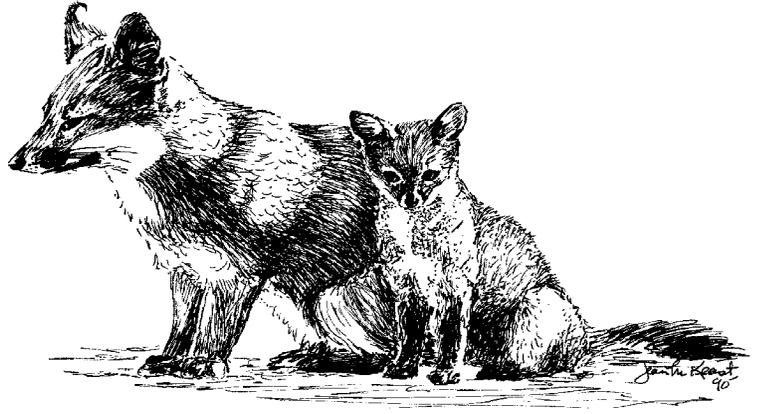




## The Island Fox: Here Today...



The island fox (*Urocyon littoralis*) lives on six of the eight Channel Islands off the coast of southern California—San Miguel, Santa Rosa, Santa Cruz, Santa Catalina, San Nicolas, and San Clemente. Each island has its own subspecies, and they are found nowhere else in the world.

Once you could see island foxes on most any trip to the larger Channel Islands. Bounding through the grass, trotting along the trail, peering intently at something underfoot—a fox sighting was often the highlight of your island adventure.

In recent years, island fox populations have declined 95% on the three northernmost islands—San Miguel, Santa Rosa, and Santa Cruz. A park monitoring program on San Miguel Island saw their numbers drop from around 450 in 1994 to 15 in 1999. Without aggressive recovery actions, foxes on these islands may be extinct within a few short years. How could this happen in such a seemingly isolated and protected area? The puzzle is complex, with a variety of factors affecting the outcome.

### The Mystery

Initially, the decline in fox numbers on San Miguel Island was viewed as possibly a natural fluctuation, not uncommon in wildlife. Genetic studies and historical observations showed other “bottlenecks” in island fox history, where numbers greatly declined and then recovered.

During this recent event, San Miguel studies showed that adults were slowly disappearing yet still breeding successfully. However, very few pups survived their first year. The decline also moved from west to east across the island. At the same time, on the southern islands, both adult and pup populations were stable. In examining the evidence, park biologists looked at a range of causes: disease, parasites, predation, and other environmental factors. The west-to-east pattern suggested disease movement, so blood and fecal samples were studied. There was no

apparent disease that could have caused the decline.

With foxes at the top of the island food chain, predation on them had been rare, but telemetry studies proved otherwise. Foxes on Santa Cruz Island were radio-collared by researchers from the Institute for Wildlife Studies. Of 29 foxes that died over a two-year period, 21 had been preyed upon. Golden eagles were suspected, but initially there was no direct evidence.

In the fall of 1998, a follow-up telemetry study was conducted by the National Park Service on San Miguel Island. Within a few months, four of the eight foxes collared had been attacked and eaten. This time, the culprit left a feather at one of the scenes. A lab identified it as “golden eagle.” A major part of the mystery was solved.

### A Conspiracy of Circumstances

Historically, golden eagles were not found on the Channel Islands. There was no prey base, and the resident and highly territorial bald eagles may have prevented them from utilizing the islands. Since bald eagles feed mostly on fish and carcasses, in a sense, island foxes were protected. But bald eagles disappeared during the 1950s and 60s due to the effects of the pesticide DDT.

With the banning of U.S. production of DDT in 1971, continental bald eagle populations have recovered. However, bald eagles have never returned to the islands due to the persistence of DDT in ocean food chains.

In more recent years, golden eagle numbers have risen on the mainland. The increased competition has caused them to search for new food sources and territories across the channel. With an abundance of feral piglets on Santa Cruz Island, supplemented by island foxes, golden eagles have found a new hunting territory. The first golden eagle nest was

discovered in 1999, and eagles have bred annually on the island since then.

Compounding the situation is a general lack of island vegetation. Years of grazing by ranch animals have removed much of the native chaparral cover, leaving only non-native grasses in many areas. Since the foxes hunt during the day and have few places left to hide, they are easy targets for hungry golden eagles.

Other complications in need of further study are the diseases and parasites potentially introduced to the foxes by domestic dogs.

When an important link in a food chain is removed, there are other effects as well. Recently, island mice populations rose dramatically. Would this have happened if foxes were still abundant? What else has been affected by this change in unique island food chains?

## A Fox in Our Future?



Channel Islands National Park is coordinating a recovery effort with the help of many individuals and organizations. Canon U.S.A., Inc. provided a grant to study the fox decline, and the National Park Foundation manages a fund-raising campaign. On March 4, 2004, the U.S. Fish and Wildlife Service listed the island fox as an endangered species. This was the last chapter in the island fox's long 19-year wait for federal protection and will help provide increased efforts to save this rare animal.

The park has undertaken the following emergency actions to restore natural populations of island foxes:

- Since 1999—2000, the National Park Service has been implementing recovery actions on Santa Rosa and San Miguel Islands, including captive breeding of foxes and removal of golden eagles. The National Park Service and The Nature Conservancy began captive breeding of island foxes on Santa Cruz Island in 2002.
- This captive breeding has been very successful. Foxes have been released to the wild on Santa Rosa, San Miguel, and Santa Cruz Islands. Some of these foxes have successfully bred and produced pups.

- Since 1999, golden eagles have been captured and released in northeastern California. None have returned to the islands.
- Bald eagles are being reintroduced as part of a feasibility study funded by settlement monies from a DDT contaminant case. These young eagles are establishing territories and will hopefully, deter golden eagles from the islands. In 2006, for the first time in more than 50 years, two bald eagle chicks were hatched unaided from two separate nests on Santa Cruz Island.
- Feral pigs are being removed from Santa Cruz Island through a joint project by the National Park Service and The Nature Conservancy that began in 2004.

While methods have been developed to help other endangered animals, islands pose unique challenges. Since the fox cannot migrate elsewhere, nor can its habitat be duplicated on the mainland, restoring its island home is the highest priority. Recovery efforts include removing exotic weeds and animals, replanting native vegetation, and improving water quality. But it's a slow, tedious process and merely a complement to the natural recovery, which could take generations.

## A Fox Profile

On each of the six islands, a different subspecies occurs, distinguished by both genetic and physical differences. For example, San Miguel Island foxes have shorter tails, due to one less tail vertebra, and longer noses than the other island foxes. The island fox is the largest native mammal on the Channel Islands, but one of the smallest canid species in the world. They average from 12 to 13 inches in height, 23 to 27 inches in length (including tail), and three to four pounds in weight—about the size of a small housecat. The island fox is nearly 20 percent smaller than its closest relative, the mainland gray fox (*Urocyon cinereoargenteus*). Similar in appearance to the gray fox, the island fox has a

gray back, rufous sides (reddish-brown), and a white underside. There are distinctive black, white, and rufous markings on the face.

Mating takes place in February and March with pupping usually in April or May. Average litter size is two. The adult males play an important role in the raising of young. Unlike nocturnal gray foxes, which hunt exclusively at night to avoid predators, island foxes normally have no natural predators, so they can be active during daylight hours. As “generalist omnivores,” they eat almost all available foods on the islands, including fruits, vegetation, insects, mice, and crabs.

## Colonizing the Islands

Geologists believe the northern Channel Islands were never connected to the mainland, yet the fossil record shows the arrival of foxes at least 16,000 years ago. So how did they cross this water barrier?

During the last ice age, 10—20,000 years ago, ocean levels were up to 400 feet lower than today's. The channel between the islands and mainland narrowed, perhaps to just four to five miles across. The northern islands became one large island we call Santarosae. Gray foxes could have “rafted” to this island on driftwood, propelled by storms or currents.

The foxes adapted to their new island home, evolving into a dwarf or smaller form of the gray fox. Environmental and ecological factors such as overcrowding, reduction in predators, food limitations, and genetic variations could have contributed to the natural selection for a smaller size. As the climate warmed and ocean levels began to rise, canyons filled with seawater. Santarosae was divided into the islands of San Miguel, Santa Rosa, Santa Cruz, and Anacapa. Because of a lack of permanent freshwater, the island fox did not persist on Anacapa, but the other three northern islands had all the requirements for foxes.

## The Chumash Connection

Evidence of Native Americans has been found on the Channel Islands dating back at least 13,000 years. Well-developed trade routes existed between the Chumash on the northern Channel Islands and the Gabrieliño/Tongva on the southern islands. Scientists believe island foxes were transported to the southern Channel Islands of Santa Catalina, San Nicolas, and San Clemente through trade by island peoples. Foxes may have colonized San Clemente Island as recently as 500 years ago.



The Chumash give special status to the fox, considering it to be a pet of the sun or dream-helper. The island Chumash performed a fox dance and probably used the pelts to make articles such as arrow quivers, capes, and headdresses.