

8. Captive Breeding and Species Survival

Critical Conservation

Sometimes the population of a species drops to such low numbers in the wild that it is almost certain to become extinct unless we intervene to save it. This was the case with both the red wolf in the southeastern United States and the Mexican wolf in the Southwest. The extensive campaigns of persecution against these wolves reduced their number to critically low levels by the 1970s. Critically low populations are vulnerable to extinction for several reasons: disease, harsh weather or other adverse conditions could easily wipe them out; closely related animals could breed with one another, increasing the chances of mutations and other weaknesses being expressed in the population and leading to “inbreeding depression.” (Inbreeding depression is the reason why brothers, sisters and close cousins are not permitted to marry in most cultures.)

The red wolf and the Mexican wolf faced other difficulties as well. Red wolves were interbreeding with coyotes in areas where red wolf numbers were particularly low, thus risking their species integrity. In the case of the Mexican wolf, the population had dropped so low that only a single female was known to exist. If anything had happened to her before she could produce a litter of pups, the Mexican wolf would have been doomed. When a species is this critically endangered, intensive efforts must be made to ensure the survival of the remaining individuals so that they too can produce offspring.

Species Survival Plans

As the number of individuals of a species declines in the world, so do their chances of survival. When so few individuals of a species remain that extinction in the wild seems inevitable, it is necessary to collect some or all of the remaining wild individuals and take them into zoos to protect them and to facilitate breeding. To ensure that this approach truly helps the species recover, detailed strategies are developed for the breeding and conservation of the remaining animals. These strategies, called Species Survival Plans (SSPs), are comprehensive plans developed by the American Zoo and Aquarium Association (AZA) to ensure the survival of species faced with extinction.

Some of the issues covered in SSPs include:

- Procedures for proper care to maintain a healthy captive population
- Accurate records of births, deaths and lineages
- Guidelines for using these records to make breeding decisions that preserve the genetic diversity of the species
- Plans for incorporating the animals into educational programs that teach the about the importance of captive breeding and species conservation
- If feasible, plans for the reintroduction of the species to the wild

The overall goal of SSPs is not simply to produce a lot of animals but to attempt to conserve, to the greatest extent possible, the genetic diversity that is present in the animals removed from the wild. To illustrate this, imagine trying to breed a species that consists of only ten animals. Nine of these animals have blue eyes and one has brown eyes. If that one brown-eyed individual does not have any offspring, brown eyes are a trait that will be forever lost in that species. Of course, not all of the traits that are carried in genes are as visible as eye color. There might be alleles (genes that occur alternatively at a particular locus on a chromosome) for traits that are difficult to measure such as resistance to a certain disease or an ability to go longer without food.

Conserving genetic diversity is important because the more variability there is in a population, the more likely it is that some of the members of the population will be able to survive unpredictable events. For instance, if global warming proceeds as some scientists predict, red wolf habitat might conceivably change. Tropical insects might move farther north and bring diseases that never before affected red wolves. The higher the genetic diversity among the population, therefore, the more likely it is that some of the wolves might, by chance, have immunity to new diseases.

Historically, wolves have had a very high level of genetic diversity. We know this because every breed of dog that exists today is descended from wolves, so alleles for all the different sizes, shapes and coat colors that we see in dogs were historically present in wolves. When a population shrinks to just a few animals, however, much of that inherent variation is lost. The problem for the captive breeder is to try to avoid losing any more. Half of any animal's genetic makeup comes from its mother, and the other half comes from its father. So it would seem, therefore, that parent wolves would have to have two pups to pass on all their genes.

Unfortunately, however, it is not that simple because a parent might pass some of the same genes on to each of its offspring. So scientists use computers to create something of a "dating service" for captive wolves to determine which wolves should breed. They create this dating service by carefully analyzing how all the wolves in a population are related. Animals are chosen to breed based on the number of relatives they have in the population. Those with the fewest relatives are most likely to be bred. Biologists also note the number of females and males, how long each animal lives and the average number of offspring each animal produces.

Species Survival Plan for the Red Wolf (*Canis rufus*)

The red wolf once ranged throughout the southeastern United States, as far west as Texas and as far north as Pennsylvania. Declining deer populations, habitat destruction for agriculture and persecution by humans led to the drastic decline of the red wolf in the first half of this century. By 1972, biologists understood that the species required intervention to prevent it from extinction.

A formal recovery program was established for the red wolf in 1973. A captive breeding program was established at Point Defiance Zoo in Tacoma, Washington. A recovery team was established

to gather information about red wolves. The team studied vocalizations to facilitate tracking wolves in the wild, developed methods using measurements and DNA to separate red wolves from coyotes and hybrids and determined parasite infestations in wild wolves. This information helped the recovery team capture and care for the last red wolves.

From 1973 to 1980, over 400 canids were captured in the wild. By weighing the animals and measuring their height and weight as well as their skulls, ears and hind feet, biologists determined that many of the animals were too small to be red wolves and were, in fact, hybrids-crosses between red wolves and coyotes. Only 43 of the 400 captured animals were considered likely to be pure red wolves. Subsequent DNA testing showed that only 14 of these 43 animals were free of coyote genes. Since no one had tried to breed red wolves in captivity, it was a trial and error process to try to keep the wolves healthy and to get them to produce pups. The biologists needed to make sure the wolves had enough of the right kind of food and that the man-made dens were suitable for raising pups.

There were some problems along the way. For instance, biologists found that the cement-floored dens they had built were unhealthy for the pups. The pups tried to dig little burrows for themselves in the concrete and wound up with sores and infections. The keepers solved the problem by putting a thick layer of straw on the concrete for the pups to dig in. All this sort of information was written down so that future wolf caretakers would not have to re-learn all the details of taking care of the wolves.

The meticulous attention to detail and the careful planning has paid off. By 1987, there were so many red wolves in captivity that biologists were able to begin releasing wolves back into portions of their former habitat in Alligator National Wildlife Refuge in North Carolina and Great Smoky Mountains National Park in Tennessee. In fact, the captive breeding program was so successful that lack of space in zoo facilities became one of the biggest difficulties.

Red wolves are doing well in North Carolina, with 60 to 100 wolves living in Alligator River National Wildlife Refuge and Pocosin Lakes National Wildlife Refuge. Unfortunately, red wolves did not fare as well in the Great Smoky Mountains. The reasons for this are not clear. The pup mortality rate was high, and some biologists think there is not a sufficient prey base to support a viable wolf population. For these reasons, the Great Smoky Mountain reintroduction program was re-evaluated, and the animals were returned to captivity. Other potential release sites are being studied for the 200 red wolves living in captivity in over 30 zoos across the nation.

Species Survival Plan for the Mexican Wolf (*Canis lupus baileyi*)

The Mexican wolf, also known as El Lobo (which means “the wolf” in Spanish) is a subspecies of the gray wolf. Like the red wolf, El Lobo is on the rebound after having been declared extinct in the wild. When serious conservation efforts for the Mexican wolf began in 1977, this species was probably in worse shape even than the red wolf. Three years of capture efforts had yielded only five pure Mexican wolves, only one of which was a female. While hybridizations with coyotes were not such a problem as they were with the red wolf, one of the four males caught had fathered a litter of puppies with a female dog.

The biggest obstacle facing the program was the fact that only one female Mexican wolf was captured. Dubbed "Number 5," she was pregnant at the time of her capture in 1978. There was, however, only one female pup in the litter, and that pup died when she was only four days old. Three years passed before Number 5 gave birth to another litter. If she had died or become infertile, the Mexican wolf would have faced almost certain extinction, as no other pure Mexican wolves were found until 1995. Fortunately Number 5's 1981 litter consisted of three females and one male. All four pups survived to adulthood and eventually had litters of their own. Conservation genetics, as described above, was very important for the health of the Mexican wolf population since most of the population is descended from only five wolves. The biologists administering the SSP had to be extremely careful about which animals were paired. The situation improved in 1995 when 29 other wolves in captivity turned out to be pure Mexican wolves. A group of 21 wolves was descended from a single pair at Ghost Ranch, Arizona. The discovery of these wolves gave the program a boost as it allowed crosses between unrelated lineages. The SSP keeps track of all these lineages and helps scientists pair animals to prevent further loss of genetic diversity.

As of January 1998, there were 175 Mexican wolves in the world, all held in captivity. That changed in the ensuing months, however, as eleven of the captive-bred Mexican wolves were moved into 1/3-acre enclosures in historic Mexican wolf habitat in Arizona's Blue Range Mountains. Here, the wolves acclimated to the region and ate road-killed elk left by caretakers. The caretakers were careful not to get too close to the wolves or seem too friendly, so that the wolves would not become acclimated to humans.

On March 29, 1998, Fish and Wildlife Service officials opened the gates, and 11 Mexican wolves reclaimed their place in the Arizona wilderness. While it is too early to predict how well these wolves will succeed in the wild, early reports indicated that the wolves had begun to learn to hunt elk on their own. Unfortunately, within a month of the release, a camper shot one of the male wolves, claiming it had attacked his dog. The male's pregnant mate was recaptured to ensure the survival of her litter. Several more Mexican wolves have been shot as well. To the best of collective knowledge, not one of these wolves was attacking humans or depredating livestock. At this time, the people responsible for killing the wolves have not been apprehended. Defenders of Wildlife and the Fish and Wildlife Service are offering a reward for information leading to the conviction of anyone who has illegally killed a Mexican wolf.

Meanwhile, the Department of the Interior has released several more Mexican wolves. Students and teachers are encouraged to keep up-to-date on the Mexican wolf issue on Defenders of Wildlife's website. Public acceptance is critical if the Mexican wolf is to survive in its former range, and public acceptance depends upon sound education programs.

