

Teetering on the Brink of Extinction? (Or Is It Too Late?): Problem Handouts



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Part 1

Driving slowly down a gravel road in southern Florida in the failing late-afternoon light, I was startled by the long tawny form that loped across the road in front of the car. My glimpse was only a second, or perhaps two at most, and then it was gone. I stopped the car and, shaking with excitement, I tried to review each aspect of that moment to make the experience indelible in my memory. It was almost impossible that I would ever again be so fortunate.

I had seen the Florida panther, an endangered subspecies of puma and a big cat that has been in geographic and numerical retreat for dozens, if not hundreds, of years. Once *Felis concolor coryi* ranged from Arkansas to South Carolina to Florida, but now it remains as a relic population confined mostly to the Everglades National Park, the Big Cypress National Preserve, and the Florida Panther National Wildlife Refuge.

Though few in number, the population has been intensively studied. Many individuals have been fitted with radio-transmitters, allowing researchers to locate individuals repeatedly by aerial surveillance. Periodic recapture and veterinary examination under sedation has provided information about the health of individuals and the dynamics of the population.

One alarming finding from these studies was the evidence of severe inbreeding. Most individuals had deformed tail vertebrae that resulted in a 90-degree kink near the tip; post-mortems of road-killed animals revealed that some had atrial septal defects of the heart; cryptorchidism was common, as was the finding that sperm production was defective.

In 1990, with the total population estimated to be fewer than 50 individuals, four government agencies combined to form a task force whose mission was to save the Florida Panther from extinction. If nothing were done, the best estimate at the time suggested that all panthers would be gone in about 25 years, or perhaps sooner.

Questions for discussion:

1. What possible strategies do you think the task force might have proposed to bring the panther back from the brink of extinction?
2. What information and assumptions are needed to make an estimate of the time to extinction of the Florida Panther?
3. What is meant by inbreeding, and why are the traits described suggestive that inbreeding has occurred? What are the mechanisms by which variability is maintained during reproduction in individuals? What are the ways that these may affect variability in a population?



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Part 2

Two ideas emerged from several years of deliberation by scientists and wildlife experts about how to rescue the panther from extinction. One possibility was to set up a breeding program for the cats. This would require removing up to 50 panthers from the wild and placing them in breeding facilities that would be run by zoos. Another proposal was to introduce animals from a non-threatened subspecies of *Felis concolor* into prime habitat to stimulate reproduction and to introduce hybrid vitality into the panther. Both proposals were adopted and action plans were developed and implemented starting in the early to mid-1990s.

Even before these efforts were started, it became clear that the purity of the Florida panther had been already corrupted by previous introductions of pumas of unknown origin. Molecular geneticists from the National Cancer Institute, working with veterinarians from the Florida game commission found that DNA from some panthers carry genes from Central or South American cougars. Red blood cells from some panthers were found to have a variant of the enzyme APRT (adenosine phosphoribosyl transferase), present otherwise only in samples from Brazil and Chile, while western cougars have quite a different variant of the same enzyme. Furthermore, results of mitochondrial DNA analysis supported the idea that the panthers in Florida also interbred with a different subspecies in the recent past. And more evidence of inbreeding emerged: using restriction fragment length polymorphism analysis, it was found that Florida panthers were less diverse than their cousins from the Western United States.

The herculean rescue efforts proposed by the task force derived from protections provided to plants and animals under the Federal Endangered Species Act, which applies to threatened species and subspecies. If the panthers are not genetically "pure," do they deserve protection under the Endangered Species Act? The question was chilling to environmentalists and gave developers reason to cheer.

Questions to ponder:

1. What information does mitochondrial DNA analysis provide that nuclear DNA cannot? What methods are currently being used to evaluate DNA?
2. What is meant by subspecies and is it just a step along the road in evolution of a new species?
3. The Fund for Animals, "a liberal New York-based group of bleeding heart do-gooders", sued the U.S. Fish and Wildlife Service to try to stop the captive breeding program. What arguments might attorneys for FFA make in their legal challenge?



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Part 3 and Group Project

Part 3:

10 years after the rescue efforts began, the challenges to the Florida panther remain, despite some successes.

On the success side, the introduction of eight female Texas cougars (*Felis concolor stanleyana*) has been effective. It is estimated that now there are perhaps 70 or 80 wild panther, good reproduction has been recorded in recent years, and it seems that the kittens being born show less of the effects of inbreeding.

Threats still remain, however, and in fact have become more acute. Some of the best panther habitat is in private holdings, and as the population grows, more animals are wandering beyond the boundaries of protection. In particular individuals are moving out of the Big Cypress National Preserve into other areas— that will result in more frequent contact with humans as well as crossing heavily traveled roads. Additionally, rapid development has been occurring in these lands in the last decade, meaning that less and less land is now suitable for panthers. A similar introduction of Texas cougars into prospective habitat in northern Florida sparked something akin to war, with most of the cougars being killed after they were blamed for the deaths of calves, hogs, a horse, a wandering house cat, and deer.

Furthermore, even the success of the introduction of the Texas cougar has sparked debate. The introduction of genes will result in the Florida panther's unique physical characteristics being lost according to some critics. It's a process that "is spiraling out of control," says Dr. David Maehr of the University of Kentucky.

Group project:

You are serving on a committee charged with the responsibility to prepare an informative report on the costs, benefits, and requirements of a sustainable panther population (and potential negative consequences). All stakeholders are represented on the committee. You are charged with writing the document, that all committee members will sign.

Prepare a written document, representing the Executive Summary (no more than a few hundred words), that 1) outlines the possible consequences to the ecosystem of losing all panther and 2) describes what needs to be done to ensure the long-term survival and stability as a population. Signatures with stakeholder affiliations should accompany the document.

