WSU Investigator's Report:

Why Save Endangered Species?

Considering the Possible Extinction of the Columbia Basin Pygmy Rabbit[1]

January 1, 2004

The pygmy rabbit (*Brachylagus idahoensis*) is the smallest rabbit in North America, a foraging specialist that eats sagebrush, and one of only two North American rabbits that digs its own burrow. Despite its mild disposition, diminutive size, and weight of generally less than a pound, the Columbia Basin pygmy rabbit that occurs in Washington State has been causing WSU wildlife researchers and veterinarians a lot of trouble in our efforts to prevent them from going extinct in the wild.

My WSU colleague, Dr. Lisa Shipley, and I have been working on pygmy rabbit ecology and conservation since 1999, when the Washington Department of Fish and Wildlife (WDFW) asked us if we would help them conduct some studies on their declining populations. We no sooner began the plant community and habitat assessments they needed when our first graduate student on the project, Nikki Siegel, discovered during routine field surveys that the largest remaining pygmy rabbit population had just experienced a major crash – leaving perhaps less than 30 animals alive in the wild. To this day we still don't know what actually caused the crash, but we suspect a disease event, aggravated by habitat conditions and the already small population size.

EMERGENCY RECOVERY EFFORTS

Faced with the eminent loss of this unique population segment of pygmy rabbits, we immediately began working with other WDFW biologists to see if anything could be done to keep them from going extinct. Pygmy rabbits have a wide distribution range throughout several western states, but only occur in highly specific locations in sagebrush habitat that have relatively tall, dense sagebrush plants coupled with soils deep enough to allow them to dig burrow systems. Consequently, their actual population distribution tends to be quite limited on the western landscape despite the total area of sagebrush habitat.

Pygmy rabbits in Washington State have been separated from other pygmy rabbit populations in Idaho, Oregon, and other areas for many thousands of years because of geologic and climate changes that isolated the remaining sagebrush habitat in central Washington. Unpublished genetic analyses completed by our research colleague, Dr. Ken Warheit at WDFW, reveal that pygmy rabbits in Washington, which we call the Columbia Basin pygmy rabbit, are genetically distinctive compared to other population segments elsewhere and probably represent a unique subspecies.

WDFW quickly assembled an advisory science team consisting of state, federal, and university biologists, zoo specialists, geneticists, wildlife managers and others to determine the best course of action to save the rabbits. At about the same time, the U.S. Fish and Wildlife Service, the lead federal agency responsible for managing endangered species, began considering whether the Columbia Basin pygmy rabbit should be officially declared an endangered population segment, which they later did with a temporary emergency listing in 2001, and then with a final ruling to continue the listing in March, 2003.

After digesting every scrap of available information and scientific evidence, the WDFW Science Team determined that the best chance for saving the rabbits was to attempt to bring some of the remaining animals from the wild into captivity to form a secure breeding population. The hope was that we could salvage some of the original genetic diversity of the Columbia Basin pygmy rabbit and propagate enough individuals to restore several different wild populations in managed shrub-steppe habitats that would support the animals.

CAPTIVE BREEDING

After reviewing potential sites for facilities, WDFW asked Dr. Shipley and me if Washington State University could house some of the captive population for breeding and we agreed to do so. Earlier, zoo specialists at the Oregon Zoo took on the task of attempting to breed some non-endangered Idaho pygmy rabbits to determine whether and how the rabbits could be encouraged to produce young in captivity. They discovered that Idaho pygmy rabbits would breed in captivity in miniature habitats that provided soils deep enough for them to dig their burrows systems, which include a special natal burrow dug right before the female gives birth to her young. She then hides the new-born kits in that special burrow for protection from predators until they are old enough to emerge and begin feeding on their own.

Armed with this information, we developed our own breeding habitats that consisted of either a large metal stock watering tank filled with soil, or smaller pens filled with soil about 2 ½ - 3 feet deep to allow burrowing. Animals generally have to be housed in separate pens except during the brief time that males mate with females because aggression occurs between adults. We've since installed closed circuit television cameras attached to video recording computers to study their breeding behavior and develop better techniques for producing and raising animals in captivity. Because the animals are quite active at night, the remote cameras that record video with the help of infrared lighting systems have provided an abundance of information we would never have otherwise obtained.

Everyone is surprised to hear that pygmy rabbits don't necessarily "breed like rabbits" in captivity. Although they are indeed capable of having 2 or 3 litters of about 3-5 young each during the breeding season, this theoretical productivity has seldom been achieved, even under the seemingly ideal conditions of captivity with abundant food. The rabbits have experienced periodic problems with diseases and also parasites that are naturally harbored by the animals, such as coccidia. Even more important, unlike the Idaho pygmy rabbits that proved they could reproduce readily, the Columbia Basin pygmy rabbits frequently did not mate easily in captivity and demonstrated generally lower reproductive readiness or behavior.

The Columbia Basin pygmy rabbit seems to be particularly susceptible to diseases and evidence is accumulating rapidly that reduced genetic diversity in the small captive population is a contributing factor – a phenomenon called inbreeding depression. This inbreeding depression,

which is a natural consequence of a small population size and the resulting lower genetic diversity among surviving individuals, is likely contributing to the overall lower reproductive fitness demonstrated by Columbia Basin pygmy rabbits. One of my current graduate students, Becky Elias, is comparing the breeding behavior of Idaho and Columbia Basin pygmy rabbits in captivity and she is discovering a number of behavioral differences between the two populations.

IDAHO REINTRODUCTION PROGRAM

One of my contributions to the recovery effort for pygmy rabbits is to help develop techniques to restore these animals back into appropriate habitat and document the resulting survival and behavior of released rabbits. To do this, my graduate student, Robert Westra, is studying the success of reintroducing captive-bred Idaho pygmy rabbits back into sagebrush habitat in SE Idaho. We are using Idaho pygmy rabbits as a surrogate for the Columbia Basin pygmy rabbit because these rabbits are not endangered in Idaho, which allows us to develop and test reintroduction techniques there before they get applied to the endangered rabbits in Washington.

The trial reintroduction program conducted in the extensive shrub-steppe habitat at the Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho has gone remarkably well as a first step. We have received excellent support for this field work from the Idaho Game and Fish Department and from wildlife biologists at the Stoller Corporation who conduct ecological monitoring on the INEEL and have assisted us with field studies. We have released 27 radio-collared animals on the INEEL to date and Rob has intensively monitored their behavior and survival on almost a daily basis for several months at a time.

Rabbits were released into an artificial plastic burrow system constructed of plastic drainage tubing to provide the animals with a temporary home that mimicked their natural burrows as well as providing some initial protection from predators. The plastic burrow is dug down to about 2 ½ - 3 feet deep in the middle, with two surface openings. We place a temporary wire cage over each burrow opening to hold the released rabbit in place for about 5 days until it gets used to the burrow and the surrounding site. The cages also protect the rabbits from their common predators, including hawks, coyotes, badgers, and weasels. We feed the rabbits supplemental food during this period to assure that they maintain good body condition.

At the end of this short adjustment period, we remove the cages and allow the rabbits to disperse into the surrounding habitat as they wish and then track their movements and record their behavior. Even with this initial sample, we have been able to determine that survival is higher for animals released later in the year during late summer or fall, partly because of lower losses to raptors and other predators. We have learned that released rabbits will continue to use the artificial burrows after release, but many also disperse varying distances and eventually dig their own burrows. The released animals adapt quickly to the dry desert heat or cold, depending upon the time of year, and began consuming natural forage immediately.

This past spring, in 2003, we were pleasantly surprised to discover that at least one of two surviving females from our last release the previous fall had apparently had a litter of kits. Consequently, we are now optimistic that if enough Columbia Basin pygmy rabbits can be produced in captivity, that we can devise an approach for reintroducing them back into selected habitats in eastern Washington. We have one last test release of about 17 Idaho pygmy rabbits planned for this coming spring in 2004, and then we will turn our attention to beginning reintroduction efforts for Washington rabbits. Rob Westra's graduate thesis project on Idaho

pygmy rabbit survival, behavior, and habitat use will allow us to make some preliminary estimates of how many rabbits need to be released over how long of a time period to reestablish a self-sustaining population.

RECOVERY EFFORTS IN WASHINGTON

Ironically, the biggest hurdle we currently face in restoring the Columbia Basin pygmy rabbit in Washington is in producing enough young rabbits in captivity to support a strong reintroduction program. The founding population of captive pygmy rabbits from Washington is not yet producing enough animals to quickly create the much larger population that is needed to retain even the limited existing genetic diversity of the Columbia Basin pygmy rabbit.

We continue to lose valuable genetic diversity of these captive rabbits because some genetically important animals occasionally die of old age or other causes, or may not mate with another individual that would help maximize overall genetic diversity of the captive population. The luck of the genetic draw during mating means that some valuable alleles (alternative forms of gene expression) are not necessarily transferred to the offspring. Consequently, we will continue to lose genetic diversity until we can increase their productivity and overall population size. This situation is a common problem for biologists trying to maintain genetic diversity in relatively small captive populations and we are certainly plagued by that problem here as well.

To solve these problems, there are probably at least 20 or more different biologists, veterinarians, geneticists, disease researchers, zoo specialists, and other scientists here and in different states helping on specific components of the issue. Different people are working to save DNA samples, solve disease problems, test for inbreeding depression effects like lower immune functions and bone deformities, develop artificial insemination techniques, conduct nutritional studies including those by Dr. Shipley's graduate student, Tara Davila, perform genetic analyses, and even possibly adapt cloning techniques developed for other rabbits.

In many of these efforts, we are challenged by the difficulties of having small sample sizes from which to derive meaningful data and make critical management decisions. Working on endangered species is almost like being an emergency medical doctor at the scene of an accident. You have no choice but to use the best information, experience, and tools at hand to make quick decisions about how to try and save the patient. There's no time for long-term studies.

IMPROVING GENETIC DIVERSITY

The biggest management question we currently face is whether it will become necessary to mix some Idaho genes with those of the Columbia Basin population through crossbreeding, or genetic introgression, to alleviate some of the extremely harmful effects of inbreeding depression among the genetically-impoverished Washington rabbits. Dr. Shipley and I, as well as Dr. Linda Hardesty from WSU, are part of the U.S. Fish and Wildlife Service recovery team for the pygmy rabbit and this team has to make formal recommendations for recovery and management of the Columbia Basin pygmy rabbit to the federal government.

We are trying to avoid having to introduce genes from other population sources, but unless something dramatic happens quickly, it may become necessary to save the limited Washington pygmy rabbit gene pool and improve the survival and reproductive fitness of the remaining

animals. The same type of genetic introgression was used to save the declining Florida panther by introducing a few cougars from Texas and proved quite successful.

All of these issues make the research effort pretty exciting, but also quite complicated. Dave Hays, the endangered species coordinator for the Washington Department of Fish and Wildlife has his hands full trying to manage everything – especially because this is not a project with a lot of money – which is rather typical of endangered species recovery efforts. Many people contribute lots of their time and resources without being compensated very much or even at all. But that's the nature of endangered species work – you'd better be dedicated to the conservation issues and the scientific importance of the work.

In the future, we are hoping to find some ranchers who would be willing to let us try and restore some rabbits on their rangeland, without impinging on their use of the land. Private landowners are going to be important to the future of the Columbia Basin pygmy rabbit in Washington State and we hope some are willing to help.

Dr. Shipley and I get a fair number of WSU students who volunteer to work on the pygmy rabbit project, but we run our graduate and undergraduate training programs somewhat like the U.S. Marine Corps. There's always room for a few good people, but you're going to have to work hard and prove yourself first before you're part of the team and take on more responsibilities for caring for an endangered species in which each individual is extremely important to the population and species as a whole.

With a bit of luck and lots of help from WSU students and our many research colleagues on the WDFW science team and the federal endangered species recovery team, we feel cautiously optimistic that we can get these endangered animals back out on the landscape where they belong. Nobody wants to see wild animals held in captivity very long and our goal is to get the rabbits restored back into natural habitats absolutely as quickly as possible.

WHY SAVE PYGMY RABBITS?

Everyone working on the pygmy rabbit recovery program gets asked this question a lot. Why should we care if we lose pygmy rabbits in Washington? After all, they exist elsewhere. Why do we need them here too? Indeed, some people argue that humans should just let endangered species go extinct, that it is a "natural process". Or maybe they say we can't afford to save them. I disagree completely. Nothing could be farther from the truth.

There's almost nothing natural about current extinction rates. It's difficult to even find an endangered species that hasn't been forced into that tenuous category because of human action through habitat loss, pollution, over harvest, introduction of invasive species, or fragmentation of remaining habitats and populations into smaller and smaller bits and pieces. And like falling dominoes, the loss or alteration of one species ends up affecting dozens, hundreds, even thousands more. We are the ultimate culprit in almost every case.

Pygmy rabbits are an important component of our arid sagebrush ecosystems. As a prey item for many predators, and as an animal that affects the structure of plant communities and nutrient cycling within the ecosystem, they are an important cog in the wheel of life – even if they seem small and insignificant to us. Without rabbits, as well as other larger and smaller organisms in these and other ecosystems around the world, the ecosystem essentially degrades and becomes

less diverse and productive. The losses cascade like waterfalls, downward toward ever greater simplicity and homogenization of the world. We certainly cannot afford to lose major components of the predator-prey food chain without dramatic consequences for the ecosystem as a whole.

But for me, the real issues that argue for conserving endangered species are human values and ethics, rather than pure science. Science at best provides better understanding and a map of the universe, but it doesn't give us precise directions for where we should go and how we should get there. How we choose to live in this vast world and universe is not a scientific decision, but clearly a matter of human values, beliefs, aspirations, and ethics.

Endangered species are simply the urgent warning signs that we are treading too harshly on the earth and consuming and degrading too much of the planet. The rapidly expanding human population and the global economy already extracts too much from the natural world, even well before we reach 9 billion or more people in just a few short decades. Each of the hundreds and thousands of endangered and declining species around the world is sending a clear message that we don't understand as much as we think we do about the value and tenuous nature of life – human or otherwise. These plants and animals were here eons before us and they should be here for eons into the future, each having the opportunity to exist and continue to evolve under the natural processes and forces of nature rather than the clumsy and heavy hand of humankind.

If we destroy the natural world, with absolute certainty, we also diminish and destroy the human world at the same time. Losing species forever is like visiting an empty zoo – what's the point? Parking lots, shopping malls, and reality television are not adequate substitutes for a living, breathing, natural world. Bit by bit, if we allow extinction to happen through ignorance or greed, our world becomes less diverse and strikingly less beautiful and mysterious with the loss of each endangered species and unique population. Our oceans, grasslands, and forests will echo with silence and the human heart will know that something is missing, but it will be too late.

Can we afford to save endangered species? Perhaps the question should be can the human spirit afford not to try? For some day we will look back with the wisdom of time and regret our decision if we do not. The human heart can tell us what science does not.

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[1] This article is a popular news report of unpublished scientific work in progress and should not be cited. Contact the author for more information.