Global Re-introduction Perspectives: 2016

Case-studies from around the globe

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IUCN/SSC Re-introduction Specialist Group (RSG)

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Cover photo: Clockwise starting from top-left:
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ii. Wetapunga, New Zealand @ Richard Gibson
iii. Morelos minnow, Mexico @ Topiltzin Contreras-MacBeath
iv. *Silene cambessedesii*, Spain @ Emilio Laguna
v. Tasmanian Devil, Maria Island, Tasmania @Simon DeSalis
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Re-introduction of the Columbia Basin pygmy rabbit in central Washington, USA

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Introduction

The pygmy rabbit (*Brachylagus idahoensis*) is a small burrowing lagomorph, classified by the IUCN as a species of Least Concern across its range in the sagebrush steppe of the western United States. However, a geographically and genetically isolated population in the Columbia Basin of central Washington declined drastically in range and abundance by the 1990s. This population was listed as endangered by the state of Washington in 1993, and listed as an endangered distinct population segment under the federal Endangered Species Act in 2001. Pygmy rabbits are shrub-steppe obligates, depending on sagebrush (*Artemisia spp.*) for a large portion of their diet (Green & Flinders, 1980). The principle threat to the species in Washington is habitat loss due to land conversion, primarily for agriculture. In 2001, 16 adult pygmy rabbits from the last remnant population in Washington were captured and transferred to an *ex-situ* captive-breeding program, after which the wild population went extinct. In 2011, after limited breeding success in captivity, the Washington Department of Fish and Wildlife (WDFW) switched to *in-situ* breeding in large field enclosures, and supplemented the Washington founders with translocated pygmy rabbits from other states. Releases from these enclosures began in 2012.

Goals

- Goal 1: Develop methods to propagate large numbers of pygmy rabbits for release to the wild.
- Goal 2: Work with public and private landowners to ensure support for pygmy rabbit re-introductions across land ownership boundaries.
- Goal 3: Establish a meta-population of free-ranging pygmy rabbits within their historic

Pygmy rabbit © B. L. DeMay

range in central Washington, sustained with little or no supplemental introductions.
- Goal 4: Monitor the re-introduced population to study post-release survival, reproduction, and dispersal, and identify variables influencing long-term recovery success.

Success Indicators

- Indicator 1: Sufficient production of captive-born animals to initiate re-introduction.
- Indicator 2: High participation of landowners in Safe Harbor Agreements to support conservation on private land.
- Indicator 3: In the short-term, establishment of at least two subpopulations with a 5 year average population size of 125 individuals (USFWS Recovery Plan).
- Indicator 4: In the longer term, consider state delisting when Washington supports a minimum 5-year average of at least 1,400 adult pygmy rabbits in six populations; two populations with at least 500 adults each and four populations with at least 100 adult rabbits each (WA State Recovery Plan).

Project Summary

Feasibility: The first recovery emphasis area identified for re-introduction was the state-owned Sagebrush Flat Wildlife Area (1,515 ha), the location of the last known wild population of pygmy rabbits in Washington prior to extirpation. Land surrounding the wildlife area is a mosaic of private and publicly owned land. Over 90% of eligible lands within a 8.05 km radius of the re-introduction site are enrolled in Safe Harbor Agreements under Section 10 of the US Endangered Species Act, offering protections to land owners in return for their cooperation with conservation efforts. Additionally, several thousand acres surrounding the wildlife area are enrolled in federal Farm Bill programs like the Conservation Reserve Program and the State Acres for Wildlife Enhancement program. The second recovery emphasis area (3,390 ha), is managed by The Nature Conservancy and a private landowner, and is located 17 km away from the first site. The Nature Conservancy and Federal lands surrounding both sites are managed consistently with pygmy rabbit recovery efforts (USFWS, 2012), and additional private land owners have enrolled in the Safe Harbor program in the area. Prior to large-scale re-introductions, a population viability analysis and trial re-introductions of captive-bred pygmy rabbits in Washington and Idaho identified the needs to 1) release large numbers of animals (>100) annually to combat high post-release mortality rates, and 2) address behavioral adaptations to captivity that produce naïve rabbits unlikely to survive in the wild. This recovery program is administered by WDFW and the US Fish & Wildlife Service, and guided by a science advisory group made up of subject experts from numerous organizations and institutions.

Implementation: From 2001 - 2012, captive breeding took place at three separate facilities to buffer against loss of the entire population in one event (e.g. disease outbreak). Inbreeding depression limited production in captivity, so pygmy rabbits from Idaho were brought into the captive-breeding program to increase genetic diversity. However, juvenile survival remained low, disease was

a major cause of mortality, and the captive-breeding program was unable to produce and maintain the numbers of rabbits needed to support a large-scale re-introduction. In 2011, the recovery strategy was adapted to increase the chances of success. The captive-breeding program was phased out, and pygmy rabbits from captivity were moved to large outdoor enclosures (2.2 - 4.4 ha) in native sagebrush habitat within the species' historic range. The enclosures are resistant to avian and terrestrial predators, and outfitted with artificial and natural burrows, supplemental food, and free water during the hot summer months.

Tracking pygmy rabbit © D. J. DeMay

In addition to rabbits from the captive-breeding program, 110 wild pygmy rabbits were translocated from Oregon, Nevada, Utah, and Wyoming from 2011 - 2013 and held in the enclosures. The addition of these rabbits was deemed necessary to increase the genetic diversity of the founder population, and increase the number of individuals available for release. Rabbits from captivity and wild translocations interbreed freely inside the enclosures during the breeding season from late spring to early summer. In 2011, we released 64 captive-reared adult and juvenile pygmy rabbits into the wild. In 2012, after the first year of large-scale breeding in the enclosures, we released 104 juveniles (kits) from 2 enclosures using both soft and hard release methods. In 2013, we released 272 kits from 3 enclosures, using only hard release. While the releases were focused on kits because of concerns that adult rabbits born in captive facilities habituated to human presence would not survive well in the wild, it became necessary to release enclosure-born adults to make room for younger breeders. In 2014, we released 830 rabbits from 4 enclosures, including 113 adults. In 2015, we released 578 rabbits from 4 enclosures, including 51 adults. We collected a tissue sample from each handled rabbit to create a genetic and demographic database of all known rabbits in the recovery program. Each year, a subset of kits shown to have high amounts of Columbia Basin ancestry were retained for future breeding, and exchanged among enclosures to simulate gene flow.

Post-release monitoring: During 2012 and 2013, we tracked 82% and 18%, respectively, of released kits with glue-on VHF transmitters. Resulting data were limited by low transmitter retention times and tracking difficulties (DeMay *et al.*, 2015), but informed later survey efforts. For long-term monitoring, we conducted winter burrow surveys coupled with collection of fecal pellets for genetic analysis.

Monitoring animals non-invasively by their genotypes allowed us to study post-release dispersal, survival, and reproduction in the wild, as well as monitor the genetic diversity of the population over time. During the winters following the 2012 - 2014 releases, we detected 39%, 13%, and 11% of released rabbits surviving to winter. We have detected first and second generation wild-born rabbits born on the release area in 2013, but overall reproduction in the wild has remained low.

Major difficulties faced

- Reproductive output in captivity was low due to inbreeding depression and disease. Even with genetic rescue, low juvenile survival limited population growth and prevented large-scale re-introductions during the decade of captive breeding.
- Captive-reared adult pygmy rabbits were naïve and suffered high mortality in the wild.
- Monitoring the re-introduced population in the near and long-term has been challenging. Immediate post-release tracking with telemetry was limited by short retention time and the small size of transmitters. Long-term monitoring with genetic analysis offers detailed information on which individuals survive and reproduce, but laboratory analyses are costly. Rabbits not detected in winter surveys may have died or dispersed beyond the surveyed area, and it is not possible to separate these two mechanisms. The area surveyed each winter is limited by weather, available time and human resources (largely volunteers), and it is not possible to survey all potential habitat.
- Estimating and managing population sizes inside the breeding enclosures has proven difficult, and we tend to underestimate the amount of adults kept over winter for future breeding, leading to higher than anticipated adult and kit densities when breeding begins.
- Holding high densities of rabbits in enclosures for multiple years impacts the vegetation, and increases risk of disease transmission. Building new enclosures is costly in terms of time and money, so we are developing a rest-rotation strategy for enclosures to rehabilitate vegetation and lessen disease loads.

Major lessons learned

- Although captive-breeding has been a crucial part of recovery for many populations, not all species thrive in captivity. The recent successes for pygmy rabbit recovery have resulted from shifting away from breeding in *ex-situ* captive facilities, and breeding rabbits instead in large naturalized enclosures, where they exhibit natural mate choice and reproductive behaviors (DeMay *et al.* (in press)). Additionally, kits produced in the enclosures had limited exposure to humans, and a present (although significantly reduced) risk of predation, making them more suitable for life in the wild than naïve rabbits raised in captivity.
- Results from a trial in 2012 indicate that soft-release enclosures did not improve survival or residency of released kits compared to hard release.
- No pygmy rabbit kits released at <125 g have been detected surviving, but rabbits released between 125g - 150 g have survival rates similar to other weight ranges, leading to the adoption of a 125 g lower limit for release.

- Drip irrigation in the large enclosures extended the growth season of the vegetation and provided more forage for rabbits in the enclosures.
- While predators such as owls, harriers and weasels have killed several pygmy rabbits in the enclosures, this source of mortality has not limited the numbers produced for re-introduction. In fact, we expect that pressure from predators while in the enclosures better prepares the rabbits for release in the wild.

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- This re-introduction program is relatively young, and it is difficult to gauge the success at this early point. Into the future, success will depend on continual assessment and adaptation of the recovery strategy, as was done in shifting from captive-breeding to field breeding.
- Community support has been paramount to the smooth operation of the recovery program. We have high participation from private landowners in Safe Harbor Agreements to support conservation on their land, and we have depended on volunteers to provide approximately 75% of the field work for both releases and winter surveys.
- The overall success to date is due to shifting to a strategy that allows this species, a species that was not doing particularly well in a captive-breeding setting, to exhibit more natural behaviors in a more natural setting.

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