WASHINGTON STATE RECOVERY PLAN FOR THE August 2001

Pygmy Rabbit

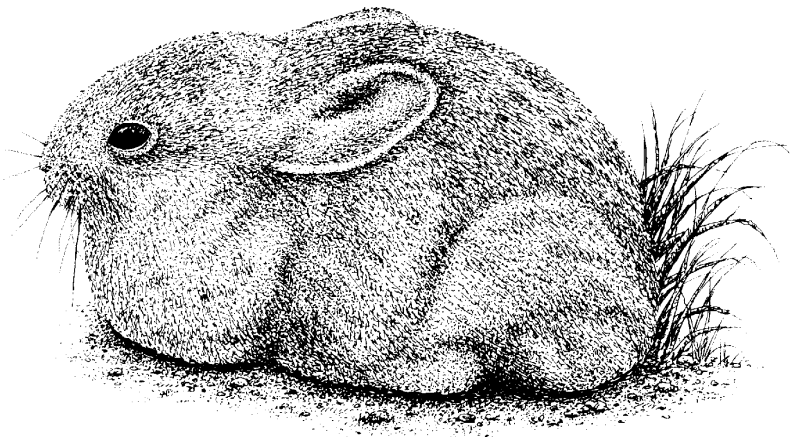
ADDENDUM

Washington Department of
FISH AND WILDLIFE
Wildlife Program

WDFW 775

Washington Pygmy Rabbit
Emergency Action Plan for Species Survival

Addendum to
Washington State Recovery Plan for the Pygmy Rabbit (1995)



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EXECUTIVE SUMMARY

This document summarizes the current status of pygmy rabbits in Washington, reassesses and prioritizes the strategies and tasks of the initial (1995) *Washington State Recovery Plan for the Pygmy Rabbit* and provides an overview of emergency measures needed to prevent extinction of Washington's pygmy rabbit.

The pygmy rabbit was listed as a threatened species in the state in 1990 and was reclassified to endangered status in 1993. It is a U.S. Fish and Wildlife Service species of concern. A state recovery plan for the rabbit was written in 1995 and efforts have been underway to implement the plan despite less than full funding. Recovery objectives are to increase pygmy rabbit numbers and distribution and manage habitat for long-term protection of features that support pygmy rabbits.

The number of populations and numbers of pygmy rabbits have been declining since 1997. In 1995, five pygmy rabbit populations were known to exist in Douglas County and a sixth population was found in 1997. Between 1997-2000 five of the six populations disappeared; by March 2001, only one area, Sagebrush Flat, was known to still have rabbits. Small populations at several sites were extirpated for unknown reasons, other populations were extirpated by known wildfires. Numbers of active burrows on standardized plots at Sagebrush Flat have declined from 229 in 1995 to zero in 2001. Random searches did reveal some active burrows at Sagebrush Flat in March and April 2001.

Genetic analyses of pygmy rabbits in Montana, Idaho, Oregon, and Washington have confirmed that the Washington population of pygmy rabbit is distinct and isolated from the rest of the species' range, and has been separated for thousands of years. These genetic differences more likely than not are similar to subspecific differences recognized in other mammals. Extinction of the Washington pygmy rabbit subspecies or race may occur at any time. The small remaining population is susceptible to disease, predation, and stochastic events.

With the apparent collapse of the pygmy rabbit population in the wild, the Department evaluated a number of options. Leaving a few remaining rabbits in the wild would encumber the population with extreme risk. There was only one option available to maintain the unique Washington pygmy rabbit - that was to initiate a captive breeding program to raise and release Washington pygmy rabbits. A decision was made by the Department in May 2001 to collect rabbits from the wild to begin a captive breeding program. The goal is to develop a captive population to ensure the maintenance of Washington's unique pygmy rabbits and to reintroduce sufficient numbers of captive-bred rabbits to re-establish populations in suitable habitat. Eleven of the remaining pygmy rabbits in Washington were captured and translocated to Washington State University. In addition, one female gave birth to 5 young in captivity.

The captive breeding program will begin with a cooperative project involving the WDFW (lead agency), Washington State University (where captive breeding will occur), the Oregon Zoo (where husbandry techniques are being developed), and Northwest Trek Wildlife Park. Other zoos may also be solicited to house small numbers of captive animals. A project biologist will be hired to conduct the captive rearing, release, and monitoring phases of the project. They will annually report on production, release and post-release survival phases of the project. Pygmy rabbits will be reintroduced into suitable habitat, provided with artificial burrows, and protected from predators with electric fencing. A Science Advisory Group will review all aspects of the project. Cost of a 3-year program is expected to be approximately $700,000 - 750,000. Long-term options will depend upon the success of the program.

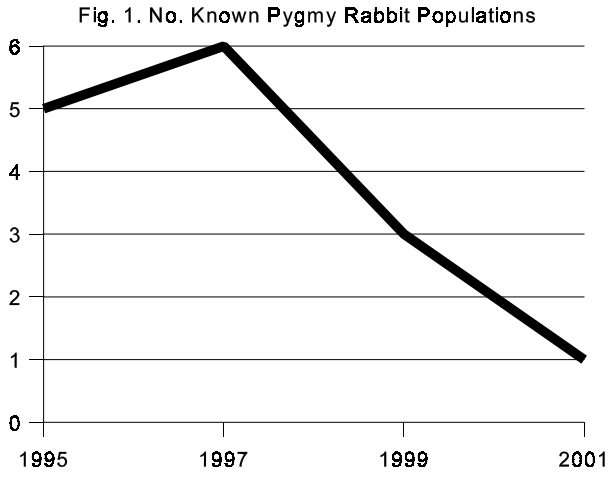
INTRODUCTION

The purpose of this document is to summarize the current status of pygmy rabbits in Washington, reassess and prioritize the strategies and tasks of the initial *Washington State Recovery Plan for the Pygmy Rabbit* (WDFW 1995) and provide an overview of emergency measures needed to prevent extinction of this animal in light of dramatic population decline since 1997. The original recovery goals for downlisting from endangered to threatened and sensitive have not changed from the 1995 Recovery Plan. However, in order to prevent extinction of Washington's pygmy rabbits, certain strategies need to be implemented immediately. These emergency measures are the focus of this 2001 addendum.

Status

The pygmy rabbit was rediscovered in Washington in 1987 after it was thought to have been possibly extirpated. The rabbit was listed as a threatened species in the state in 1990 and was reclassified to endangered status in 1993. It is a U.S. Fish and Wildlife Service (USFWS) species of concern. A state recovery plan for the rabbit was written in 1995 and efforts have been underway to implement the plan despite less than full funding. Recovery objectives are to increase pygmy rabbit numbers and distribution and manage habitat for long-term protection of features that support pygmy rabbits.

In 1995, five pygmy rabbit populations were known to exist in Douglas and northern Grant Counties; a sixth population was found in 1997. Between 1997-2001 five of the six populations disappeared; by March 2001, only one area, Sagebrush Flat, was known to still have rabbits (Fig. 1). Small populations at several sites were extirpated for unknown reasons, other populations were extirpated by known wildfires.

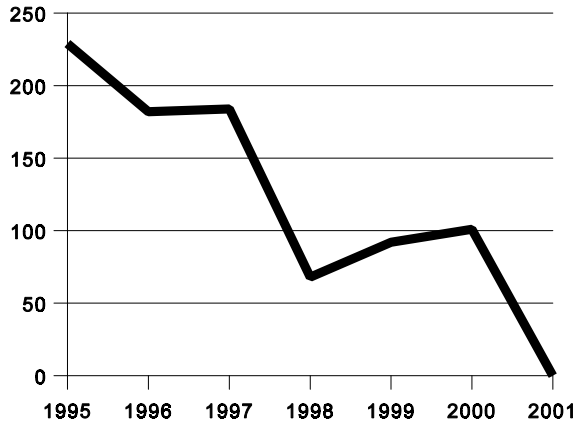


Rabbit populations are monitored by conducting surveys for active burrows. Numbers of active burrows have been estimated from standardized plots since 1995 on Sagebrush Flat, where the largest concentration of rabbits was known to occur. Estimates declined from 229 in 1995 to zero in 2001 (Fig. 2). No active burrows were encountered in the 2001 survey. Random searches did reveal some active burrows at Sagebrush Flat and a few rabbits were seen on the site in March and April 2001. Similar random searches revealed 68

active burrows in Fall 2000, 37 in December, and 8 in March 2001.

Extinction of the Washington pygmy rabbit subspecies or race may occur at any time. The small remaining population is susceptible to disease, predation, and stochastic events and may meet criteria for emergency federal listing.

Fig. 2 Estimated No. Active Burrows at Sagebrush Flat



Recovery Efforts to Date

Recovery actions to date have included: 1) protection of populations and habitat through purchase of habitat, creation of fire breaks, and control of predators at Sagebrush Flat and in one privately-owned site, 2) surveys for new populations of rabbits, 3) two graduate student studies of pygmy rabbit ecology and habitat relationships, and 4) the creation of linkages between known sites through purchases of shrub-steppe and potential habitat. In the past 5 years, marked progress has been made with The Nature Conservancy and other partners in acquisition, protection and enhancement of lands surrounding Sagebrush Flat. Other management actions have been to continue a Cooperative Resource Management Plan for cattle grazing at Sagebrush Flat when the site was transferred from Washington Department of Natural Resources to WDFW ownership.

In 2000, WDFW biologists trapped pygmy rabbits from Idaho and relocated them to the Oregon Zoo in an effort to learn more about their behavior and to develop husbandry techniques for captive breeding. The captive rabbits have adjusted well and 10 young rabbits were produced.

Genetic analyses of pygmy rabbits in Montana, Idaho, Oregon, and Washington have confirmed that the Washington population of pygmy rabbit is distinct and isolated from the rest of the species' range, and has been separated for thousands of years. These genetic differences more likely than not are similar to subspecific differences recognized in other mammals. Exact taxonomic resolution will take additional time and possibly additional study.

REVISED RECOVERY STRATEGIES

Management Direction

With the apparent collapse of the pygmy rabbit population in the wild, WDFW evaluated a number of options. Leaving a few remaining rabbits in the wild would encumber the population with extreme risk. There was only one option available to maintain the unique Washington pygmy rabbit - that was to collect rabbits from the wild that represent the unique genetic makeup of Washington pygmy rabbits and begin a captive breeding program to raise and release Washington pygmy rabbits.

A decision was made in May 2001 that the WDFW would work to maintain the unique genetics represented by Washington pygmy rabbits and would collect rabbits from the wild to begin a captive breeding program. The goal is to develop a captive population to ensure the maintenance of Washington's unique pygmy rabbits and to reintroduce sufficient numbers of captive-bred rabbits to re-establish populations in suitable habitat. This decision was supported by the Wildlife Diversity Advisory Council and the Pygmy Rabbit Working Group.

TASKS FOR IMMEDIATE ACTION

1. Begin Captive Rearing

Background

Captive rearing provides an opportunity to augment populations where declines may have impaired their resiliency to recover from environmental stresses, and to re-establish populations where direct translocation may risk the persistence of the donor population (Gilpin and Soule 1986). Captive breeding programs have been successful in augmenting wildlife populations of a number of species but are limited by high cost and a long-term commitment of resources (Reading and Miller 1994, Snyder 1994 Wielebnowski 1998). Advantages of captive breeding programs and involvement of zoos include public education, opportunities for basic research in captive situations, improvements in genetic diversity and the potential of a self-sustaining captive population for future reintroduction into the wild (Wielebnowski 1998).

Factors affecting success of a captive breeding program includes life history and diet, the numbers of animals released, the duration of release, and the degree to which an organization commits to the program (Wilson and Price 1994, Balmford et al. 1996), but the greatest factor in determining reintroduction success is the availability of suitable habitat (Griffith et al. 1989,

Wilson and Price 1994). There is a tremendous ongoing effort by several groups to acquire habitat for conservation in the vicinity of historic pygmy rabbit sites.

Although habitat loss and fragmentation have likely played the principal role in long-term decline of the population (McAllister 1995), habitat loss does not appear to be a direct determining factor in post-1995 declines at Sagebrush Flat and extirpations of some of the small populations of pygmy rabbits in Washington. Extirpations have been noted at several sites where habitat has been acquired and restoration efforts begun. Fire has had an impact on one site in particular, resulting in dramatic decline in 1999 at Coyote Canyon. It may be 6 - 8 years before the sagebrush recovers at Coyote Canyon. The continuity of habitat may play a role in the stability of the pygmy rabbit population over the long-term, and efforts to reduce habitat fragmentation are underway and will continue.

There are three factors that are linked to dramatic population declines in other rabbit species; predation (Trout and Tittensor 1989, Krebs et al. 1995), weather (Stoddart 1985), and disease (Sumption and Flowerdew 1985). During fall, 2000, coyotes killed at a pygmy rabbit site were tested for diseases. Plague was found in one of the coyotes (Lancaster, pers. comm.). This is the same site that underwent a dramatic decline during the winter of 1999-2000.

WDFW is committed to looking at alternatives to increase wild populations through active management. Two promising methods are predator control, which has been implemented at two sites, and food supplementation (Krebs et al. 1995). An important research component associated with predator management is understanding predator use (e.g. coyote and badger) of the remnant sagebrush patches in an agricultural mosaic. Exploring food supplementation for pygmy rabbits may require an experiment for several years or more outside Washington State.

Initiation

As a precursor to development of a captive breeding program, we initiated a study in 2000, in cooperation with the Oregon Zoo, to develop pygmy rabbit husbandry techniques. We captured 2 pairs of pygmy rabbits in Idaho and transferred them to the Oregon Zoo in Portland, where they are currently housed. The project is beginning to show results, with 10 young produced during spring, 2001.

To initiate captive rearing, we have begun a cooperative project involving the Washington Department of Fish and Wildlife, the lead agency, Washington State University, where captive breeding of Washington's pygmy rabbits will occur, and the Oregon Zoo, where husbandry techniques are being studied.

Eleven of the remaining pygmy rabbits in Washington were captured and translocated to Washington State University beginning in May 2001. Five young have already been born in

captivity. Additional animals may be added with continued capture. The specific number of animals removed will depend upon genetic analyses of individuals removed and genetic diversity of the wild population.

Captive Rearing Protocols and Procedures

A captive breeding facility has been constructed at WSU with the capacity to support 14 - 16 rabbits. A project biologist will be hired to conduct the captive rearing, release, and monitoring phases of the project. They will annually report on production, release and post-release survival phases of the project. Pygmy rabbits will be reintroduced into Sagebrush Flat (and potentially other sites), provided with artificial burrows, and protected from predators with electric fencing. Washington Department of Fish and Wildlife will assist with construction of the breeding facility, capture, release and monitoring of pygmy rabbits. Dr. Kenneth Warheit of WDFW will conduct genetic analyses of the captive population. The Oregon Zoo will consult on husbandry methods and participate in oversight of the project. The Oregon Zoo will also house 2 pairs of Washington's pygmy rabbits as a hedge against catastrophic events such as disease occurring at WSU. Other zoos including Northwest Trek Wildife Park and Zoo Montana may also house small numbers of captive animals. A Science Advisory Group with members from the Oregon Zoo, WDFW, the USFWS, and WSU, as well as one expert in genetics, one outside expert in captive rearing, and one in the ecology of rabbits will review all aspects of the project. Cost of the program is expected to be approximately $700,000 - 750,000 for three years. Long-term options will depend upon the success of the pilot program.

1.1. Capture pygmy rabbits and transport them to a captive facility.

The remaining pygmy rabbits are in a portion of Sagebrush Flat Wildlife Area and adjacent private land. We contacted adjacent landowners to get their permission to trap pygmy rabbits from private property. We hired one biologist on site to monitor remaining rabbits, search for additional active burrows, and assist other biologists with trapping.

Two trapping methods have been used. The first method uses tomahawk, single-door traps placed at the entry of burrows. This method, where the rabbits are seen going into burrows, and then traps placed at the entrance of burrows, was used successfully in trapping efforts in Idaho. Traps are covered with burlap, plastic, or other dark material to provide greater security for rabbits, and are checked every 10-20 minutes. The second method uses wooden box traps placed overnight and checked immediately after sunrise. These traps are modeled after traps used successfully in the southeast U.S. for marsh and cottontail rabbits (S. Pozzanghera, pers. comm.)

When trapping, each biologist is in communication with one-another with a cell

phone or radio. When a rabbit is caught, it is immediately removed, sexed, and placed in a pet carrier. The carrier has burlap coverings over all openings, and is stuffed with native grasses (green grasses), forbs (if available) and sagebrush, approximately ½ full. Ear punches are taken and transported separately to Dr. Ken Warheit, WDFW in Olympia, for genetic analysis. In order to protect handlers from disease, they wear face masks and gloves while handling rabbits. Cleaning materials (towelettes, soap, towels) are used to wash after handling.

Carriers are placed in an air conditioned vehicle, or alternately in a metal box with air holes, in the back of a pickup truck, depending upon temperature. This is a carrier that was used successfully in transporting pygmy rabbits from Idaho to Portland in 2000. It is important that rabbits be kept cool. If it is a hot day, the circulating air through the box as the vehicle is moving will help keep them cool, but the carriers cannot be kept in the box for longer than a few minutes if inside temperatures are over 60 degrees F. In addition, sagebrush is cut, bagged and transported with the rabbits.

1.2. Care for pygmy rabbits in quarantine.

Pygmy rabbits are transported to the vivarium (indoor quarantine facility) at WSU, and the rabbits are first examined by the vivarian veterinarian. The rabbits will need to be examined in a cool room (under 60 degrees F) to prevent heat stress. A complete work-up for diseases occurs within the first 1-2 weeks. If an animal is stressed, collection of fleas, treatment for fleas, fluids, and insertion of a PIT tag may be all that is done prior to placement in quarantine. A complete disease work-up is performed within the first two weeks including fecal analysis and blood testing for antibodies of plague, tularemia, and other diseases of rabbits.

The rabbits are then placed in quarantine. The quarantine pens have dirt floors with artificial burrows, escape cover, shrubs and cut sagebrush. After approximately 3 weeks, the animals are transferred to outdoor pens.

1.3. Care for Washington pygmy rabbits at WSU and affiliated zoos.

Care of captive rabbits requires approximately 3 hours/day at the captive breeding facility at WSU. Because pygmy rabbits eat large amounts of sagebrush during the winter, sagebrush will need to be cut from a location approximately 1 hour from the WSU campus and brought to the facility every 2-3 weeks. Animals are weighed on a weekly basis until they begin to gain weight. Thereafter, the animals are weighed on a monthly basis. Animals are monitored daily for aggressive or abnormal behavior indicating illness or stress. Sick rabbits will be examined by Laboratory Animal

Resource veterinarians or taken to the WSU veterinary hospital for care and treatment. Additional captive rearing methods are currently being developed by the Oregon Zoo.

In addition to daily monitoring, intensive monitoring of birthing will begin during April of each year using direct observation and remote video observation. Results of on-going work at the Oregon Zoo will be used as a guide to determine the need for separation of young from either adult male, female or both. Approximately 3 broods with 5- 6 rabbits per brood per breeding pair are anticipated each year (Wilde 1978). We expect the project will produce up to 100 young rabbits or more each year. The on-going research project at the Oregon Zoo will provide information about when young will be weaned and can be released into the wild.

1.4. Construct outdoor enclosures for pygmy rabbits at WSU.

The existing pens available at WSU for the project were approximately 36' X 44', and divided into four 12 X 22' chambers. The pens held other animals in past years that contracted giardia, so to reduce all chance that the rabbits could be infected from the soil, the top 1 ft. of the soil was removed by the WDFW Washington Conservation Corps crew and replaced prior to occupancy by rabbits.

Weasels are the primary mammalian predator of concern for pygmy rabbits in captivity, given their ability to squeeze through small openings. In order to protect the enclosure from weasels, ½" hardware cloth was attached to the periphery of the enclosure.

Within the larger enclosure, individual rabbits are kept in 8 ft diameter stock tanks. Each tank is surrounded by hardware cloth and covered overhead. Ramps connect individual stock tanks to allow male and female rabbits access to each other. Netting or hardware cloth was installed over the enclosure to prohibit avian predators. Screens have been installed between each chamber, to reduce stress from anticipated intra-sexual aggression. This work was performed by WCC, WSU Steffen Center manager, WSU professors, and student workers, both paid and volunteers from WSU.

Additional pens will be erected nearby to allow more area for breeding rabbits, and for a behavioral modification chamber, to teach young rabbits predator avoidance prior to being released. Pen structure is based upon the stock tank design, modified with hardware cloth, aluminum flashing, and double doors for pygmy rabbits. A redundant breeding facility will be established at one or more participating zoos to reduce potential loss from catastrophic disease.

Preliminary work by the Oregon Zoo has indicated that wooden screens and the development of artificial burrows reduces initial stress to the animals. Screening reduces contact with humans. Minimizing human contact will help maintain the wild nature of the animals as much as possible. Burrows are made from 4-6" PVC, and scattered throughout the enclosure chambers. Video cameras will be placed in the chambers and computer linked so that keepers can review behavioral activities. Each year, the facility will require some maintenance or minor modifications. This may include repair of the structure, new hardware cloth, replacement of shrubs and small trees, electrical work, and/or plumbing.

Gary Radamaker, the Steffen Center manager has successfully raised sagebrush and other native shrubs from seed. Shrubs have been planted in anticipation of this project and are growing at the facility. Supplemental larger sagebrush plants can be purchased through a local native plant nursery.

Prior to their release, we will attempt to train young rabbits to avoid predators. This procedure, which has been used in captive rearing of the black-footed ferret (Miller et al. 1996) has been beneficial in release of a number of animals (Wielebnowski 1998).

1.5. Staff the captive facility at WSU.

Dr. Lisa Shipley, Nikki Siegel and Gary Radamaker will be the principal caretakers of the captive rabbits at WSU until a professional animal keeper or research associate can be hired. A research biologist will conduct and supervise rearing, release, and monitoring of released rabbits. This position will have a multitude of tasks, including developing methods for behavioral modification, determining optimal timing for release of young, and evaluating potential release sites. The lead animal keeper will be assisted by temporary animal keepers throughout the year.

1.6. Develop a captive population model indicating desired numbers of captive animals, breeding plans, and release targets.

We will develop either internally or through contract, a model that will indicate the desired number of animals to be maintained in a captive population, breeding pairings, and desired annual release numbers. This will also help indicate how many facilities will be needed for the captive population. The American Zoological and Aquarium Association provides assistance and training in development of species survival plans (SSP), and has developed software designed to manage breeding of captive populations. A species survival plan is a carefully designed breeding plan to maintain a healthy and self-sustaining captive population that is both genetically diverse and demographically stable. We will evaluate whether development of a

breeding plan similar to the SSP plans will be beneficial to our captive management efforts.

1.7. Report on the progress of captive rearing and release.

Each year, the lead project biologist will evaluate the progress of the project and write a detailed report assessing ways to improve the project the following year. The report will be disseminated to a Science Advisory Group and recommended changes will be incorporated into the project for the following year. Results of the first year of the captive rearing project will be summarized by October 1 of year one. These results will be needed prior to the initiation of capture of rabbits for the second year breeding program. Changes in captive breeding methods designed to improve the program will be incorporated during winter and spring. Results of the first year of the release will be summarized by December 31. The report will be submitted to the advisory committee and recommendations will be incorporated into plans for the second year of release and monitoring.

2. Establish a Science Advisory Group.

One of the most important parts of a recovery program is the development of advisory committees to review methodologies and to suggest changes and improvements to planned activities (Clake et al.1994). WDFW has established a working group (Pygmy Rabbit Working Group) that meets twice yearly to review pygmy rabbit population status, discuss new information and study results and proposed pygmy rabbit projects. There will also be a science advisory group established to review and advise on the progress of all aspects of recovery, including the captive breeding effort. This group will include representatives from the Oregon Zoo, WDFW, U.S. Fish and Wildlife Service, and several experts in conservation genetics, captive breeding, and rabbit ecology. The group will interact with the principal investigators, suggesting and approving changes in methodologies throughout the recovery process. The Science Advisory Group should meet to review genetic analyses, structure of the captive rearing program, and allocation of resources for pygmy rabbit recovery

3. Locate additional facilities to house Washington's pygmy rabbits.

Additional captive facilities will be needed to maintain reserve populations of pygmy rabbits in case of disease or mortality of rabbits at the WSU facility and to accommodate the number of rabbits needed for the captive breeding population. At present the Oregon Zoo has expressed interest in maintaining two pairs in Portland. Northwest Trek Wildlife Park and Zoo Montana

have also expressed interest in maintaining animals at their facility. We will arrange for additional zoos to house pygmy rabbits, preferably in arid environments.

4. Publish results of genetic studies and manage genetics of captive rabbits.

In 1999 Dr. Kenneth Warheit conducted population genetic analyses of pygmy rabbits from Washington, Oregon, Idaho, and Montana (WDFW; unpublished data). These analyses were based on muscle (ear punches) or blood tissue collected in the field, and skin tissue collected from museum specimens. Warheit (unpub. data) analyzed two types of DNA data: molecular sequences from the mitochondrial cytochrome *b* locus, and DNA fragment sizes from nine nuclear microsatellite loci. The cytochrome *b* locus or gene evolves more slowly than that of any of the microsatellite loci, and can provide a measure of genetic isolation at long temporal scales (thousand to millions of years).

Based on the samples analyzed thus far the cytochrome *b* type (haplotype) from Washington is invariant (i.e., only one haplotype present) and different from those Montana, Idaho, and Oregon. There are at least three haplotypes present in the Oregon, Idaho, and Montana samples, and each of these states share these haplotypes. The cytochrome *b* and microsatellite data conclusively demonstrate that the Washington pygmy rabbit is isolated and very distinct from other pygmy rabbits and may have been isolated and distinct for thousands of years. Furthermore, the Washington pygmy rabbit has reduced genetic variability, compared with other pygmy rabbit populations, and reduced genetic variability is frequently associated with relatively small population sizes. Finally, Warheit (unpub. data) compared microsatellite data from Washington pygmy rabbit museum samples collected in the 1940s and 1950s with those from tissue samples collected in Washington in the 1990s, and found a continued and accelerated reduction in the genetic variability, which may be associated with an accelerated decline in population size and health.

A draft report on genetic analyses of pygmy rabbits from Montana, Idaho, Oregon, and Washington was completed during May 2001. The report was sent to several reviewers for comment. The comments will be incorporated into the genetic study, and a scientific paper will be prepared. That paper will be submitted for publication and/or taxonomic modification.

Blood samples or ear punches were taken from all adult pygmy rabbits captured from the field for the captive breeding program. These samples were transported to WDFW's genetics laboratory where they were fingerprinted using a battery of molecular markers. A breeding program intended to increase the amount of genetic variability within the Washington pygmy rabbit population will be designed based on each rabbit's genetic fingerprint. Blood will also be taken from the offspring of each breeding pair, and will be analyzed using the same set of molecular markers used for the adults. These analyses will provide data to assess the degree to

which we were successful in increasing genetic variability within the population, and, along with survivorship data, may help determine which of the breeding adults (or pairs of adults) produce the most fit offspring. Finally, offspring from some breeding pair may be retained and either transferred to a zoo to maintain a pool of captive animals (and a pool of Washington pygmy rabbit genes), or to become part of the captive breeding program.

5. Release captive-reared rabbits and monitor their movements and survival.

Young raised at the Oregon Zoo from Idaho pygmy rabbits will be used to test release methods during the summer 2001. Dr. Rod Sayler, WSU Assistant Professor of Wildlife Science will direct the project. A number of "soft release" methods will be tested for acclimatization and survival of rabbits.

Potential release sites will be evaluated during fall and winter 2001 by the lead project biologist in consultation with WSU faculty and WDFW. A number of factors will be considered in the review, including soil maps and ownership boundaries.

Precautionary measures will be needed to reduce potential for disease transmission at reintroduction sites, and careful monitoring will be needed to assess factors affecting the health of the wild population.

5.1. Protect pygmy rabbits to be released from predators.

Temporary predator exclusion netting originally designed for the black-footed ferret release program may be used to keep the majority of larger mammal predators (primarily coyotes and badgers) out of augmentation areas for several months after release. The portable+ fence, called ElectroNet designed by Premier Fencing has been used successfully in black-footed ferret releases. The fence will require simple modifications to prevent potential electric shock to pygmy rabbits. It will be erected during May, prior to the release of the first cohort, and removed during November, prior to the first winter snowfall. If we anticipate the need for protection during winter months, a permanent electric fence will be installed.

The fence will be monitored twice weekly while it is in place. Monitoring will be done to ensure the fence is intact, upright, and free of debris. With the same monitoring effort, the interior of the fence will be evaluated for coyote sign. Experience with the fence in the black-footed ferret program indicate few coyotes make it inside the fence. The number of coyotes that succeed in getting under or through the fence will decline several weeks after installation (R. Machette, pers. comm.). Any coyotes inside the fence will be removed by a contracted trapper.

A burrow box with 4-6 inch black plastic drainage pipe attached at two ends will be buried near release sites prior to release of rabbits. This is the artificial burrow developed and used at the Oregon Zoo. The artificial burrow system will be inserted 2-3 feet down, and will allow the rabbits some refuge from predators during the initial acclimatization period, as they develop their own burrow system. We anticipate release into areas of older burrow systems, and will provide up to 1 artificial burrow per rabbit released.

5.2. Release captive-raised pygmy rabbits back to the wild.

Young rabbits will be released within an area occupied or unoccupied by pygmy rabbits, but not released directly into occupied burrow systems. Each rabbit will be released separately at least 100m from the previously released rabbit. The number of rabbits released into an area will be determined at a later time, but males and females will need to be in close proximity. Rabbits will be able to disperse into areas with active or recently inactive burrow systems. Juvenile rabbits are anticipated to be released between 1 June and 10 August.

Adult rabbits will be released (if additional rabbits are available as breeding pairs) during August, timed with release of the 3rd cohort (pygmy rabbits generally have three broods/year). If their previous burrow system became occupied by other rabbits, they will be released at least 100m away, and temporary artificial burrows will be created for them. If their previous burrow system is unoccupied, they will be released directly back into their previous burrow system.

5.3. Monitor released pygmy rabbits with radio-telemetry.

Radio-transmitters will be attached to 20-50% of released rabbits in order to determine factors affecting their survival during the period of acclimatization to their new environment. Holohil PD2C transmitters are the preferred type for use. These are 4.2 gram collar-attached whip transmitters with a life of 5-6 months. Survival of young has been shown to vary among cohorts (Wilde 1978), and is lowest during the first two months of life in each cohort.

Each release group will be monitored, as factors affecting survival may be influenced by time of release. As pygmy rabbits are active throughout the day, monitoring will be conducted throughout the day. Principal focus of monitoring will be to determine factors affecting survival, time needed for development of burrow system with multiple exits, and dispersal and movements of young animals. For at least 5 weeks, each animal will be located daily. This is the period of greatest potential mortality for juveniles (Wilde 1978).

Monitoring will be on-going between June and January, from the release of the first broods during June, though several months after the last brood is released in August. Transmitters will be removed or replaced after 4 months of monitoring. At least one cohort will be monitored through the first winter and re-located again during spring of the following year. Monitoring will be conducted by a project biologist with aid and supervision by temporary staff or graduate students.

6. Continue field surveys for pygmy rabbits.

Field surveys need to continue to search for additional animals for the captive breeding program, determine the number and distribution of surviving animals, and search for other relict populations of pygmy rabbits. Surveyors should be hired immediately and should continue for approximately 6 months, depending upon available funding.

7. Continue to acquire, manage, and restore habitats for pygmy rabbits.

There are a number of tasks related to habitat management and acquisition that need to be accomplished to develop appropriately sized landscapes of suitable pygmy rabbit habitat.

7.1. Refine descriptions of pygmy rabbit habitat and identify potential habitat.

Information developed by WSU on habitat selection by pygmy rabbits at Sagebrush Flat will be summarized to refine descriptions of pygmy rabbit habitat, and develop a landscape-based assessment tool for potential pygmy rabbit habitat.

7.2. Identify locations of soils in Douglas and Grant counties suitable for pygmy rabbits.

Develop a map of soils likely to be used by pygmy rabbits in Douglas and Grant counties. The Natural Resource Conservation Service has products that can be used to develop a product specific to pygmy rabbits.

7.3. Determine pygmy rabbit habitat quality and distribution.

The landscape assessment tool (7.1), including soils maps, will be applied to potential pygmy rabbit habitat, including public ownerships, preserves or other natural areas, to determine habitat quality and distribution.

7.4. Identify priorities for pygmy rabbit habitat acquisition and management.

A habitat management and acquisition plan specific to pygmy rabbits will be developed, and areas to acquire and/or manage will be prioritized. This document will direct development of conservation easements and habitat restoration efforts.

7.5. Incorporate pygmy rabbit needs in habitat planning efforts.

Planning and management efforts will focus on areas needed for long-term management of pygmy rabbits. This includes guidance for projects like the Douglas County Habitat Conservation Plan, addressing managing habitats for pygmy rabbits in the Pygmy Rabbit Working Group, and review of WDFW management practices in pygmy rabbit habitat.

7.6. Protect remaining pygmy rabbits in the wild.

Additional actions should be taken to protect remaining pygmy rabbits in the wild. This should be a topic addressed by the Science Advisory Group and the Pygmy Rabbit Working Group. Actions such as electric fencing, supplemental feeding, and other measures should be considered and discussed.

7.7. Work with the Natural Resources Conservation Service (NRCS) to provide benefits for pygmy rabbits with the Conservation Reserve Program (CRP).

Landowners and the pygmy rabbit will benefit from a focus on providing habitat for pygmy rabbits with the CRP program. Increasing the importance of lands within the range of the pygmy rabbit for the CRP, and providing sagebrush planting and seeding in CRP lands may be of great benefit to the pygmy rabbit. WDFW and the NRCS need to discuss issues associated with wildlife benefits to CRP habitat prior to the next CRP signup in 2007.

7.8. Evaluate potential risks to pygmy rabbits with grazing.

Grazing plans should be reviewed to determine risks to pygmy rabbits in light of the dramatic decline of rabbits and plans for population augmentation through captive breeding.

8. Determine diseases and parasites affecting wild pygmy rabbit populations.

Diseases and/or parasites may have contributed to the decline of the pygmy rabbit population in Washington.

8.1. Identify diseases/parasites that the rabbits may have come in contact with.

8.2. Take action to prevent or reduce risks to reintroduced populations.

8.3. Closely monitor remaining rabbits for indications of disease or parasites.

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