Red Wolf

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Common Name: red wolf
Scientific Name: *Canis rufus*
Order: Carnivora
Family: Canidae
Status: Endangered under the Endangered Species Act of the United States; Critically Endangered (CR) on the 1996 IUCN Red List.
Threats: Hybridization with other members of the Canidae family; lack of public acceptance of large carnivores.
Habitat: Highly variable throughout southeastern and eastern North America where sufficient prey and minimal human development occur.
Distribution: Currently free-ranging in a reintroduced population in northeastern North Carolina and on (2) islands in South Carolina and Florida. The red wolf's historic range was recently redefined to extend from eastern Texas northward to Missouri and eastward and northward to the northeastern United States.

DESCRIPTION

The red wolf is intermediate in size between the coyote (*Canis latrans*) and gray wolf (*C. lupus*). Male red wolves range from 23 to 38 kg, and females range from 19 to 34 kg. Coloration is typically brownish with black shading on the back and tail.

NATURAL HISTORY

The red wolf was first described during the 18th century. However, its natural history remains poorly understood. Knowledge of red wolves prior to restoration efforts is based on relatively small samples from remnant and probably atypical red wolf populations. Historical data and restoration data indicate that the red wolf is a monestrous species (i.e., goes into estrous once each year) that typically becomes sexually mature by its second year. Red wolves live in extended family groups similar to gray wolves, and litters average three to five pups (Riley & McBride 1972; Shaw 1975). Data from the restored population indicate that offspring from a breeding pair are tolerated in their natal home range until they disperse, with dispersal apparently related to social factors most typically associated with the onset of sexual maturity. Principal prey items prior to the red wolf's extinction in the wild

included nutria (*Myocastor coypus*), rabbits (*Sylvilagus* spp.), and rodents (*Sigmadon hispidus*, *Oryzomys palustris*, *Ondatra zibethicus*) (Riley & McBride 1972; Shaw 1975), whereas in the re-introduced population in North Carolina, white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), rabbits, and small rodents (*Mus musculus*, *Sigmadon hispidus*, *Peromyscus* spp.) are the primary prey, with resource partitioning evident within packs. Data from the restoration program indicate that dens can be located both above and below ground and that mortality is owing to a variety of factors, including vehicles, parasitism, and intraspecific aggression (i.e., aggression among wolves).

CONFLICTING ISSUES

In 1973 a decision was made to place wild red wolves in captivity for managed breeding and eventual restoration (U.S. Fish and Wildlife Service 1989). This action led to the extinction of the red wolf in the wild by 1980. In 1987 captive-born descendants of the animals removed from the wild 14 years earlier were released onto Alligator River National Wildlife Refuge (NWR) in northeastern North Carolina (NENC). This was the first attempt to restore a carnivore declared extinct in the wild to a portion of its former range. Currently a free-ranging population of red wolves, estimated at 80 individuals, inhabits approximately 1 million acres of federal, private, and state lands in northeastern North Carolina.

Despite this success, red wolf recovery has had setbacks and challenges. Land Between the Lakes (LBL) in Kentucky and Tennessee was the initial choice for the re-introduced of red wolves. However, in 1984 the proposal to release wolves at LBL was abandoned owing to lack of public support. This failure to address private landowner concerns helped precipitate an amendment to the Endangered Species Act (Public Law No. 93–205) that allows for the designation of re-introduced populations as experimental and nonessential (section 10(j) of the Act). Duly designated populations are managed as threatened species with specific management rules drafted to address public concern. The ability to designate re-introduced populations in this manner made red wolf re-introduction possible, as it removed many of the potential social and bio-political conflicts associated with re-introduction (Parker & Phillips 1991).

By the mid-1960s habitat alteration and loss, as well as predator extermination campaigns, effectively reduced the free-ranging red wolf population to a small remnant population in southeastern Texas and southwestern Louisiana (U.S. Fish and Wildlife Service 1989). Extensive hybridization between the red wolf and coyote threatened those wolves that remained (U.S. Fish and Wildlife Service 1989). This hybridization was the ultimate factor that caused red wolves to be removed from the wild. The hybridization also fueled a debate regarding whether the red wolf is of hybrid origin

or a unique taxon that hybridized with coyotes owing to a dwindling population and a concomitant expansion of the coyote population (Nowak et al. 1995).

The ability of wolves to colonize large areas quickly is a fundamental biological reason for the success of the restoration program in NENC. However, the lack of federal land relative to a conglomeration of many small private land holdings, many of which are utilized as farms and hunt clubs, has presented a challenge to red wolf recovery. Although there is strong public support for the red wolf program, landowners can and do request that wolves be removed from their land, often simply because hunters who pay for access to the land believe the wolves have an adverse effect on their hunting success. Public attitude surveys have indicated widespread support for the red wolf program (Mangun et al. 1996; Quintal 1995; Rosen 1997), and the projected economic impact of the program to the re-introduction area may be to bring as much as $184 million into the local economy annually (Rosen 1997).

Two primary conflicting issues challenge red wolf recovery: (1) the interface with private landowners, and (2) hybridization with other members of the *Canis* genus.

First, section 10(j) of the Endangered Species Act has been and will continue to be a critical tool to affect restoration of wolves. A publicly reviewed rule package that addresses management of wolves on private lands accompanies a re-introduction under section 10(j) of the Act. It is important to remember that the release of red wolves on Alligator River NWR in 1987, and the eventual expansion of the population throughout the designated five-county restoration area in NENC, represents the first successful restoration of a carnivore extinct in the wild. However, there was no model regarding the management of wolves on private lands when wolves were released in NENC. The public had no firsthand experience with wolves and was apprehensive regarding the possible threats to personal safety, the potential for depredations of livestock and pets, and the likelihood of land use restrictions.

This, combined with a general lack of biological knowledge of the red wolf, resulted in a set of 10(j) rules that are biologically and politically problematic. To address local landowners' concerns about wolves leaving federal land, the rules associated with the restoration allow for landowners to request the capture and removal of a wolf from their land when there is not an associated, wolf-caused problem. Whereas during the initial years of the re-introduction this may have been feasible, the current demographics of the re-introduced population (80 animals over 1 million acres) make it impossible to resolve such requests, and such removals may represent a threat to recovery. Reasons for this include the following: (1) wolves disperse widely and are a fluid resource, (2) wolves thrive in a variety of habitats, (3) the current rule requires such wolves be released back to the wild,

(4) the unknown effect such removals may have on hybridization rates, and (5) the diversion of manpower away from monitoring hybridization and achieving recovery goals.

Second, issues regarding hybridization fall into two categories. First, is the red wolf of hybrid origin? Two petitions to delist the red wolf have been filed on the basis of its being of hybrid origin. In 1991 the American Sheep Industry Association filed a petition based on mitochondrial DNA analysis, and in 1995 the National Wilderness Institute filed a petition based on nuclear DNA results. Both petitions were found to be untenable based on current data (Henry 1992, 1998). Recent genetic and morphological evidence supports these findings (Theberge 1998). Second, what is the potential for and effect of hybridization with coyotes, hybrids, or feral dogs? Such hybridization is not unique to the red wolf (Wayne et al. 1995; Theberge 1998). A better understanding of the cause and significance of hybridization among canid species is needed.

FUTURE AND PROGNOSIS

The prognosis for landowners and red wolves to co-exist is good. Most landowners have come to understand that wolves do not represent a significant threat to person or property. The implementation and use of the experimental nonessential designation has illustrated how endangered species so designated can represent little if any threat to loss of private property rights. There is currently nothing landowners cannot do on their land that they could not do prior to the presence of red wolves. Furthermore, landowners may, and do, request that wolves be captured and removed from their land. It must be recognized that with the current population demographics, removal of nonproblem wolves is typically no longer possible. Additionally, such efforts cost the taxpayer money and divert recovery personnel away from the program's ultimate goal—delisting the red wolf. The removal of wolves that are established and not affecting personal safety or personal property (e.g., livestock) contradicts the goals of the program, and diverts manpower away from monitoring and managing hybridization. Furthermore, when wolves are removed, social bonds may be disrupted and/or a vacant territory may result. These factors alone threaten recovery, but they also potentially facilitate the establishment of a resident coyote population. The degree to which hybridization occurs in a wolf population may depend on having enough wolves established to exclude coyotes or maintain them at relatively low levels.

Specific recommendations on removing red wolves are problematic. Until the current rule is changed, Service personnel will continue to attempt to trap and relocate red wolves that inhabit private land on which the landowner requests their removal. Rules written for additional red wolf reintroductions should reflect that wolves will be removed only to resolve a

depredation or related problem. Rules written for gray wolf re-introduction to Yellowstone National Park include this provision and have worked well (Phillips & Smith 1998). However, such a change in NENC may be viewed unfavorably by some landowners, instead of as a natural evolution of the program. In contrast to removing nonproblem wolves, the current rules allow landowners, or their agents, to take a problem wolf when Service efforts have not been successful. Written permission from the Service is required before a landowner can take such wolves. However, this option has, to date, not been used. Part of living with wolves is realizing that some wolves will need to be taken (Mech 1996). It remains, however, sociologically and biologically problematic that wolves that have not caused a problem, and are critically endangered, may be included in this realization—especially given the implications of such removals to hybridization rates between coyotes and red wolves. Recently a North Carolina law was passed that would allow the taking of nonproblem red wolves. Although a federal court recently upheld the Service's authority to regulate such taking of red wolves, the decision is currently being appealed.

The prognosis for addressing hybridization in red wolf recovery is uncertain. Too little is currently understood. The advent of DNA analysis has raised questions about how species are defined and how such data are applied to taxonomic classification (Dowling et al. 1992; Nowak et al. 1995).

Interbreeding between wolves and coyotes may be the result of a small remnant or expanding population of wolves. This paradigm was the basis for choosing re-introduction sites for red wolves without coyotes present (Parker 1987). Such restoration sites would give red wolves the opportunity to establish a population without the potential for hybridization. Thereafter, the potential for hybridization should be minimized. However, it is doubtful there are any potential re-introduction sites within the historic range of the red wolf that are free of coyotes.

To date, hybridization between coyotes and red wolves has occurred in the NENC red wolf population; however, the circumstances under which mixed pairs occur require better understanding. Coyotes were not present in NENC in 1987 when red wolves were first released, but they are now being seen frequently. Space use studies of sympatric coyotes and red wolves (i.e., where both species live in the same location) are being undertaken. Such studies are part of a monitoring program designed to help understand (1) the degree to which hybridization occurs between red wolves and coyotes, (2) the circumstances under which hybridization occurs, and (3) the contribution hybrids make to a population. It is not known with certainty whether red wolf/coyote hybrids are reproductively viable. The red wolf program has an opportunity to study these issues that it did not have in the 1970s when the red wolf was recognized as being endangered.

The threat that hybridization represents to red wolf recovery is not unique to red wolves. Indeed, the traditional definition of species should be revised

and/or the role hybridization plays in canid populations and evolution should be re-examined by the scientific community. Is some level of hybridization in a population "natural" or "acceptable"? By definition, wolves and coyotes are different species, yet they interbreed.

With respect to the red wolf, if hybridization occurs at levels that are unacceptable, can a population be managed such that acceptable levels are maintained? If hybridization occurs at acceptable levels or under circumstances that are manageable in a red wolf population that established itself essentially in the absence of coyotes, can future populations of red wolves be established in areas with established coyote populations with the same result? Clearly, more information is needed on sympatric interactions between red wolves and coyotes, and with respect to acceptable levels of hybridization in canid populations in general. The red wolf recovery program is in a unique position to provide data to help clarify these issues for the red wolf and other canid species.