pennies) although in flight they have a wingspan of 9 to 11 inches. Their fur is dark-brown to black. They hibernate during winter in caves or, occasionally, in abandoned mines. During summer they roost under the peeling bark of dead and dying trees. Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands.

Below are links to information about Indiana bat life history, threats, and actions to recover the species.

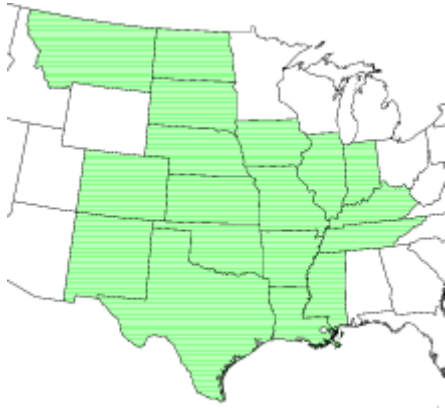
White-nose Syndrome

White nose syndrome (WNS) is an illness that has killed over a million bats since dead and dying bats with the distinctive "white nose" were first observed in 2006. "White nose" refers to a ring of white fungus often seen on the faces and wings of affected bats. It was first observed in a cave in New York in February 2006 and has since spread from New York caves to caves in Vermont, Massachusetts, Connecticut, New Hampshire, New Jersey, Pennsylvania, and West Virginia. The condition has been found in over 25 caves and mines in the northeastern U.S. The US Fish & Wildlife Service has called for a moratorium on caving activities in the affected areas, and strongly recommends that any clothing or equipment used in such areas be decontaminated after each use.

Least tern **(*Sterna antillarum*)**

Kingdom: Animalia **Class:** Aves **Order:** Ciconiiformes **Family:** Laridae

Listing Status: Endangered



Species Range



Appearance - This 8 to 9 inch birds have a black "crown" on their head, a snowy whiter underside and forehead, grayish back and wings, orange legs, and a yellow bill with a black tip.

Habitat - From late April to August, terns use barren to sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines.

Reproduction - The terns nest in a shallow hole scraped in an open sandy area, gravelly patch, or exposed flat. The nest in small colonies. The chicks leave the nest only a few days after hatching, but the adults continue to care for them, leading them to shelter in nearby grasses and bringing them food.

Feeding Habits - The terns hover over and dive into standing or flowing water to catch small fish.

Range - Interior least terns breed in isolated areas along the Missouri, Mississippi, Ohio, Red, and Rio Grande river systems. Their winter home is not known, but probably includes coastal areas of Central and South America.

Why is the Interior Least Tern Endangered?

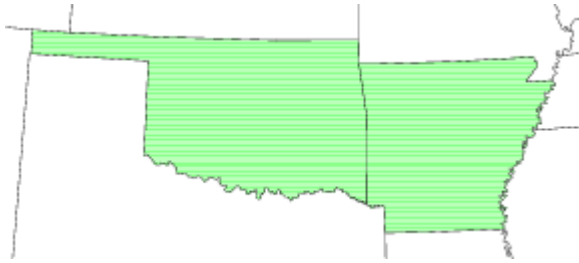
Habitat Loss or Degradation - Dams, reservoirs, and other changes to river systems have eliminated most historic least tern habitat. The wide channels dotted with sandbars that are preferred by the terns have been replaced by narrow forested river corridors.

Nest Disturbance - Recreational activities on rivers and sandbars disturb the nesting terns, causing them to abandon their nests.

Leopard darter
(*Percina pantherina*)

Kingdom: Animalia **Class:** Actinopterygii **Order:** Perciformes **Family:** Percidae

Listing Status: Threatened



Species Range





Description: Leopard darters rarely exceed three inches (8 cm) in length. They have 11-14 large, dark spots on their sides. These spots contrast against a light background that ranges from pale olive on the back to yellowish-olive on the underside. The back of the fish has numerous saddles and bars.

Life History: Leopard darters typically live less than two years, but individuals older than three years have been found. Spawning occurs in March and April, but may occur as early as February, on gravel-bottomed riffles. The fertilized eggs are buried in gravel. The average clutch size is about 65 eggs. Young leopard darters begin to appear in May of each year. Food items include aquatic insects and micro-crustaceans.

Habitat: Leopard darters are found in intermediate to larger streams. Typically, they are not found in smaller, headwater streams. From May to February, leopard darters prefer large, quiet pools with a rubble and boulder substrate. Spawning occurs on gravel substrates; however, the dominant riffle substrate may be gravel, rubble, boulder, and bedrock.

Distribution: Historically, the leopard darter was limited to upland, large stream habitats of the Little River drainage in Oklahoma and Arkansas. Currently, scattered populations are found within its historic range. In Oklahoma, it occurs within the Little River drainage (Mountain Fork, Glover, and Little Rivers) in LeFlore, McCurtain, and Pushmataha counties. In Arkansas, the leopard darter occurs in the Cossatot, Robinson Fork, and Mountain Fork Rivers in Howard, Polk, and Sevier Counties.

Causes of Decline: Leopard darters have never been common. The greatest

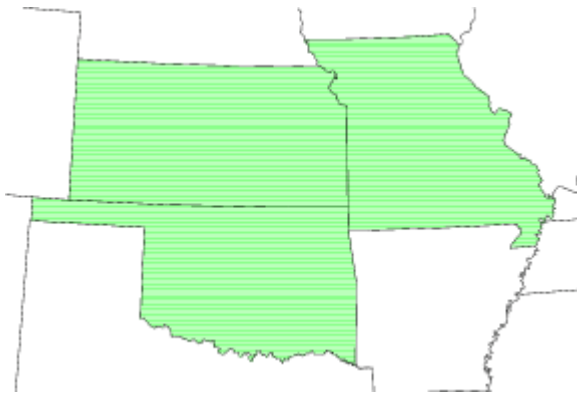
threat to the survival of the species is the loss of habitat due to the construction of reservoirs. These impoundments also isolate populations, which further endangers the species. Logging activity, agricultural and industrial runoff, and gravel removal all pose threats as well.

Recovery Needs: Recovery of the leopard darter primarily involves managing and protecting its habitat and individual populations from known threats.

Neosho madtom
(*Noturus placidus*)

Kingdom: Animalia **Class:** Actinopterygii **Order:** Siluriformes **Family:** Ictaluridae

Listing Status: Threatened



Species Range



Habitat: This fish is found in stream riffles over loosely-packed gravel bottoms. Adults prefer swift, shallow currents while young madtoms inhabit deeper water with slower currents.

Behavior: The madtom eats aquatic insects such as mayfly larvae, usually in the three hours before sunset. Little is known of its reproductive habits, though biologists believe it spawns in June and July.

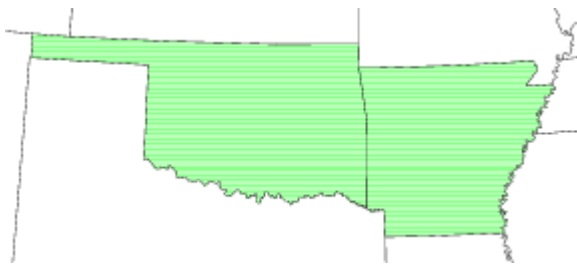
Why It's Endangered: Dams and reservoirs have inundated much of the madtom's habitat, destroying the gravel riffles and the swift currents the fish needs to live. Cold water released from the Tenkiller Dam killed off all madtoms on the Illinois River in Oklahoma. Reservoirs which would destroy more madtom habitats are currently being planned.

Other threats include gravel dredging and pollution from cattle feedlots. Urban and agricultural runoff may also contaminate the rivers in which madtoms live. During droughts people draw more water from reservoirs, drying up the river downstream where madtoms live.

Ouachita Rock pocketbook
(*Arkansia wheeleri*)

Kingdom: Animalia **Class:** Bivalvia **Order:** Unionoida **Family:** Unionidae

Listing Status: Endangered



Species Range



Description: The Ouachita rock pocketbook is a freshwater mussel. Its shell reaches a maximum size of 4.4 inches (11 cm) long, 3.4 inches (8.6 cm) high, and 2.4 inches (6 cm) wide. The shell is relatively thick, moderately inflated, and subovate. The outer surface is chestnut-brown to black with a silky luster. It is distinguished from other similar appearing species by distinctive details of its shell.

Life History: Very little is known about the life history of the Ouachita rock pocketbook. However, closely related species develop eggs during the fall and then release larvae during the spring. The larvae attach to fins, gills, or scales of fish until they mature. Adults feed by filtering out plankton and small particles from the water.

Habitat: The Ouachita rock pocketbook inhabits pools, backwaters, and side channels of certain rivers and large creeks in or near the southern slope of the Ouachita Uplift. The species occupies stable substrates containing gravel, sand, and other materials. The Ouachita rock pocketbook always occurs within large mussel beds containing a diversity of mussel species.

Distribution: The historical distribution of the Ouachita rock pocketbook included the Kiamichi River in southeastern Oklahoma, the Little River in southwestern Arkansas, and the Ouachita River in central Arkansas. Recent surveys have found it surviving in a small section of the Little River in Oklahoma, at one locality in the Ouachita River in Arkansas, and within an 88-

mile (141 km) section of the Kiamichi River upstream from Hugo Reservoir. Other recent evidence of the species includes single shells recovered from Pine and Sanders Creeks in Texas.

Causes of Decline: The range of the Ouachita rock pocketbook has been reduced due to the construction and operation of dams and by decreases in water quality. These and other factors pose continuing threats to the species.

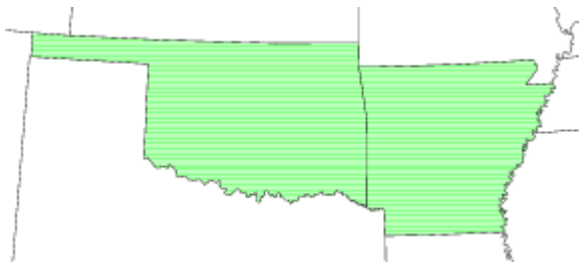
Recovery Needs: Many life history and habitat requirements of the Ouachita rock pocketbook are not well understood, and gathering information about these is a high priority. Protecting known populations and habitat, and restoring degraded populations and habitat, also are needed.

Other information: The Kiamichi River has an unusually large number of mussel species. However, it is believed that no more than 1,800 individuals of the Ouachita rock pocketbook survive in that river and fewer than 100 individuals survive in the Little River.

Ozark Big-Eared bat
(*Corynorhinus townsendii ingens*)

Kingdom: Animalia **Class:** Mammalia **Order:** Chiroptera **Family:** Vespertilionidae

Listing Status: Endangered



Species Range



Also known as the lump-nosed bat, the western big-eared bat, and the long-eared bat, the Ozark big-eared bat is born with its long ears draped over its eye for the first few days.

Habitat: This bat prefers caves in limestone karst formations, in regions dominated by mature hardwood forests of hickory, beech, maple and hemlock trees. Maternity caves, where females bear and raise their young are closer to food sources than are hibernation caves, which are better protected from cold and wind.

Behavior: Big-eared bats are nocturnal and navigate by echolocation - they make high-pitched cries which return as echoes when the sounds bounce off solid objects. They also use echolocation to find food, which usually consists of moths and other insects.

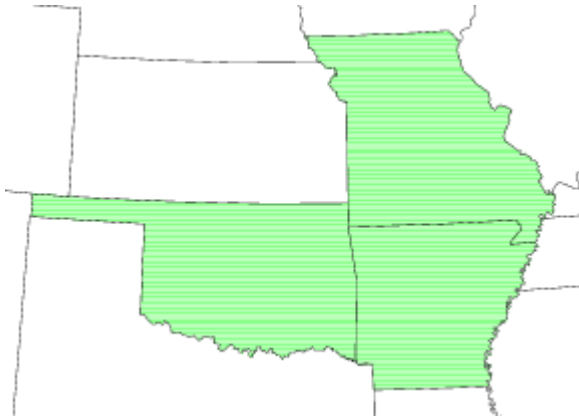
Ozark big-eared bats mate in the fall after ritual vocalizations and head-nuzzling. Females store the sperm through the winter and become pregnant after emerging from hibernation in the spring. They give birth two to three months later after migrating to a maternity colony.

Why It's Endangered: Ozark big-eared bats have suffered greatly from human disturbance of caves due to exploration and commercialization. Bats enter hibernation with only enough fat reserves to last until spring. When stirred up by cave explorers or other people, a bat may burn up 10 to 30 days of its fat supply. These bats may starve to death before the warm spring weather arrives and they can begin feeding again. The bat is now limited to a few isolated populations in Arkansas and Oklahoma.

Ozark cavefish
(*Amblyopsis rosae*)

Kingdom: Animalia **Class:** Actinopterygii **Order:** Percopsiformes **Family:** Amblyopsidae

Listing Status: Threatened



Species Range





The Ozark cavefish is a threatened species. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Endangered Species are animals and plants that are in danger of becoming extinct. Identifying, protecting, and restoring, endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is the Ozark cavefish?

- **Appearance** - The Ozark cavefish is a small fish about 2-1/4 inches long. It is pinkish-white and blind.
- **Habitat** - The Ozark cavefish lives in cave streams and springs. The cave ecosystem is often dependent upon bats (especially gray bats) as a source of energy and nutrients.

- **Reproduction** - Very little is known about the reproduction of the Ozark cavefish. Spawning is often triggered by spring floods. The greatest obstacle to the cavefish may be finding a potential mate at the right time.
- **Feeding Habitats** - Because it cannot see, the cavefish depends on sensing water movement to find animals to eat. The cavefish primarily eats plankton. They also eat isopods, amphipods, crayfish, salamander larvae, and bat guano.
- **Range** - The cavefish can be found in caves within the Springfield Plateau of the Ozark Highlands in Arkansas, Missouri, and Oklahoma.

Why Is the Ozark Cavefish Threatened?

- **Water Pollution** - Chemicals in the groundwater threaten the cavefish.
- **Destruction of Habitat** - Some caves have intentionally been sealed shut by humans. Sealing cave entrances cuts off the food supply to the cave ecosystem. Other caves have been inundated by reservoirs or have dried up due to lowered water tables, drastically changing the habitat.
- **Overcollection** - Ozark cavefish taken from the wild by collectors can hurt or eliminate local populations.
- **Disturbance** - Exploration of caves by careless recreational cavers can damage the cave ecosystem. Disturbances can destroy the habitat, interrupt the breeding of the cavefish, and cause the fish to leave.

What Is Being Done to Prevent Extinction of the Ozark cavefish?

- **Listing** - The Ozark cavefish was added to the U.S. List of Endangered and Threatened Wildlife and Plants on December 3, 1984.
- **Recovery Plan** - The U.S. Fish and Wildlife Service has developed a

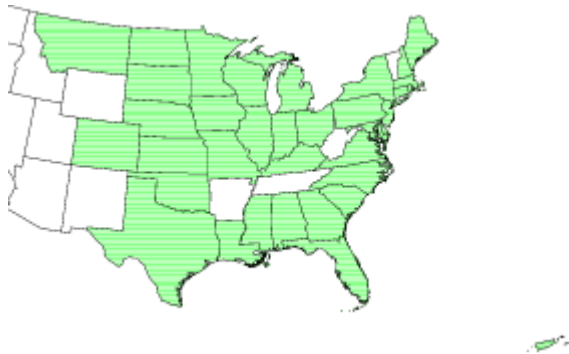
recovery plan that describes actions needed to help the cavefish survive.

- **Habitat Protection** - A variety of government and private conservation agencies are all working to preserve the Ozark cavefish and its habitat. Some private landowners have voluntarily agreed to protect caves and help improve the groundwater on their land.

Piping Plover **(*Charadrius melodus*)**

Kingdom: Animalia **Class:** Aves **Order:** Ciconiiformes **Family:** Charadriidae

Listing Status: Endangered and Threatened







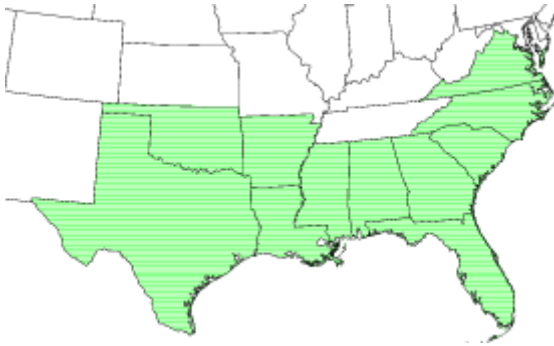
The piping plover is a small shorebird that nests in the Great Plains states, on the shores of Lakes Michigan and Superior, and along the Atlantic coast - all populations winter along the southern Atlantic and Gulf coasts in the U.S. This website features the Great Lakes population, which is listed as endangered under the federal Endangered Species Act.

An active recovery program in Michigan, aided by many volunteers, has helped the plover population to steadily increase. In 2008, there were 63 breeding pairs (126 individuals). Of these, 53 pairs nested in Michigan, while 10 were found outside the state, including six pairs in Wisconsin and four in Ontario, Canada. A single breeding pair discovered in 2007 in the Great Lakes region of Canada represented the first confirmed piping plover nest there in over 30 years, and in 2008 the number of nesting pairs further increased to four. In 2009, a pair nested on the Lake Michigan shoreline in Illinois, the first nest in Illinois in 30 years.

Red-Cockaded woodpecker
(*Picoides borealis*)

Kingdom: Animalia **Class:** Aves **Order:** Piciformes **Family:** Picidae

Listing Status: Endangered



Species Range





Photograph by Joel Sartore; photographed at the North Carolina Zoo

In the world of North American woodpeckers, red-cockaded woodpeckers stand out as an exception to the usual rules. They are the only woodpeckers to excavate nest and roost sites in living trees. Living in small family groups,

red-cockaded woodpeckers are a social species, unlike others. These groups chatter and call throughout the day, using a great variety of vocalizations. And they are one of only two woodpecker species protected by the Endangered Species Act. The other protected woodpecker species, the ivory-billed, had been assumed extinct for decades until sightings on a national wildlife refuge in the Southeast. The U.S. Fish and Wildlife Service is working with Federal and State agencies and private landowners to keep red-cockaded woodpeckers from sliding to extinction.

It's all about the habitat

Red-cockaded woodpeckers live in mature pine forests—specifically those with longleaf pines averaging 80 to 120 years old and loblolly pines averaging 70 to 100 years old. From the late 1800s to the mid 1900s, red-cockaded woodpeckers declined rapidly as their mature pine forest habitat was altered for a variety of uses, primarily timber harvest and agriculture. Pine savannahs and open woodlands once dominated the southeastern United States and may have totaled more than 200 million acres at the time of European colonization. Longleaf pine communities may have covered 60 to 92 million of those acres. Today, fewer than 3 million acres remain. Listed in 1970 as endangered, red-cockaded woodpeckers once ranged from Florida to Maryland and New Jersey, as far west as Texas and Oklahoma, and inland to Missouri, Kentucky, and Tennessee. About 1 percent of their original range remains.

Home is where the trees are

About the size of cardinals; these woodpeckers excavate cavities exclusively in living pine trees, preferring older pines infected with the fungal red heart disease that softens heartwood. The birds need up to three years to excavate the cavities they use for nesting and roosting. The woodpeckers are faithful to their cavity trees, and each member of the group has its own roost cavity. Cavity trees occupied by a group are called a cluster and may include 1 to 20 or more trees on 3 to 60 acres. Red-cockaded woodpeckers peck holes around actively used cavities. These small wells exude resin that coats much of the

tree. The birds keep the resin flowing as a defense against rat snakes and other predators. Red-cockaded woodpeckers play a vital role in the intricate web of life of southern pine forests. A number of birds and mammals use the nest cavities that the woodpeckers excavate—such as chickadees, bluebirds, titmice, and species including the downy, hairy, and red-bellied woodpeckers. Larger woodpeckers may take over a red-cockaded woodpecker cavity, sometimes enlarging the hole enough to allow screech owls, wood ducks, and even raccoons to move in. Flying squirrels, several species of reptiles and amphibians, and insects, primarily bees and wasps, also use red-cockaded cavities.

Raising the roost

Red-cockaded woodpeckers live in groups with a breeding pair and as many as four helpers, usually male offspring from the previous year. Each group needs about 200 acres of old pine forest to support its foraging and nesting habitat needs. Juvenile females generally leave the group before the breeding season to join a solitary male group and form a new breeding pair. Breeding pairs are monogamous and raise a single brood each year. The female lays three to four small white eggs in the roost cavity. Group members incubate the eggs for 10 to 12 days and feed the hatchlings ants, beetles, caterpillars, corn ear worms, spiders, centipedes, wood-boring insects, and other insects that the adults eat. About 15 percent of their diet includes seasonal wild fruit. Chicks remain in the nest cavity for about 26 days.

Build it, and they will come

Planting long-leaf pine trees and conducting controlled burns to remove undergrowth to create the open, park-like areas that the woodpeckers like has helped the recovery effort, along with developing artificial cavities and relocating birds. In 10 years, red-cockaded woodpecker groups have increased nearly 30 percent to about 6,000. Artificial cavity construction has enhanced clusters and established new groups. Moving isolated woodpeckers to these new habitats has reduced the likelihood of extinction and increased genetic diversity. Still, even at the current rate of growth, it will take decades

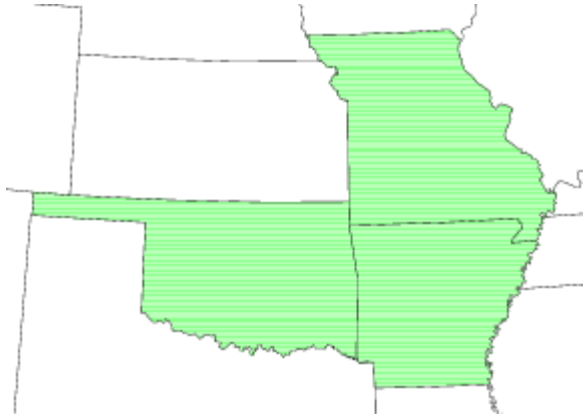
to restore the species to a secure status in the wild, according to a management strategy, the 2003 recovery plan. Working with conservation partners, the U. S. Fish and Wildlife Service created the red-cockaded woodpecker recovery plan featuring the participation of other Federal and State agencies and private landowners. Because many large landscapes that provide habitat are on Federal land, the U. S. Forest Service and the Department of Defense have developed special management guidelines for the woodpeckers on national forests and military installations. From 1994 to 2002, red-cockaded woodpecker populations increased as much as 50 percent at six military installations that include primary core populations required for delisting. These are Eglin Air Force Base (Florida), Fort Benning (Georgia), Fort Bragg (North Carolina), Fort Polk (Louisiana), Fort Stewart (Georgia), and Marine Corps Base Camp Lejeune (North Carolina). Recovery initiatives by private landowners are also conserving this species. For example, under a Safe Harbor Agreement, North Carolina's Pinehurst Resort is creating habitat for red-cockaded woodpeckers and helping to ensure their long-term future.

Red-cockaded woodpeckers rarely come to the ground. They even bathe in water-filled depressions on tree limbs. Recent research, however, notes that female red-cockaded woodpeckers search for bone bits on the forest floor and stuff them in tree crevices. Zoologists say that is the first known instance of a bird's hoarding something for its mineral, rather than caloric content. Calcium-rich bone is not rare, but the birds probably seek it to ensure stronger eggshells. They stash it in a tree so they won't have to eat on the ground where they are vulnerable to predators.

Scaleshell mussel
(*Leptodea leptodon*)

Kingdom: Animalia **Class:** Bivalvia **Order:** Unionoida **Family:** Unionidae

Listing Status: Endangered





The scaleshell is a freshwater mussel that was listed in 2001 as an endangered species by the U.S. Fish & Wildlife Service. Endangered species are animals and plants that are in danger of becoming extinct. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting, and restoring endangered and threatened species is the primary objective of the US Fish and Wildlife Service's endangered species program.

What is a Scaleshell Mussel?

Appearance - The scaleshell is a relatively small freshwater mussel with a thin, fragile shell and faint green rays. It grows to about one to four inches in length. The inside of the shell is pinkish white or light purple and highly iridescent. The scaleshell gets its name from the scaly appearance of the shell, which is only seen in females.

Range - Scaleshells historically occurred across most of the eastern United States. During the last 50 years this species became increasingly rare within a reduced range. Of the 55 historical populations, 14 remain scattered within the Mississippi River basin in Arkansas, Missouri, and Oklahoma.

Habitat - Scaleshell live in medium-sized and large rivers with stable channels and good water quality. They bury themselves in sand and gravel on the bottom with only the edge of their partially-opened shells exposed. As river currents flow over them, they siphon particles out of the water for food such as plant debris, plankton, and other

microorganisms. The roles of scaleshell in river ecosystems are as food for wildlife like muskrats, otters, and raccoons and as filters which improve water quality.

Reproduction - The life cycle of the scaleshell, like most freshwater mussels, is unusual and complex. Their eggs develop into microscopic larvae (glochidia) within the gills of the female. The female discharges its glochidia into the river where they must attach to gills or fins of a fish to continue developing. Each mussel species has specific fish species (host fish) that are needed by the glochidia to develop. Freshwater drum have been identified as a host fish for the scaleshell but there may be other species. Glochidia continue growing on the fish and transform into juveniles. After a few weeks they drop off and land on the river bottom where they grow into adults.

What are the threats to the scaleshell mussel?

Pollution - Adult mussels are easily harmed by toxins and declines in water quality from pollution because they are sedentary (stay in one place). Pollution may come from specific, identifiable sources such as factories, sewage treatment plants and solid waste disposal sites or from diffuse sources like runoff from cultivated fields, pastures, cattle feedlots, poultry farms, mines, construction sites, private wastewater discharges, and road drainage. Contaminants reduce water quality and may directly kill mussels, reduce the ability of surviving mussels to have young, or result in poor health or disappearance of host fish.

Sedimentation - Sediment is material suspended in water that usually is moved as the result of erosion. Although sedimentation is a natural process, poor land use practices, dredging, impoundments, intensive timber harvesting, heavy recreational use, and other activities may accelerate erosion and increase sedimentation. A sudden or slow blanketing of the river bottom with sediment can suffocate freshwater mussels because it is difficult for them to move away from the threat. Increased sediment levels may also make it difficult for scaleshells to feed, which can lead to decreased growth, reproduction, and survival.

Dams - Dams affect both upstream and downstream mussel populations by disrupting natural flow patterns, scouring river bottoms, changing water temperatures, and eliminating habitat. The scaleshell, a mussel adapted to living in river currents, cannot survive in the still water impounded behind dams.

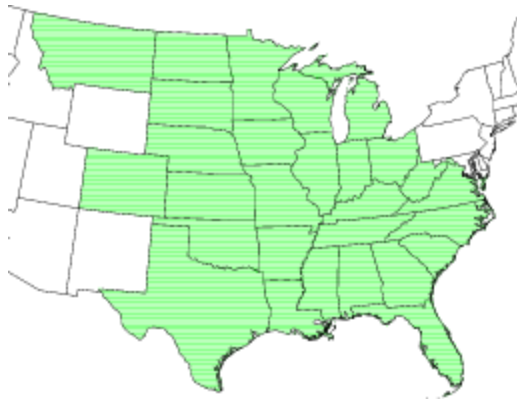
Scaleshells depend on their host fish as a means of moving upstream. Because dams are barriers that prevent fish from moving upstream they also prevent mussels from moving upstream. Upstream mussel populations then become isolated from downstream populations. This isolation leads to small unstable populations which are more likely to die out.

Exotic Species - The invasion of the exotic zebra mussel into the US poses a substantial threat, because it starves and suffocates native mussels by attaching to their shells in large numbers.

Whooping crane
(*Grus americana*)

Kingdom: Animalia **Class:** Aves **Order:** Gruiformes **Family:** Gruidae

Listing Status: Endangered and Experimental Population, Non-Essential



Species Range





General Information

132 cm. Large white crane. Adults white with red crown and black forehead, lores and moustache (tipped red), and red facial skin around large, horn-coloured bill. Shows black primaries in flight. Immature whitish with scattered brown feathers over wings and paler, reddish-brown head and neck.

Diet: Omnivore

Average life span in the wild: 22 to 24 years

Size: Body, 4.9 ft (1.5 m); wingspan, 7.5 ft (2.3 m)

Weight: 13.3 to 17.2 lbs (6 to 7.8 kg)

Protection status: Endangered

Size relative to a 6-ft (2-m) man: See Picture below



Whooping cranes nearly vanished in the mid-20th century, with a 1941 count finding only 16 living birds. But since then, these endangered animals have taken a step back from the brink of extinction. Captive breeding programs have boosted their numbers, and successful reintroduction efforts have raised the number of wild birds to over 200, with roughly the same number living in captivity.

The massive whooping crane management effort involves numerous U.S. and Canadian governmental agencies, nonprofit organizations, volunteers, and other contributors. The process even includes using ultralight aircraft to lead young whooping cranes on their first southward migration, from Wisconsin to Florida.

These majestic white birds are the tallest in North America. They live in family groups and frequent marshes, shallow lakes, and lagoons. Cranes feed by foraging with their bills and gobbling up plants, shellfish, insects, fish, and frogs.

The whooping crane's primary natural breeding ground is Wood Buffalo National Park, in Canada's Northwest Territories and Alberta. Here the cranes perform elaborate running, leaping, wing-flapping dances to choose mates that they will keep for life.

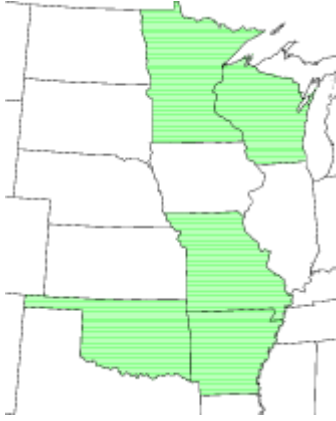
When summer ends, these migratory birds set out for the Gulf Coast of Texas, where they winter in the Aransas National Wildlife Refuge. Managers hope to establish a Wisconsin breeding population that will winter in Florida, where a small introduced population lives year-round on the Kissimmee Prairie.

Whooping cranes are generally safe from hunting and egg collection, which hastened their decline. However, their biggest threat—loss of wetlands—persists. Though the areas that the birds frequent are protected, they are isolated and make the entire population vulnerable to any disastrous ecological event or change.

Winged Mapleleaf
(*Quadrula fragosa*)

Kingdom: Animalia **Class:** Bivalvia **Order:** Unionoida **Family:** Unionidae

Listing Status: Endangered and Experimental Population, Non-Essential



Species Range





The winged mapleleaf is an endangered species. Endangered species are animals and plants that are in danger of becoming extinct. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is the winged mapleleaf?

Appearance - Winged mapleleaf grow up to four inches long. They have thick shells that are greenish brown, chestnut, or dark brown in color. Their shell, like that of a few other native freshwater mussel species, has several rows of bumps running from the hinge (umbo) to the edge of the shell. The patterns of these rows of bumps, or tubercles, help biologists differentiate this from other, similar mussel species. Faint rays are visible in small shells.

Range - When the recovery plan was approved in 1997 only one population of winged mapleleaf was known to be extant – in the St. Croix River on the border between Minnesota and Wisconsin. Since then four additional

populations have been found – in the Saline River and Ouachita River in Arkansas, in the Little River in Oklahoma, and in the Bourbeuse River in Missouri. Additional survey effort is needed to assess and monitor the status and distribution of each population.

Habitat - Winged mapleleaf are found in riffles with clean gravel, sand, or rubble bottoms and in clear, high quality water. In the past, it may also have been found in large rivers and streams on mud, mud-covered gravel, and gravel bottoms.

Feeding Habits - To feed, the winged mapleleaf siphons in water and filters out food particles. It is thought that most of the particles that are actually used as food are phyto- and zooplankton – tiny organisms that drift with river currents.

Reproduction - Winged mapleleaf reproduction is similar to many other freshwater mussels. The males shed sperm into the water. Eggs on the gills of females are fertilized when sperm is collected as the female siphons in water. After fertilization, the females store the developing larvae (glochidia) in their gills until they're expelled into the river current. These glochidia must attach to the gills or fins of a fish to complete development. Glochidia can only develop on certain species of fish which are called host fish. Known host fish for the winged mapleleaf are channel and blue catfish. Glochidia continue growing on the fish and transform into juveniles, then they drop off and land on the river bottom where they mature into adults. The life span of the winged mapleleaf is not known, but the oldest known individual in the St. Croix is 22 years old.

Why is the winged mapleleaf endangered?

Habitat Fragmentation and Small Population Size - The five remaining populations are largely or entirely isolated from one another and appear to be highly differentiated genetically (Hemmingsen 2008). Thus, each may possess important local adaptations. Propagation of winged mapleleaf and its reintroduction into historically occupied river reaches could reduce the impact

to the species' genetic diversity that might result from the loss of any of the remaining populations. In addition, it may be an important tool to increase the viability of one or more populations. The Service and its partners have not yet demonstrated the ability to produce winged mapleleaf in the numbers that would be necessary to effectively reintroduce the species. Significant progress toward this end has been made recently, however, and several agencies and scientists are now cooperating to establish successful protocols.

Zebra Mussels - Zebra mussels are an exotic species of mussel that threaten native freshwater mussels in the Mississippi River watershed. They were inadvertently introduced into North America during the late 1980's and became established in the lower St. Croix River in 2000. Zebra mussels attach to any hard surface and breed so prolifically that they smother or otherwise harm native mussels. It is essential to the conservation of winged mapleleaf that zebra mussels are not allowed to invade any of the remaining winged mapleleaf habitat.

Land Use Changes - The population of winged mapleleaf in the St. Croix River is near the major metropolitan area of Minneapolis and St. Paul, Minnesota. As sprawl from this urban area continues, more and more of the St. Croix River watershed will be developed, which could result in increasing levels of contaminants and sediments in runoff that drains into the river. Researchers have recently documented an increase in fine sediments in the winged mapleleaf habitat in the river (Hornbach & Hove 2008). In Arkansas, Missouri, and Oklahoma agriculture and industry are abundant in the watersheds where winged mapleleaf are present. These activities can destabilize river corridors and increase runoff of harmful pesticides, chemicals, and sediment.