U.S. Fish & Wildlife Service

Endangered Red Wolves

The U.S. Fish and Wildlife Service is reintroducing red wolves to prevent extinction of the species and to restore the ecosystems in which red wolves once occurred, as mandated by the Endangered Species Act of 1973. According to the Act, endangered and threatened species are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people.

On the Edge of Extinction

The red wolf historically roamed as a top predator throughout the southeastern U.S. but today is one of the most endangered animals in the world. Aggressive predator control programs and clearing of forested habitat combined to cause impacts that brought the red wolf to the brink of extinction. By 1970, the entire population of red wolves was believed to be fewer than 100 animals confined to a small area of coastal Texas and Louisiana. In 1980, the red wolf was officially declared extinct in the wild, while only a small number of red wolves remained in captivity.

Greg Koch

During the 1970's, the U.S. Fish and Wildlife Service established criteria which helped distinguish the red wolf species from other canids. From 1974 to 1980, the Service applied these criteria to find that only 17 red wolves were still living. Based on additional breeding studies, only 14 of these wolves were selected as founders to begin the red wolf captive breeding population. The captive breeding program is coordinated for the Service by the Point Defiance Zoo & Aquarium in Tacoma, Washington, with goals of conserving red wolf genetic diversity and providing red wolves for restoration to the wild. Approximately 40 cooperating facilities across North America participate in the national breeding program.

Back in the Wild

The red wolf is a shy species with a segment of its population now back in the wild, hunting, raising young, and howling across portions of its native habitat. The reintroduction effort began in 1987 with the release of four captive-bred red wolf pairs into the Alligator River National Wildlife Refuge (ARNWR), the first-ever restoration of an officially extinct species back into the wild. Since this initial restoration, nearly 100 red wolves now roam over 1.7 million acres of public and private land in northeastern North Carolina.

Melanie McGaw ©

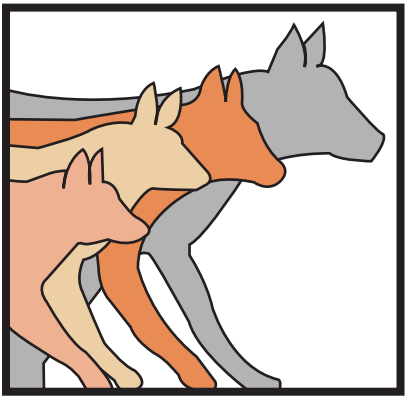
FWS biologist conducting a hard release

In 1988, a litter of red wolf pups was born in the wild at ARNWR, the first wild-born pups in almost a decade. Another milestone was reached in 2002, when all red wolves in this wild population were born in the wild. Ongoing innovations in red wolf management mean success of this restored red wolf population continues. Small numbers of red wolves also live in the wild on island propagation sites on national wildlife refuges in other southeastern states.

The northeastern North Carolina location is the only wild red wolf mainland population site in the world.

Why restore red wolves?

Essential reasons are to prevent extinction of the species and to restore the ecosystems where red wolves lived. It is important to save all members of an ecosystem, including predators, if we are to be good stewards of the land. Predators maintain the balance and health of ecosystems by controlling over-populations of prey species and removing unhealthy animals.



From top to bottom: gray wolf, 80-120 lbs.; red wolf, 50-80 lbs.; coyote, 20-45 lbs.; red fox, 10-15 lbs.

Greg Koch

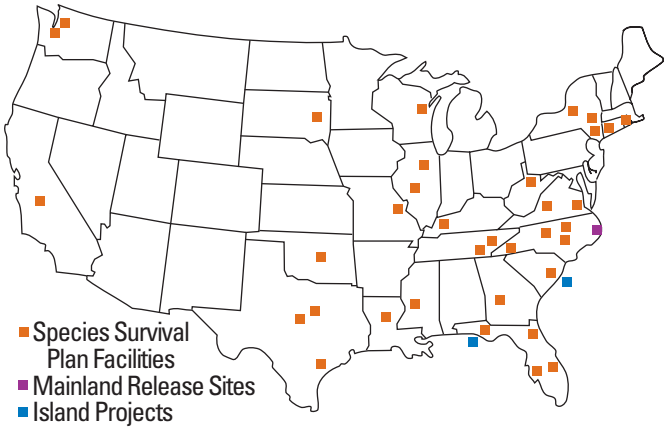
Red wolf dad and pups

Restoring red wolves contributes significantly to local economies. The presence of red wolves in the wild or in zoos and wildlife centers generates ecotourism dollars from those seeking to enhance their understanding of this endangered species. Howling Safaris, sponsored by the Red Wolf Coalition in cooperation with the Service, attract over 1,000 visitors annually to northeastern North Carolina and provide opportunities for red wolf education.

The Endangered Species Act requires recovery plans for federally-listed threatened or endangered species. The Red Wolf Recovery Plan describes population goals and objectives for the red wolf. Lessons learned and techniques developed in the Red Wolf Recovery Program continue to serve as templates for recovery and management of other species. The Red Wolf Recovery Program could be described as an alliance of agencies, organizations, and individuals.

What do red wolves look like?

Red wolves are mostly brown and buff colored with some black along their backs. Typically there is a reddish color behind their ears, on their muzzles and along the backs of

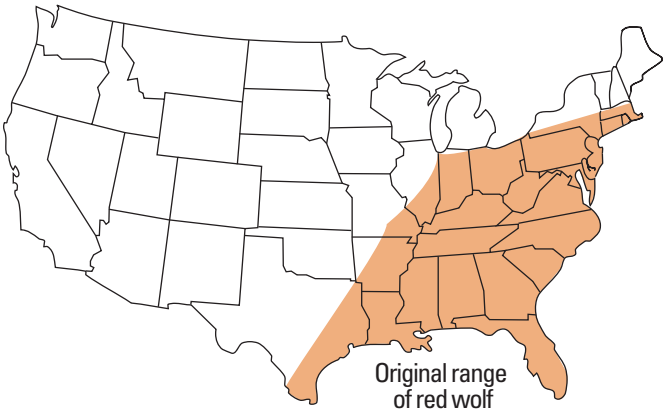


their legs. Red wolves are intermediate in size between the larger gray wolves and smaller coyotes.

Chad McClure

Adult red wolf and yearling

The average adult red wolf weighs from 50-80 pounds, stands about 26 inches at the shoulder and is about four feet long from the tip of the nose to the end of the tail. Red wolves have tall, pointed ears, long legs, and large feet. Since coyotes sometimes enter the restoration area, it is important for people to know the physical differences between the two species. Adult coyotes weigh about one-half to two-thirds as much as adult red wolves and stand approximately four inches shorter; coyotes are much less massive through the head, chest, legs, and feet. However, red wolf yearlings could be confused with adult coyotes based on size similarities.



Captive red wolves can be seen at nearly 40 facilities located across the United States. A list of these facilities is posted on the Alligator River National Wildlife Refuge web site.

Did red wolves ever exist in North Carolina?
Based on fossil and archaeological evidence, the original red wolf range extended from the Atlantic and Gulf Coasts, north to the Ohio River Valley, through central Pennsylvania and New England, and west to southern Missouri and central Texas. At least one archaeological specimen has been found in North Carolina. Early naturalists encountered red wolves, and court records from eastern North Carolina document the payment of red wolf bounties from 1768 to 1789. Animal bounties in the U.S. began with the red wolf.

Do red wolves hybridize with coyotes?
Since applying adaptive management principles, biologists have demonstrated that red wolf hybridization with coyotes can be effectively managed. This means success in establishing wild red wolf populations is achievable. In fact, significant success has been recorded in northeastern North Carolina where the nation's first restored wild red wolf population has been established.

Barron Crawford

USFWS

Radio tracking collar

In the 1960's only a few red wolves remained due to more than three centuries of persecution and habitat destruction. These same factors allowed coyotes and coyote hybrids to migrate from the western U.S. into southern and eastern states. These factors also broke down social structures which formerly minimized interbreeding between wolves and coyotes.

When the few remaining red wolves were unable to find mates of their own species, hybridization with more abundant coyotes did occur. This hybridization is generally accepted as the final factor that resulted in the near extinction of the red wolf. Red wolves, gray wolves, domestic dogs, and coyotes are all capable of interbreeding and producing fertile hybrid offspring. Social structures and territoriality usually prevent such interbreeding.

Alligator River National Wildlife Refuge was chosen as a red wolf restoration site, in part because it was free of coyotes prior to the 1980's. As the non-native coyote colonized North Carolina, by the mid-1990's, it once again became a threat to the restored red wolf population. By 2005, biologists demonstrated that hybridization can be effectively managed while restoring red wolves to the wild.

Red wolf prey: nutria, raccoon, rabbits, white-tailed deer and rodents.

How are red wolves and coyotes managed?

Red wolves are managed at four levels: population, gene pool, family groups, and individuals. In 1999, the Service partnered with various organizations and scientific experts to develop a zone-based Adaptive Management Plan to protect the wild red wolf population from hybridization with coyotes. The plan establishes three zones where coyotes are eventually replaced with a growing red wolf population. The first five years of adaptive management demonstrated coyotes and interbreeding can be effectively managed, red wolves can be successfully restored, red wolves can displace or kill coyotes, the wild red wolf population is expanding, and red wolf reproduction is increasing. The current recovery goal for the species is 550 animals (at least 220 in the wild), but that figure may change depending on the overall health of the population.

How does the Service keep track of red wolves?

Biologists use technologies known as aerial and radio telemetry to track and monitor red wolves in the wild. When red wolves are 8-10 months old, they are captured with a soft-sided leg trap, fitted with a radio collar, and released back into the wild. Each collar works like a mini-radio station, emitting a unique frequency that identifies the wolf. On the ground, biologists can receive a telemetry signal from a distance of up to 1.5 miles under good conditions. Aerial telemetry allows a range of approximately 20 miles. Red wolf locations and activities are monitored by fixed-wing aircraft several times a week. Over time, red wolves will be outfitted with collars than can be detected by satellites and which offer continual data collection over a broader area.

USFWS

Red wolf wildlife biologists also spend a great deal of time in the field looking for red wolf tracks and scat (feces) or listening for howls. Traveling down a dirt road will sometimes reveal red wolf traffic, and for example, whether a wolf is traveling alone or with another wolf, in what direction it's heading, and the general size of the canid. Scat samples are often sent to a genetics lab for further analysis.

Are red wolves a threat to humans?
There have been no documented cases of red wolves attacking humans in North America, despite 500 years of coexistence. Wild red wolves are wary and prefer to avoid humans. However, in the same way it is wise to stay away from stray domestic dogs, red wolves and all wildlife should not be approached for the safety of the animal and people.

What are the primary threats to red wolves?
The primary threats to red wolves are hybridization with the eastern coyote, illegal mortality, vehicle mortality, and diseases such as mange, hookworm, and heartworm. Hurricanes have not caused significant losses to the red wolf population, but they have destroyed pens and enclosures. Hunting is a growing problem as red wolves are sometimes mistaken for coyotes. The Service recommends a "Please Don't Shoot" advisory for hunters in the five-county Albemarle Peninsula because of the presence of endangered red wolves.

What do red wolves eat?
Although the exact diet of red wolves varies depending on available prey, a study of approximately 2,200 scats of wild red wolves from northeastern North Carolina estimates that their diet consists of about 50 percent white-tailed deer, 30 percent raccoons, and 20 percent small mammals, such as rabbits, rodents and nutria. A red wolf consumes about two to five pounds of food per day and can travel up to 20 miles a day in search of food.

USFWS

FWS biologist with new born pups

Do red wolves live and/or hunt in packs?
A "pack" is simply defined as an extended family unit, which is the primary social structure of both red and gray wolves. Pack size is influenced by habitat and prey availability. A typical red wolf pack consists of five to eight animals – an "alpha" or breeding adult pair and offspring of different years. The alpha wolves breed once a year during winter months and are usually the only breeders. The gestation period is about 63 days, and the pups' eyes open between 10-12 days. Red wolves tend to be monogamous.

Since the red wolf's diet does not consist of larger ungulates (elk, bison, or moose), group or pack hunting is probably less frequent. Most hunting by red wolves is believed to be done individually or in pairs.

Wolf packs have specific home ranges that they actively defend against other canids, including other wolves. The pack is a very closely-knit group; in fact, older offspring assist the breeding pair with den attendance and pup-rearing. Almost all offspring between one and three years of age will leave the pack or "disperse."

USFWS

USFWS / Chris Lucash

Above: red wolf pups; below: typical den

Pup Fostering

The Red Wolf Recovery Program has used pup fostering to enhance the genetic diversity of the wild red wolf population and to sustain the overall survival of the red wolf. The first fostering event took place in May, 2002. The North Carolina Zoological Park in Asheboro, North Carolina, donated two pups, a male and a female from a litter of six red wolf puppies born at the zoo. The pups were implanted with microchips for future identification and transported to the Alligator River NWR. The captive pups were then inserted into a wild wolf den containing two wild born pups of identical age and were accepted by the wild mother. The pups grew to adulthood and continued to live among the wild population. Red wolves are highly social animals and have very strong parental instincts. Fostering has proven to be a useful tool in red wolf recovery efforts.

How do red wolves maintain territories?

Red wolves rely heavily on their sense of smell for survival. Similar to domestic dogs, wolves use scent-marking to establish their territories and travel routes. Because each wolf has a unique odor, members of the same pack can identify each other. A red wolf territory can range from a few hundred to more than 50,000 acres.

Howling is another significant form of communication and a means of maintaining territorial boundaries. Wolves howl for many reasons: to keep track of wolves within and between packs, to assemble pack members, to announce or defend a fresh kill, to unify the pack (group howl), or to mark a territory.

Joey Hinton

This is a juvenile male red wolf in a cotton field.

What does a red wolf on private land mean to the landowner?

Various measures of flexibility are built into the Endangered Species Act that recognizes the needs of landowners while offering protection for the red wolf. The rights and lawful activities of a landowner, such as farming, logging, hunting, trapping, or livestock operations, can continue with little or no impact from red wolves.

Some landowners report positive benefits from red wolves, such as natural control of non-native nutria or nest-raiding raccoons on their land. The presence of a pack of red wolves is likely to also reduce the presence of nuisance coyotes.

Red wolves cause very few depredation problems. Should livestock or domestic pet depredations occur, regulations have been passed that allow landowners to take (kill) red wolves if certain conditions exist. The animal must have been "caught in the act" of a depredation, or freshly wounded livestock or pets should be evident. There are also payment mechanisms for landowners if they choose to become involved with red wolf recovery or if they suffer livestock or pet depredations.

Private/corporate lands are an integral component of the Red Wolf Recovery Program. They act as important wildlife corridors between federal lands and provide diverse habitats for wolves to occupy. Partnerships with private land owners work well for people and wolves.

USFWS

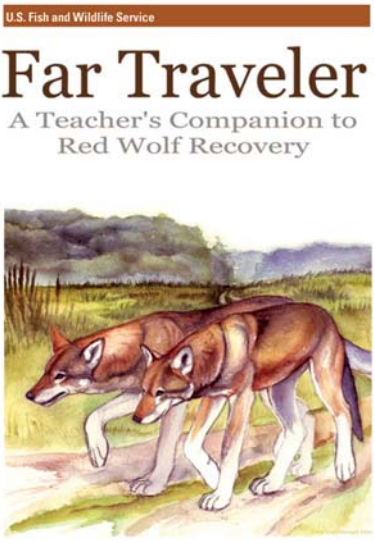
Eastern North Carolina Wildlife Art Show

Donna Storie, Red Wolf Coalition

Tiger Cub Scout Troup #921 of Grifton, North Carolina

How can people learn more about red wolf restoration?

The Red Wolf Recovery Program reaches thousands of people annually by participating in community events throughout North Carolina, often in partnership with other agencies and the Red Wolf Coalition, a citizen-support group. Howling Safaris draw over 1,000 visitors a year to the ARNWR.



"Far Traveler" teacher workshops are held semi-annually to expand red wolf education. Discovery Boxes, containing red wolf teaching tools, are mailed to environmental educators throughout the U.S. on a reservation system.

The red wolf web site is maintained with up-to-date information and other red wolf resource links. Public awareness surrounding the red wolf restoration effort is further expanded to domestic and international audiences through print and broadcast media.

Visiting red wolf exhibits at zoos and nature centers offer another source of education and, in many cases, public viewing opportunities. Learn the mission of the American Zoo and Aquarium Association's Species Survival Plan Program and its link to the Service and endangered species.

How can you help?
Learn about wildlife and how to enjoy and protect wild animals.

Drive safely since red wolves and other wild animals often cross roads to find food.

Keep the roads clean of litter. It attracts wild animals, putting them in harm's way.

Hunt responsibly. There are 100 counties in North Carolina – 95 do not have red wolves.

Support the Red Wolf Coalition and cooperating zoo facilities.

Historic Time Line for the Endangered Red Wolf	
1791	Red wolf first described by Bartram.
1851	First publication of valid scientific name for red wolf by Audubon and Bachman.
1905	First recognition of red wolf as a distinct species by Bailey.
1937	First recognition of three subspecies of red wolf by Goldman.
1962	Scientific community informed by McCarley that red wolf is in danger of extinction.
1967	Red wolf listed as an endangered species under provisions of the Endangered Species Preservation Act of 1966.
1968	Service begins a study of the red wolf in southeast Texas and southwest Louisiana.
1969	First red wolf placed into captivity initiating the red wolf captive-breeding center at PDZA.
1973	Endangered Species Act becomes Federal law. First red wolf recovery plan completed and implementation begins. In a race against extinction, an all-out effort to capture wild red wolves for captive-breeding program begins.
1977	First litter of red wolf pups born in captivity in PDZA.
1978	First successful experimental release, tracking, and recapture of red wolves on Bulls Island, South Carolina, solidifies restoration techniques.
1980	Last red wolves removed from the wild and red wolf declared extinct in the wild. Unique allele found by Ferrell *et al.* in *Canis* specimens from within red wolf range supports conclusion that red wolf is a distinct species.
1984	Red wolf recovery plan revised, updated, and approved. Red wolf incorporated into AZA's SSP. ARNWR established on land in northeastern North Carolina donated to the Service by Prudential Insurance Company.

1987 First restoration begins with the release of four pairs of captive-born red wolves into ARNWR. First island propagation project begins on Bulls Island in an attempt to give red wolves some wild experience before release into mainland reintroductions.

1988 First litter of red wolf pups born in the wild at ARNWR.

1989 Second restoration project started by the release of red wolves into GSMNP. Wayne and colleagues publish mtDNA results suggesting that the red wolf may be of hybrid origin. American Sheep Industry Association files petition to delist red wolf based on the mtDNA results.

Greg Koch

1991 Second-generation red wolf pups born in the wild at ARNWR. 1991 petition request to delist the red wolf found unwarranted by Service. First litter of red wolf pups born via artificial insemination at PDZA.

1992 Red wolves released into PLNWR. First red wolves born in the wild in GSMNP.

1995 Attitude survey by North Carolina State University shows majority of residents in eastern North Carolina support red wolf reintroduction. Amendment to Interior Appropriation Bill introduced in Senate to suspend all funding for Red Wolf Recovery Program. Amendment narrowly defeated.

Historic Time Line for the Endangered Red Wolf

1995	North Carolina law to allow taking of red wolves on private property in two counties goes into effect. Revised relaxed Federal regulations published addressing concerns about restored red wolves. National Wilderness Institute files petition to delist red wolf based on nuclear DNA results.
1996	Economic study by Cornell University shows strong regional support for red wolf recovery, substantial potential tourism benefits, and a significant willingness of the public to pay for red wolf recovery that far exceeds the cost of the program. Study by East Carolina University shows strong local support for red wolf recovery in northeastern North Carolina and a willingness to contribute financially to support the program.
1997	1995 petition request to delist the red wolf found unwarranted by the Service. Two North Carolina counties and two individuals file suit to invalidate federal regulations regarding the red wolf. Fourth island propagation project initiated on Cape St. George Island off the Gulf Coast of Florida.
1998	GSMNP reintroduction project canceled due to low pup survival and the inability of wolves to establish home ranges within the Park. PHVA and Adaptive Management Plan initiated.
1999	PHVA determines that hybridization with coyotes is the greatest threat to the recovery of the red wolf. An adaptive management plan is developed to address and manage hybridization.
2002	The entire red wolf population in northeastern North Carolina is wild-born except for two pups born at the North Carolina Zoo that are fostered into a wild den.
2003	Litter of pups born at PDZA via artificial insemination using fecal hormone analysis to time insemination.
2004	One of the 2002 fostered pups fathers a litter of eight. Two captive-born pups (born at CRNWR) fostered into separate wild dens.

2006 About 100-130 wild red wolves roam 1.7 million acres in northeastern North Carolina, and over 170 exist in the captive population throughout the U.S. Adaptive management is working to control the coyote population in the recovery zones and has seen measurable success.

2006 With support from the Recovery Implementation Team, red wolf recovery continues to progress. New research techniques and data management are continually incorporated into the recovery effort.

Key to Acronyms

ARNWR: Alligator River National Wildlife Refuge, NC

AZA: American Zoo and Aquarium Association

CRNWR: Cape Romain National Wildlife Refuge

GSMNP: Great Smoky Mountains National Park

mtDNA: Mitochondrial DNA

PDZA: Point Defiance Zoo & Aquarium, Tacoma, WA

PHVA: Population and Habitat Viability Assessment

PLNWR: Pocosin Lakes National Wildlife Refuge, NC

SSP: Species Survival Plan

U.S. Fish and Wildlife Service
Red Wolf Recovery Program
Alligator River National Wildlife Refuge
P.O. Box 1969, Manteo, NC 27954
Phone: 252/473 1131 Ext. 246 Fax: 252/473 4836
E-mail: redwolf@fws.gov
www.fws.gov/alligatorriver

Red Wolf Captive Breeding Program
Point Defiance Zoo and Aquarium
5400 North Pearl Street, Tacoma, WA 98407
Phone: 253/591 5337 Fax: 253/591 5448
www.pdza.org

Red Wolf Coalition
P.O. Box 96, 212 Main Street, Columbia, NC 27925
Phone: 252/796 5600 Fax: 252/796 5601
E-mail: redwolf@redwolves.com
www.redwolves.com

U.S. Fish & Wildlife Service
1 800/344 WILD
www.fws.gov/southeast

December 2006

Brad McPhee, Point Defiance Zoo