

# Periodic Status Review for the Pygmy Rabbit



Washington  
Department of  
**FISH &  
WILDLIFE**

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The Washington Department of Fish and Wildlife maintains a list of endangered, threatened, and sensitive species (Washington Administrative Codes 220-610-010 and 220-200-100). In 1990, the Washington Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 220-610-110). The procedures include how species listings will be initiated, criteria for listing and delisting, a requirement for public review, the development of recovery or management plans, and the periodic review of listed species.

The Washington Department of Fish and Wildlife is directed to conduct reviews of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing by the Washington Fish and Wildlife Commission. The periodic status reviews are designed to include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification. The agency notifies the general public and specific parties who have expressed their interest to the Department of the periodic status review at least one year prior to the five-year period so that they may submit new scientific data to be included in the review. The agency notifies the public of its recommendation at least 30 days prior to presenting the findings to the Fish and Wildlife Commission. In addition, if the agency determines that new information suggests that the classification of a species should be changed from its present state, the agency prepares documents to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act.

This is the Draft Periodic Status Review for the Pygmy Rabbit. It contains a review of information pertaining to the status of Pygmy Rabbits in Washington. It was reviewed by species experts and is available for a 90-day public comment period from 29 May 2024 through 26 August 2024. Comments received will be considered during the preparation of the final periodic status review. The Department will present the results of this periodic status review to the Fish and Wildlife Commission at a meeting in Summer 2024.

Submit written comments on this document by 25 August 2024 via e-mail to: [TandEpubliccom@dfw.wa.gov](mailto:TandEpubliccom@dfw.wa.gov) or by mail to:

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# Periodic Status Review for the Columbia Basin Pygmy Rabbit in Washington



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## ACKNOWLEDGING THE INDIGENOUS PEOPLE, LAND & CULTURE OF THE PACIFIC NORTHWEST

Since time immemorial, Indigenous People have graced the Pacific Northwest with rich traditions of many diverse cultures, languages, traditional knowledge expressed artistically and practically with intricate principles passed down throughout generations. As the first stewards of this land, Indigenous People from this part of the world are ancestrally engrained in the very fabric of this region that is known today as Washington State.

Washington Department of Fish and Wildlife (WDFW) acknowledges the American Indian Tribes as the original occupants of this land enjoyed today by all Washingtonians. Their historic reliance to hunt, fish, and gather traditional foods defines their inherent responsibilities to protect and steward the precious resources on the waters and landscape shared today by all Washington residents.

The very survival of the Pacific Northwest Tribes is a testament of resiliency of what they have endured and continue to endure throughout generations on this very landscape. Through scarred valor, many historical encounters of massacre, renunciation of religious freedom, systemic racism, cultural assimilation of native children through institutional residential schools, and the fight for their inherent rights and liberties, they have prevailed. Throughout this tormented history brought by colonization, abrogated treaties, infringement of civil rights, and the salmon protests of the 1960s, the Northwest Tribes and WDFW have founded a commitment of respect, unity, and alliance taught by the realities of the past.

Today tribal governments and WDFW work collaboratively to conserve and manage aquatic and terrestrial resources across the State and practice sound science to ensure successful resource management decisions. The Tribes and WDFW work together to ensure the sustainability of fish, wildlife, ecosystems, and culture for the next seven generations and beyond.

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## EXECUTIVE SUMMARY

Pygmy rabbits (*Brachylagus idahoensis*) occur mainly in the Great Basin and some of the adjacent intermountain areas of the western United States, including Washington, Oregon, California, Idaho, Montana, Wyoming, Colorado, Nevada, and Utah. Columbia Basin pygmy rabbits are geographically and genetically discrete from the remainder of the taxon and this population is significant due to the unique ecological setting (i.e., geologic, climate, soil, and vegetation community) in which it occurs. For these reasons, the Columbia Basin pygmy rabbit population was designated as a Distinct Population Segment (DPS) for protection under the Endangered Species Act.

Pygmy rabbits are sagebrush obligates. Within their broad geographic range, pygmy rabbits have a patchy distribution and are found where sagebrush occurs in tall, dense clusters and soils are sufficiently deep and friable to allow for burrowing. Dense stands of sagebrush provide pygmy rabbits with year-round food and shelter; native, perennial grasses and forbs provide an important food source beginning in spring and especially in summer and fall; deep, friable soils allow them to construct burrows for shelter and to give birth to their young.

Historical documented locations of pygmy rabbits indicate a prior distribution that included portions of five Washington counties. By 1997, pygmy rabbits were known to occur at only six isolated populations in pockets of suitable habitat in Douglas County (five sites) and northern Grant County (one site); three of these sites had fewer than 30 active burrows. By March 2001, five of the six populations had disappeared, and pygmy rabbits were known to occur only at the Sagebrush Flat Wildlife Area. A captive breeding program began in 2002 and was effective in managing the genetic characteristics of the population and maintaining the captive population, but ultimately could not produce enough kits to support large-scale reintroductions. In 2011, the recovery effort transitioned from off-site captive breeding to semi-wild breeding within large enclosures located within shrubsteppe. Additionally, breeding enclosure populations were augmented with wild pygmy rabbits that were translocated from Great Basin populations between 2011 and 2013 to bolster genetic diversity and sustain breeding enclosure populations. Kit production and rabbit releases increased substantially through 2015 before dramatically declining in 2016 due to disease (coccidia) in enclosures. To reduce disease and weed infestations in permanent breeding enclosures the recovery effort in 2017 began transitioning to a smaller, mobile breeding enclosure design. A second augmentation to breeding enclosure populations occurred in the spring of 2020 with wild rabbits translocated from Great Basin populations. In 2020, the Pearl Hill fire setback recovery efforts with the burning of all suitable habitat in the Burton Draw Recovery Area and the resulting loss of all rabbits in enclosures and in the wild. Currently, two small, wild populations occur in the Beezley Hills and Sagebrush Flats Recovery Areas.

Large-scale loss, degradation, and fragmentation of native shrubsteppe habitat likely played a primary role in the long-term decline of the Columbia Basin pygmy rabbit. By the mid-1900s, large portions of shrubsteppe habitat within the Columbia Basin were converted to agricultural crops or urban and rural development. Remaining stands of sagebrush are affected by other, often interacting, factors including

historical overgrazing by livestock, invasion by non-native plant species, and altered fire frequency. Disease was initially a limiting factor in breeding enclosure populations but now seems to have been alleviated with the transition to a new breeding enclosure design. Fire remains a significant threat to pygmy rabbit recovery.

The Columbia Basin pygmy rabbit population has not met population or secure habitat criteria for down-listing from its current state endangered classification. The population remains small and its distribution in the wild is extremely limited. It is therefore recommended that the pygmy rabbit remain a state endangered species in Washington.



## INTRODUCTION

The Washington Department of Fish and Wildlife (WDFW) is required to conduct a review of the status of each endangered, threatened, and sensitive species at least every five years after the date of its listing (WAC 220-610-110). WDFW conducted a status review of the Columbia Basin pygmy rabbit in 2018 (Hayes 2018). The purpose of this periodic status review is to determine whether the pygmy rabbit (*Brachylagus idahoensis*) warrants its current listing status of endangered or deserves reclassification.

## DESCRIPTION AND LEGAL STATUS

The pygmy rabbit is the smallest rabbit species in North America. Adults weigh 375 to about 500 g (0.83-1.1 lb), and measure 23.5-29.5 cm (9.3-11.6 in) in length with females tending to be slightly larger than males (Gahr 1993, USFWS 2003). Overall pelage color is slate-gray, tipped with brown; legs, chest and nape are a tawny cinnamon brown; the ventral surface is buff; and the edges of their ears are pale buff (Fig. 1). A single annual molt occurs, usually in mid to late summer. The pygmy rabbit is distinguished from other rabbit species within its range by its relatively small size; small hindfoot; short, rounded ears, and short tail buff in color rather than white on the underside (WDFW 1995, Chapman and Litvaitis 2003, USFWS 2003).



Figure 1. Pygmy rabbit.

Pygmy rabbits are members of the family Leporidae, which includes the rabbits and hares. The pygmy rabbit is the only species in the genus *Brachylagus* (Green and Flinders 1980a, Hoffmann and Smith 2005). The Columbia Basin pygmy rabbit population in eastern Washington is discrete from other populations of the taxon. Fossil evidence indicates that rabbits in this population were disjunct from the remainder of the species' range by 10,000 years ago (USFWS 2010a). The historic distribution of the Columbia Basin population is separated by over 200 km (125 miles) from the nearest historic population in central Oregon (USFWS 2003, USFWS 2010a). Genetic analyses of both mitochondrial and nuclear DNA markers indicated that purebred Columbia Basin pygmy rabbits had markedly different genetic characteristics compared to the remainder of the taxon (USFWS 2010a). Based on information indicating that the Columbia Basin pygmy rabbit population is geographically and genetically discrete from the remainder of the taxon and that this discrete population is significant due to the unique ecological setting in which it occurs, it was designated as a Distinct Population Segment (DPS) for protection under the Endangered Species Act (ESA) (USFWS 2003, 2010a).

The pygmy rabbit was classified as a state threatened species (WAC 220-200-100) in 1990 and reclassified as state endangered (WAC 220-610-110) in 1993 (WDFW 1993). In 2001, the U.S. Fish and

Wildlife Service (hereafter the Service) published an emergency rule to federally list the Columbia Basin DPS of the pygmy rabbit (hereafter Columbia Basin pygmy rabbit) as endangered under the ESA (USFWS 2001). In 2003, the Service published a final rule listing the Columbia Basin pygmy rabbit as endangered, without critical habitat designated (USFWS 2003). Under the ESA, the Service is required to review each listed species' status at least every five years. In 2010, the Service completed a five-year status review of the Columbia Basin pygmy rabbit that reaffirmed its federal listing as an endangered DPS (USFWS 2010a). In March 2023, the Service announced that it was initiating a five-year status review for the Columbia Basin pygmy rabbit (USFWS 2023).

The pygmy rabbit was petitioned for range-wide protection under the ESA in 2003, but the Service concluded that ESA listing was not warranted (USFWS 2010b). The pygmy rabbit was again petitioned for range-wide protection in March 2023 (WWP 2023), and the Service published a 90-day finding that the petition may be warranted (USFWS 2024). The Service has initiated a status review of the pygmy rabbit and will issue a 12-month petition finding as to whether petitioned actions are warranted.

## DISTRIBUTION

**North America.** Pygmy rabbits are distributed mainly in the Great Basin and adjacent intermountain areas of Washington, Oregon, California, Idaho, Montana, Wyoming, Colorado, Nevada, and Utah (Orr 1940, Green and Flinders 1980a; USFWS 2010a,b; Rachlow et al. 2021; Fig. 2). Within this broad geographic range pygmy rabbits have a highly patchy distribution and primarily occupy areas dominated by subspecies of big sagebrush (*Artemisia tridentata* ssp.), where the sagebrush is taller and denser (Orr 1940, Green and Flinders 1980a, Weiss and Verts 1984, Rachlow et al. 2021).

**Washington.** Historically, the Columbia Basin pygmy rabbit probably occurred in parts of Douglas, Grant, Lincoln, Adams, Franklin, and Benton Counties during the first half of the 20<sup>th</sup> century (WDFW 1995, USFWS 2012). Currently, wild pygmy rabbit populations occur at two sites in southern Douglas County and at another site in northern Grant County.

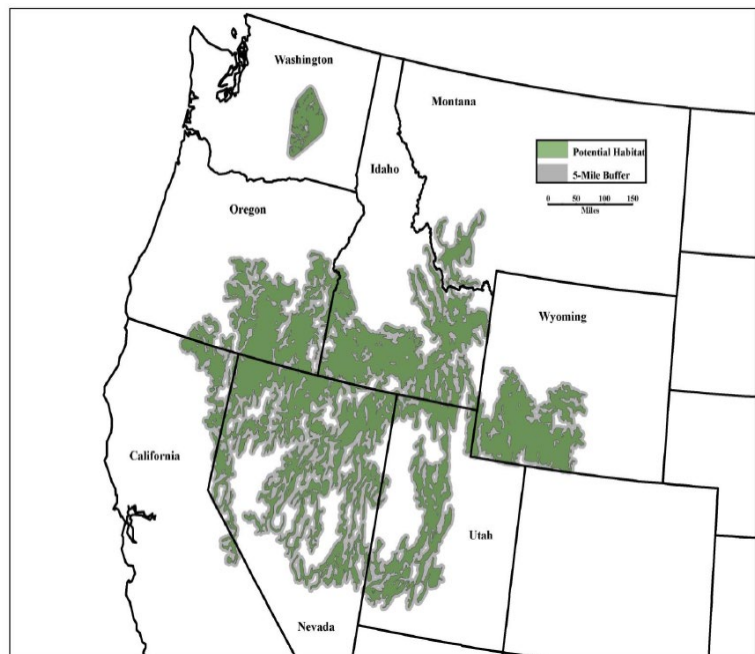


Figure 2. Approximate historical distribution of the pygmy rabbit based on available occurrence data and the distribution of potentially appropriate shrub-steppe community types (source USFWS 2010a).

## NATURAL HISTORY

**Habitat requirements.** Nearly the entire historical distribution of the Columbia Basin pygmy rabbit overlaps the big sagebrush – bluebunch wheatgrass (*Pseudoroegneria spicata*) zonal habitat type (Daubenmire 1988). This habitat type consists of four well-defined vegetation layers: big sagebrush, perennial grass - bluebunch wheatgrass, low-lying (<10 cm [4 in]) perennial and annual grasses dominated by Sandberg bluegrass (*Poa secunda*), and a thin and fragile layer of cryptogamic crust composed of lichens, mosses and occasionally liverworts.

Pygmy rabbits are a sagebrush (*Artemisia tridentata*) obligate, depending on big sagebrush for both food and cover (Heady and Laudré 2005). Pygmy rabbits have a patchy distribution and are typically found in areas of tall, dense big sagebrush, and deep, sandy-loam soils (Green and Flinders 1980b, Weiss and Verts 1984, Gahr 1993, Katzner and Parker 1997, Larrucea and Brussard 2008a, Fig. 3). Burrows are typically excavated under big sagebrush of greater height and canopy cover (Katzner and Parker 1998, Schmalz et al. 2014). Dense stands of sagebrush provide pygmy rabbits with year-round food and cover (Green and Flinders 1980b, Weiss and Verts 1984, Schmalz et al. 2014), while native, perennial grasses and forbs provide an important food source beginning in spring and especially in summer and fall (Green and Flinders 1980b, Thines et al. 2004, Schmalz et al. 2014). Deep, loose soil allows pygmy rabbits to construct burrows for shelter and to give birth to their young (Janson 1946, Rachlow et al. 2005).

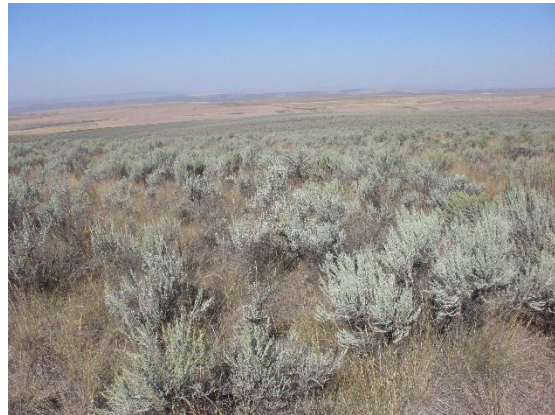


Figure 3. Pygmy rabbit sagebrush habitat.

**Diet and foraging.** Pygmy rabbits rely on big sagebrush as their primary food source. Coincident with “green-up” of vegetation in the spring, sagebrush remains a primary food source, but grasses and forbs increase in the diet, comprising 13%-15% and 1-2%, respectively (Green and Flinders 1980b, Schmalz et al. 2014). In summer, use of sagebrush declines further, comprising 47-54% of the diet, and use of grasses and forbs increase, comprising 42-43% and 5-10%, respectively (Green and Flinders 1980b, Schmalz et al. 2014). At one occupied site in Washington (Sagebrush Flat), grasses (54%) and forbs (33%) formed the bulk of pygmy rabbit diets in the summer, whereas shrubs comprised only 13% of the diet (Thines et al. 2004). By fall, pygmy rabbits forage increasingly on sagebrush (58-85% of the diet) and less on grasses (12-31%) and forbs (3-11%) and by winter the diet is almost exclusively comprised of sagebrush (99%) (Green and Flinders 1980b, Thines et al. 2004, Schmalz et al. 2014).

Pygmy rabbits have relatively high energy and low protein requirements for their size (Shiple et al. 2006) and can minimize absorption and detoxify plant secondary metabolites (PSMs) allowing them to

consume large amounts of sagebrush (Shipley et al. 2006, Shipley et al. 2012). Pygmy rabbits have a relatively lower capacity to digest cellulose in plant fiber and will consume more PSMs in their diet to avoid consuming higher levels of fiber that reduces the amount of nutrients they can acquire from plants (Camp et al. 2015). Sagebrush browsed by pygmy rabbits is higher in crude protein, lower in fiber, and lower in some plant secondary compounds compared to unbrowsed sagebrush (Schmalz et al. 2014, Ulappa et al. 2014, Pu et al. 2015).

**Home range and movements.** Home range size varies by sex and season. Earlier studies describing basic space use by pygmy rabbits suggest that male pygmy rabbits use larger home ranges than females (Gahr 1993, Heady and Laudré 2005, Burak 2006) and home ranges are smaller in the winter (Katzner and Parker 1997). At the Sagebrush Flat site in Washington, home ranges during the breeding season averaged 2.7 ha (6.7 acres) for females and 20.2 ha (49.9 acres) for males (Gehr 1993). Comparisons between sexes, seasons, and populations across these studies are confounded, however, by differences in method of home range estimation, study season duration, habitat quality, and by small sample sizes. In the most comprehensive study to date, Sanchez and Rachlow (2008) maintained larger sample sizes of radio tagged animals (n=36-46) and assessed variation in home range both between sexes and seasons. Their results showed a similar pattern as previous studies with annual home ranges of males up to three times larger than females and breeding season home ranges larger than nonbreeding season ranges (Sanchez and Rachlow 2008). Male home ranges were nearly five times larger than female home ranges during the breeding season, whereas this inter-sexual difference was much reduced during the nonbreeding season. In addition, seasonal range fidelity by individual pygmy rabbits is highly variable. Percent overlap between home ranges was 18.1-30.6% between consecutive seasons (breeding-nonbreeding) and 2.8-37.1% between like seasons (e.g., breeding-breeding) over two years (Sanchez and Rachlow 2008). Overall, pygmy rabbits use larger home ranges than expected based on their body size (Swihart 1986, Swihart et al. 1988).

Median natal dispersal distances are three times farther for juvenile females (2.9 km, range = 0.02-11.9 km [1.8 mi, range = 0.01-7.4 mi]) than juvenile males (1.0 km, range = 0.03-6.5 km [0.6 mi, range = 0.01-4.0 mi]) in Idaho (Estes-Zumpf and Rachlow 2009). Juveniles monitored with telemetry at Sagebrush Flat remained close (mean 204 m, range 0 m -1.5 km [669 ft, range 0 ft-0.93 mi]) to release sites but this method likely underestimated dispersal based on evidence from fecal DNA (DeMay et al. 2017).

**Reproduction and survival.** Pygmy rabbits begin breeding after their first winter (Gahr 1993). Photoperiod and vegetative habitat condition influence the timing of breeding with the breeding period extending from late February through early June (Elias et al. 2006). Breeding is highly synchronous and promiscuous. Mating behavior includes chasing, by both sexes, followed by brief copulation. Male reproductive activity begins in January, peaks in March, and declines in June. Females can be pregnant from late February through June and nurse young from March through September.

Most females become pregnant and produce kits each breeding period (Elias et al. 2006, DeMay et al. 2016). About two to three weeks after mating, but a week before giving birth, the female excavates a

single-entrance natal burrow at a location separate from the residential burrow system. The natal burrow terminates at a nest chamber that the female lines with grass and fur (Rachlow et al. 2005, Elias et al. 2006, Scarlata et al. 2015). After a gestation period of about 24 days the female opens the entrance to the natal burrow and gives birth to her young that are born with their eyes closed and with little fur (Elias et al. 2006). Litter size averages about four kits (range 1 - 9) in captivity (Elias et al. 2013) and three emerged kits in semi-wild breeding enclosures at Sagebrush Flat (DeMay et al. 2016). Females have an average of about three litters per year per female in both captivity and in semi-wild breeding enclosures (Elias et al. 2013, DeMay et al. 2016). After giving birth, females cover the entrance to the natal burrow with soil, presumably to conceal the location and protect against predators. Females open the natal burrow prior to nursing the young once or twice daily. After nursing, young remain in the natal burrow. Juveniles permanently emerge from the natal burrow two weeks after birth and are first observed in March (DeMay et al. 2016). Nursing ceases by about two weeks post-emergence (Elias et al. 2006). Juvenile dispersal rates are high for both males (90%) and females (80%) and dispersal occurs between 2.5 and 12 weeks of age, with most dispersal movements completed within one week of initiation (Estes-Zumpf and Rachlow 2009).

Pygmy rabbits generally live less than three years (Sanchez 2007, Zeoli et al. 2008) though survival rates can be highly variable among study sites, years, and sexes (Sanchez 2007, Crawford et al. 2010, Price et al. 2010). In east-central Idaho, juvenile mortality was 69.2% and 88.5% for male and females, respectively, with the highest mortality occurring within the first two months of emergence from natal burrows (Estes-Zumpf and Rachlow 2009). Annual adult survival of males and females in Idaho ranged from 7% to 45% (Sanchez 2007) and less than 1% to 17% in Oregon and Nevada (Crawford et al. 2010). For rabbits released from 2012-2016 at Sagebrush Flat, apparent survival of released rabbits (spring-summer) to the following winter was 39%, 13%, 10%, 0.1%, and 9%, respectively based on genetic analysis of fecal DNA (Nerkowski 2023). Average apparent survival rate across all winter surveys was 10% for juveniles and 20% for adults (Nerkowski 2023).

## POPULATION AND HABITAT STATUS

**Range-wide.** The pygmy rabbit's geographic range includes most of the Great Basin and adjacent intermountain areas of nine western states in the U.S. (USFWS 2010). The scientific literature indicates that pygmy rabbits are not evenly distributed throughout their geographic range (Bailey 1936, Jansen 1946, Hall 1946), but instead occur in a patchy distribution due to their specialized habitat requirements for tall, dense sagebrush and deep, loose soils. Recent occurrence locations from eight range states (excluding Washington) were used to estimate range-wide estimates of the minimum occupied area by pygmy rabbits and a species distribution model that predicted suitable and primary habitat (Smith et al. 2019). The minimum occupied area range-wide was estimated as 28,367 km<sup>2</sup>, with the largest contiguous patches of occurrence in the Wyoming Basin, but relatively large patches were also identified in east-central Idaho and southeastern Montana, in southwestern Idaho, and near the intersection of Oregon, Nevada, and California borders. States with the greatest occupied area include Wyoming (8595 km<sup>2</sup>), Idaho (7766 km<sup>2</sup>) and Nevada (6417 km<sup>2</sup>). Predicted suitable and primary habitat for pygmy rabbits were estimated as 224,819 km<sup>2</sup> and 145,724 km<sup>2</sup>, respectively. Wyoming, Nevada, and Idaho supported the greatest amount of primary habitat (40%, 24%, and 16%, respectively) (Smith et al. 2019). Population estimates are not available for most states due to the difficulty and increased effort of capturing and recapturing enough rabbits to estimate densities (e.g., Crowell 2023), therefore most monitoring efforts are focused on surveys to document presence or absence based on sign (e.g., burrows and pellets; Ulmschneider et al. 2008).

**Columbia Basin Pygmy Rabbit Distinct Population Segment.** Prior to European settlement an estimated 4.2 million ha (10.4 million acres) of shrubsteppe existed in eastern Washington (Dobler et al. 1996). However, because pygmy rabbit habitats require areas of tall, dense (>25% canopy cover) big sagebrush in deep, friable soils, and these conditions likely cover only 5-26% of the state's shrubsteppe (Franklin and Dryness 1988), much of the pygmy rabbit populations were likely restricted to localized areas of suitable habitat in pre-settlement times (WDFW 1995). Today, over half of Washington's original shrubsteppe habitat has been converted to agricultural lands resulting in high fragmentation of extant habitat (Dobler et al. 1996) and disproportionate loss of deep-soil shrubsteppe communities (Vander Haegen et al. 2000).

Pygmy rabbits were considered fairly common in the coulees and slopes of central Adams County in the early 1900s (Taylor and Shaw 1929). By the mid-1900s, they were reported to occur only in the central part of the Columbia Basin and considered to be "rare and of local occurrence" (Dalquest 1948) and "very scarce, occurring only in a small area in the arid parts of Adams and Grant counties" (Booth 1947). In 1979, WDFW biologists found pygmy rabbits at a site in Douglas County but surveys in 1985 found no signs of a population at this site or elsewhere in the state, and the species was thought to be extirpated. However, in 1987 WDFW biologists found pygmy rabbits at another site in Douglas County and intensive surveys conducted in 1988 found pygmy rabbits at four additional sites in southern Douglas County, including Sagebrush Flat. By 1995, pygmy rabbits were still present at these five isolated sites in pockets of suitable habitat, but three of these populations had <30 active burrows (WDFW 1995). A sixth

population was found in 1997 in northern Grant County, but by 2001 five of the six populations had disappeared. In March 2001, pygmy rabbits were known to occur only at the Sagebrush Flat Wildlife Area (WDFW 2001, USFWS 2003, Becker et al. 2011). That same year, a genetic analysis found that the Columbia Basin population had lost significant genetic diversity over the past 50 years (Warheit 2001) and few of these genetically unique rabbits remained in the wild. In May 2001, 16 individuals were captured to establish a founding captive population for future recovery efforts. The last known wild subpopulation of the Columbian Basin pygmy rabbit was extirpated in Washington by early 2004 (USFWS 2010a).

**Captive breeding program.** Captive breeding of Columbia Basin pygmy rabbits began in 2002. Poor reproduction from the outset was attributed to the low genetic diversity in the founder population (Elias et al. 2013). As a result, intercrossing with captive Idaho pygmy rabbits occurred from 2003 to 2011 to introduce more genetic diversity into the population. The off-site captive breeding program was effective in managing the genetic characteristics of the population and maintaining the captive population, with the number of kits produced each breeding season increasing from a low of 19 in 2002 to a high of 275 in 2010 (USFWS 2012). While genetic diversity and reproduction of the captive population largely improved, survival of young declined, primarily due to disease, which led to the production of insufficient numbers of pygmy rabbits for large-scale reintroductions. As a result of these circumstances, the recovery program transitioned from an off-site captive breeding program to an on-site semi-wild breeding program where large breeding enclosures were constructed in shrubsteppe.

**Semi-wild breeding program.** Potential reintroduction sites for pygmy rabbits in the Columbia Basin were evaluated based on potential habitat using geographic information systems, field surveys for suitable soils and vegetation, and expert opinion of biologists (Becker et al. 2011). Ten candidate sites were identified and Sagebrush Flat (Douglas County) and Beezley Hills (Grant County) were ranked as the number one and two priority reintroduction sites and the focus of early reintroductions. WDFW's Dormaier and Chester Butte units of the Sagebrush Flat Wildlife Area were the sites of reintroductions later in recovery. Reintroduction sites, which are termed "recovery emphasis areas", are actively managed to help conserve the pygmy rabbit and represent areas where long-term recovery objectives (>10 years) may be attained (USFWS 2012). WDFW manages the Sagebrush Flat site, which totals about 1,515 ha (3,740 acres), and the Dormaier and Chester Butte units, which total 1,278 ha (3,160 acres). The Nature Conservancy, in cooperation with a private landowner, manages the reintroduction site in Beezley Hills, which totals about 1,374 ha (3,390 acres) (USFWS 2012). As the recovery program transitioned from the off-site captive breeding program to on-site semi-wild breeding in shrubsteppe, enclosures were established, and pygmy rabbits were released within the recovery emphasis areas. Each of the reintroduction sites (i.e., recovery emphasis areas) is surrounded by a five-mile buffer to comprise a recovery area, including the Sagebrush Flat Recovery Area, Beezley Hills Recovery Area, and Burton Draw Recovery Area (Fig. 4).

In 2011, the recovery effort transitioned to semi-wild breeding within large enclosures located within their former range. These large (6 to 10 acres) breeding enclosures were established in each of three

Recovery Areas (RAs) and remained in place for several years. However, with the onset of declines in kit production in 2016 and associated disease (coccidia) and weed infestations in the permanent enclosures, WDFW began transitioning to a new breeding enclosure design to improve rabbit survival, kit production, and reduce maintenance costs. In 2017, a new breeding enclosure design was developed that was smaller in size (3 acres) and comprised of lighter weight materials and interlocking panels that allowed the enclosures to be more easily relocated on the landscape every two to three years (i.e., mobile), thereby minimizing incidence of disease (i.e., coccidia) and invasive weed growth in the enclosures. The first mobile breeding enclosure was established in the Beezley Hills RA (Fig. 4) in 2017 and new mobile breeding enclosures were built in subsequent years as permanent enclosures were phased out. With the transition to mobile breeding enclosures, prior use of supplemental feeding, irrigation, and provision of artificial burrows in permanent enclosures was discontinued. From 2011 to 2016 releases of rabbits was focused on the Sagebrush Flat RA (Fig. 4), except for the single year of releases in the Beezley Hills in 2015. With the recognition of the vulnerability to wildfire of the single established population of pygmy rabbits at Sagebrush Flat, WDFW shifted release efforts beginning in 2017 to the Beezley Hills and/or the Burton Draw RAs to establish new rabbit populations in these additional areas (Fig. 4).



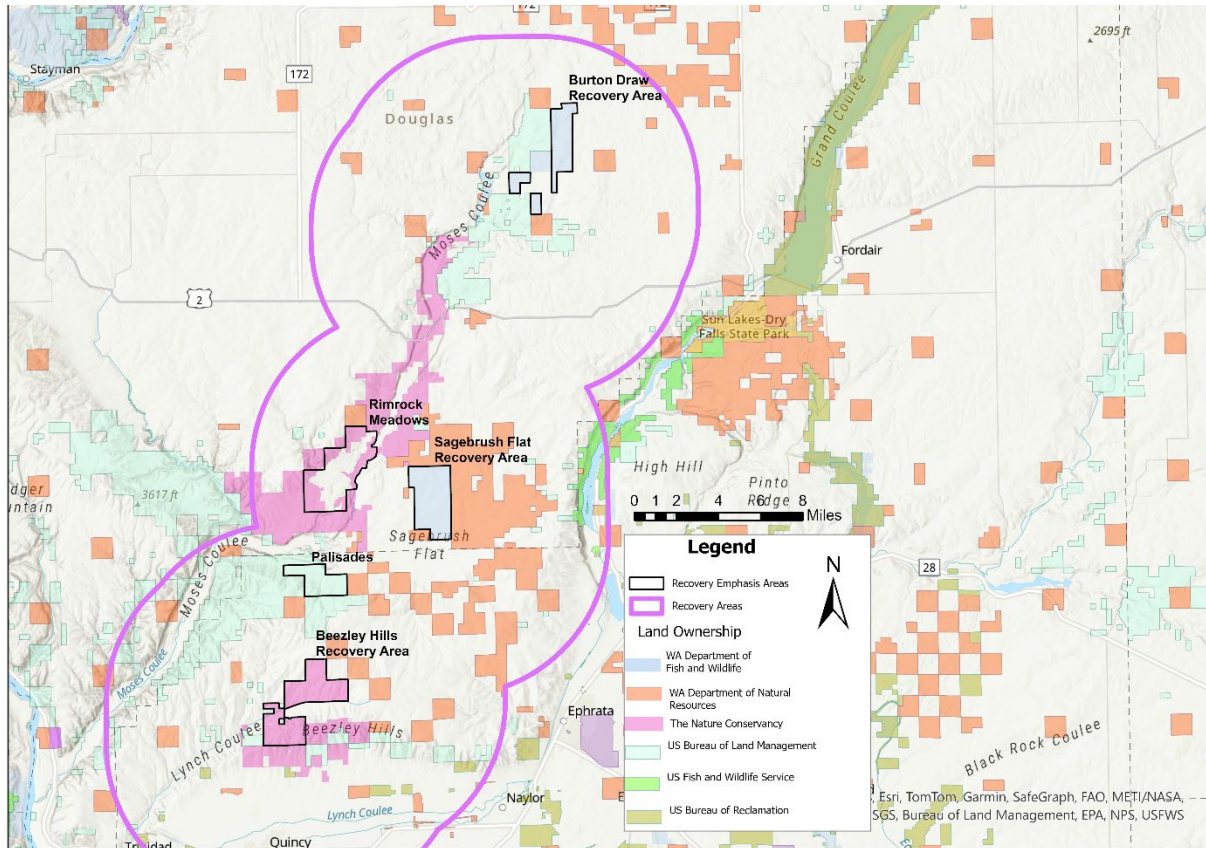


Figure 4. Recovery Areas (Sagebrush Flats, Beezley Hills, and Burton Draw) identified for re-establishment of wild pygmy rabbit subpopulations in the Columbia Basin, Washington.

**Translocations.** Wild pygmy rabbits have been translocated from out-of-state sources to augment Washington’s Columbia Basin pygmy rabbit population to bolster genetic diversity and sustain breeding enclosure populations. Between 2011 and 2013, 109 adult pygmy rabbits were translocated from other parts of their range (OR, NV, UT, WY) and added to all breeding enclosures to augment population size and bolster genetic diversity of the semi-wild breeding population (Wisniewski 2015, Gallie 2017). In 2019, record snowfall in February that extended into March when rabbits typically breed, associated poor kit production in breeding enclosures in the spring, and the dramatic decline of the wild pygmy rabbit population in the Sagebrush Flat RA in April/May required WDFW to obtain rabbits from out-of-state populations to rebuild its breeding enclosure population and continue with kit releases for the following year. In March 2020, 26 adult pygmy rabbits were translocated from Idaho (n = 19; 8M/11F) and Nevada (n = 7; 1M/6F) and released in breeding enclosures in Washington.

**Winter surveys.** During winter months, and preferably after snowfall, ground-based transect surveys are conducted in shrubsteppe habitat within the known range of pygmy rabbits and near release sites to locate active burrows and to collect fecal pellets for genetic analysis. Based on DNA extracted from tissue samples collected from rabbits in enclosures prior to release and DNA extracted from fecal pellets collected from active burrows in the wild population, genetic analyses are used to confirm species

identification (e.g., pygmy rabbit vs. cottontail), identify individual rabbits, and document enclosure-born versus wild-born rabbits (DeMay et al. 2017). Mapping locations of active burrows combined with results from genetic analyses allow researchers to determine the distribution and abundance of the wild rabbit population and to determine key demographic parameters such as apparent survival of released rabbits and evidence of wild reproduction (DeMay et al. 2017). When snow is present, rabbit tracks, active burrows, and fecal pellets are conspicuous and fecal pellets that are collected are typically “fresh” thereby yielding higher quality DNA for genetic analyses. In contrast, during winters with relatively low snowfall and surveys proceed on bare ground, active burrows are more difficult to locate, and wet conditions can make old fecal pellets appear “fresh”, and when collected, degraded DNA from pellets result in reduced success rates of obtaining species identity and individual identity.

**Summer surveys.** Beginning in 2019, ground-based transect surveys were conducted in mid-summer only on release sites to determine initial survival and dispersal of kits released earlier in the year and to determine the distribution, apparent survival, and evidence of reproduction in the wild for the overall rabbit population. Like winter surveys, data collected on mid-summer surveys include the location of active burrows and collection of fecal pellets for genetic analysis. Mid-summer survey data provide an early assessment of the dispersal and settlement of kits released earlier in the year compared to obtaining similar data months later during winter surveys.

**Genetic monitoring.** Recovery actions identified in federal and state recovery plans for the Columbia Basin pygmy rabbit include optimizing the genetic and demographic characteristic of pygmy rabbits in breeding enclosures and monitoring the survival, movements, spatial distribution, and genetic diversity of free-ranging rabbits within the Columbia Basin (USFWS 2012, Gallie and Hayes 2020). Noninvasive genetic sampling (NGS), specifically using fecal DNA, is a valuable tool for monitoring wildlife populations (Waits and Paetkau 2005). NGS of fecal pellets was determined to be a reliable and effective method for surveying and monitoring both demographic and genetic trends in the reintroduced Columbia Basin pygmy rabbit population (Adams et al. 2011, DeMay et al. 2013, DeMay et al. 2015, DeMay et al. 2017). Since 2012, NGS using fecal DNA has been used to evaluate demographic and genetic parameters of pygmy rabbit populations in the Sagebrush Flats, Burton Draw, and Beezley Hills RAs as they relate to recovery of the Columbia Basin pygmy rabbit, including: 1) assessing the spatial distribution of rabbits around release sites, 2) assessing apparent survival rates, 3) estimating post-release dispersal distance, 4) assessing genetic diversity, and 5) assessing the persistence of Columbia Basin ancestry (DeMay et al. 2017, Nerkowski 2023). For the period 2012-2019, observed heterozygosity values ranged from 0.62-0.84 (Sagebrush Flats), 0.59-0.80 (Beezley Hills), and 0.73-0.77 (Chester Butte within Burton Draw RA), and Columbia Basin ancestry persisted in all three wild populations, ranging from 14.85%-27.46% (Nerkowski 2023). For additional details on genetic management of Columbia Basin pygmy rabbits in the wild population, breeding enclosures, and release pens see Gallie and Hayes (2020) and Nerkowski (2023).

**Population status.** A small population of pygmy rabbits is maintained annually within breeding enclosures to serve as a source of rabbits for releases to the wild. The breeding enclosure population

includes rabbits retained within fenced enclosures that are distributed among the RA's. Rabbits that exist outside of breeding enclosures comprise the wild population.

**Breeding enclosure population.** Since 2011, 2,547 kits have been produced in breeding enclosures and 2,230 rabbits have been released to the wild in the Sagebrush Flat (n = 1,559), Beezley Hills (n = 593), and Burton Draw (n = 78) RA's (Table 1, Fig. 4). Kit production declined after 2015 due to: 1) disease (coccidia) in the larger permanent breeding enclosures, 2) low over-winter adult survival in some years, 3) transition to smaller breeding enclosures (beginning in 2017) with their associated reduced rabbit breeding capacity and apparent inconsistencies in their siting in "good" habitat, and 4) impacts of fires. Further, since transitioning to the smaller mobile breeding enclosures, kit production in the enclosures has been insufficient to support kit releases and/or maintain the viability of the breeding enclosure population in some years (e.g., 2018, 2019, 2020, 2023), thereby requiring augmentation of rabbits trapped from wild populations at Sagebrush Flat and Beezley Hills or obtained from out-of-state populations. In May of 2023, the breeding enclosure population produced too few kits (n = 6) and was unable to support kit releases or maintain the viability of the breeding enclosure population; a similar scenario occurred in 2019. To re-establish the breeding enclosure population in the fall of 2019, rabbits were obtained from out-of-state translocations from Great Basin populations. However, in 2023, the potential for out-of-state translocations in order to re-establish a breeding enclosure population in Washington was deemed unlikely due to the March 2023 federal petition to list the pygmy rabbit range-wide and the risk of possibly introducing rabbit hemorrhagic disease (RHD), a viral disease of lagomorphs (rabbits and hares) caused by rabbit hemorrhagic disease virus (RHDV), to pygmy rabbits and other native lagomorphs in eastern Washington. Collapse of the breeding enclosure population in 2023 resulted in no kits being released in that year nor are kit releases expected in 2024. Fires have also impacted rabbits in breeding enclosures with the Sutherland Canyon fire killing 48 in 2017 and the Pearl Hill fire killing 20 rabbits in 2020.

Table 1. Annual summary of pygmy rabbit kits born (produced) within breeding enclosures and rabbits released into the wild, Columbia Basin, Washington 2011-2023.

|                  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Kits produced    | 0    | 150  | 381  | 794  | 590  | 157  | 122  | 18   | 42   | 105  | 71   | 111  | 6    | 2547  |
| Rabbits released | 42   | 104  | 272  | 830  | 579  | 120  | 37   | 27   | 38   | 70   | 33   | 78   | 0    | 2230  |
| Sagebrush Flat   | 42   | 104  | 272  | 830  | 150  | 120  | 0    | 0    | 0    | 0    | 0    | 2    | 0    | 1520  |
| <i>Rimrock</i>   |      |      |      |      |      |      |      |      |      |      |      | 39   | 0    | 39    |
| Beezley Hills    | 0    | 0    | 0    | 0    | 429  | 0    | 37   | 10   | 17   | 30   | 33   | 2    | 0    | 558   |
| <i>Palisades</i> |      |      |      |      |      |      |      |      |      |      |      | 35   | 0    | 35    |
| Burton Draw      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 17   | 21   | 40   | 0    | 0    | 0    | 78    |

**Wild population.** Reintroductions of pygmy rabbits have established population and expanded their range in Washington's shrubsteppe. Releases of rabbits from 2011 to 2016 on the Sagebrush Flat Wildlife Area (Table 1) led to the establishment of the Sagebrush Flat population, evidenced by the increasing proportion of wild-born kits (Table 2). Reintroductions in the Beezley Hills began in 2015 but failed to establish rabbits in the wild from this single release (Table 1). Releases in the Beezley Hills

resumed from 2017-2021 (Table 1) and led to the establishment of the Beezley Hills population in 2020, evidenced by the increasing proportion of wild-born kits (Table 2). Reintroductions of pygmy rabbits to WDFW’s Dormaier and Chester Butte units of the Sagebrush Flat Wildlife Area occurred from 2018-2020 (Table 1) and were beginning to establish a wild population in the Burton Draw RA before a catastrophic fire in the fall of 2020 killed these rabbits.

Based on the most recent winter survey data of active burrows (2022-2023), pygmy rabbits are currently found in two subpopulations, one at Beezley Hills and the other at Sagebrush Flats. Small numbers of rabbits occur on private property northeast of Sagebrush Flats, and rabbits are beginning to become established at the new Rimrock Meadows release site (Fig. 5). There was a minimum of 125 Columbia Basin pygmy rabbits in the wild (i.e., not in breeding enclosures) during the winter of 2022-2023 based on genetic analysis of fecal pellets collected at active burrows (Table 2). During the winter of 2022-2023, the Sagebrush Flat population was estimated at a minimum of 64 rabbits (number of genetically identified rabbits: 56 SBF + 8 Rimrock Sub Area, Table 2) and has been on an upward trajectory following the dramatic population decline in 2019. The Beezley Hills population was estimated at a minimum of 61 rabbits in the winter of 2022-2023 and has also increased in recent years.

Table 2. Annual summary of winter burrow surveys (2012-2023) of pygmy rabbits on Sagebrush Flat, Beezley Hills and Burton Draw Recovery Areas, Columbia Basin, Washington.

|  | Winter Survey Year |         |         |         |         |         |         |         |         |         |         |
|--|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|  | 2012/13            | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
| <b>Sagebrush Flat RA</b>                         |                    |         |         |         |         |         |         |         |         |         |         |
| # of Active Burrows                              | 52                 | 64      | 174     | 88      | 146     | 336     | 306     | 27      | 80      | 67      | 130     |
| % of Released Kits Detected (est. survival rate) | 37                 | 11      | 10      | <1      | 4       | -       | -       | -       | -       | -       | -       |
| # of Genetically Identified Pygmy Rabbits        | 45                 | 44      | 91      | 17      | 62      | 175     | 140     | 8       | 31      | 20      | 56      |
| % of Identified Pygmy Rabbits being wild-born    | 9                  | 9       | 3       | 88      | 92      | 100     | 100     | 100     | 100     | 100     | 96      |
| <b>Rimrock Sub Area</b>                          |                    |         |         |         |         |         |         |         |         |         |         |
| # of Active Burrows                              |                    |         |         |         |         |         |         |         |         |         | 13      |
| % of Released Kits Detected (est. survival rate) |                    |         |         |         |         |         |         |         |         |         | 21      |
| # of Genetically Identified Pygmy Rabbits        |                    |         |         |         |         |         |         |         |         |         | 8       |
| % of Identified Pygmy Rabbits being wild-born    |                    |         |         |         |         |         |         |         |         |         | 0       |
| <b>Beezley Hills RA</b>                          |                    |         |         |         |         |         |         |         |         |         |         |
| # of Active Burrows                              |                    |         |         |         |         |         | 6       | 9       | 43      | 77      | 84      |
| % of Released Kits Detected (est. survival rate) |                    |         |         |         |         |         | 30      | 36      | 43      | 3       | -       |
| # of Genetically Identified Pygmy Rabbits        |                    |         |         |         |         |         | 4       | 5       | 19      | 25      | 61      |
| % of Identified Pygmy Rabbits being wild-born    |                    |         |         |         |         |         | 25      | 0       | 42      | 96      | 93      |
| <b>Palisades Sub Area</b>                        |                    |         |         |         |         |         |         |         |         |         |         |
| # of Active Burrows                              |                    |         |         |         |         |         |         |         |         |         | 0       |
| % of Released Kits Detected (est. survival rate) |                    |         |         |         |         |         |         |         |         |         | 6*      |
| # of Genetically Identified Pygmy Rabbits        |                    |         |         |         |         |         |         |         |         |         | 0       |
| % of Identified Pygmy Rabbits being wild-born    |                    |         |         |         |         |         |         |         |         |         | 0       |
| <b>Burton Draw RA</b>                            |                    |         |         |         |         |         |         |         |         |         |         |
| # of Active Burrows                              |                    |         |         |         |         |         | 11      | 22      |         |         |         |
| % of Released Kits Detected (est. survival rate) |                    |         |         |         |         |         | 35      | 48      |         |         |         |
| # of Genetically Identified Pygmy Rabbits        |                    |         |         |         |         |         | 6       | 10      |         |         |         |
| % of Identified Pygmy Rabbits being wild-born    |                    |         |         |         |         |         | 0       | 0       |         |         |         |

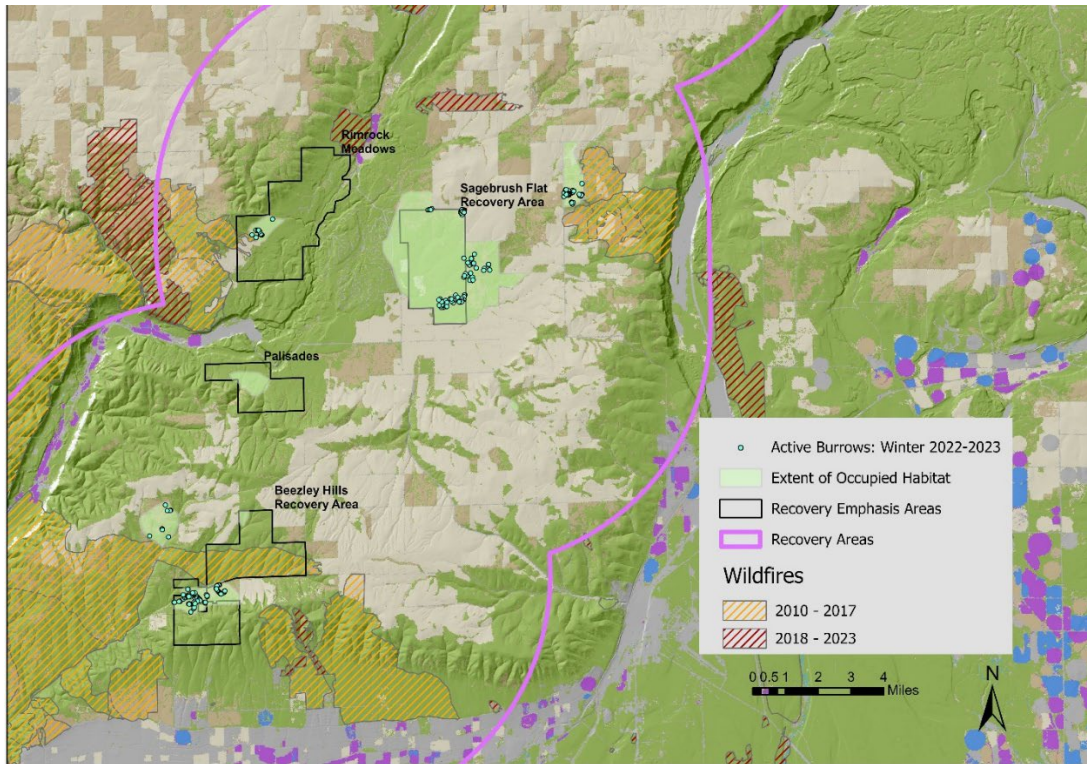


Figure 5. Distribution of Columbia Basin pygmy rabbits based on winter surveys (2022-2023) of active burrows.

Fires are a significant threat in pygmy rabbit recovery. Fires have impacted pygmy rabbit habitat and rabbit populations in all three RA's (Fig. 6). Wildfires in the Beezley Hills RA have resulted in extensive loss of shrubsteppe that was likely suitable habitat for pygmy rabbits (Fig. 6). In June of 2017, the Sutherland Canyon Fire burned 30,000 acres of shrubsteppe habitat within the Beezley Hills Recovery Area; fire-related mortality likely claimed 85 pygmy rabbits in enclosures and in the wild. The Pearl Hill fire ignited on September 7<sup>th</sup>, 2020, in Douglas County, and burned ~224,000 acres of shrubsteppe vegetation in a single day, including all pygmy rabbit habitat in the entire Burton Draw RA (Fig.6) and killed a minimum of 70 pygmy rabbits that were in enclosures or in the wild. As a result of the Pearl Hill fire, an entire recovery area was lost and years' worth of recovery efforts to establish this wild population. In the Sagebrush Flat RA, a site occupied by pygmy rabbits in Coyote Canyon burned in the summer of 1999.

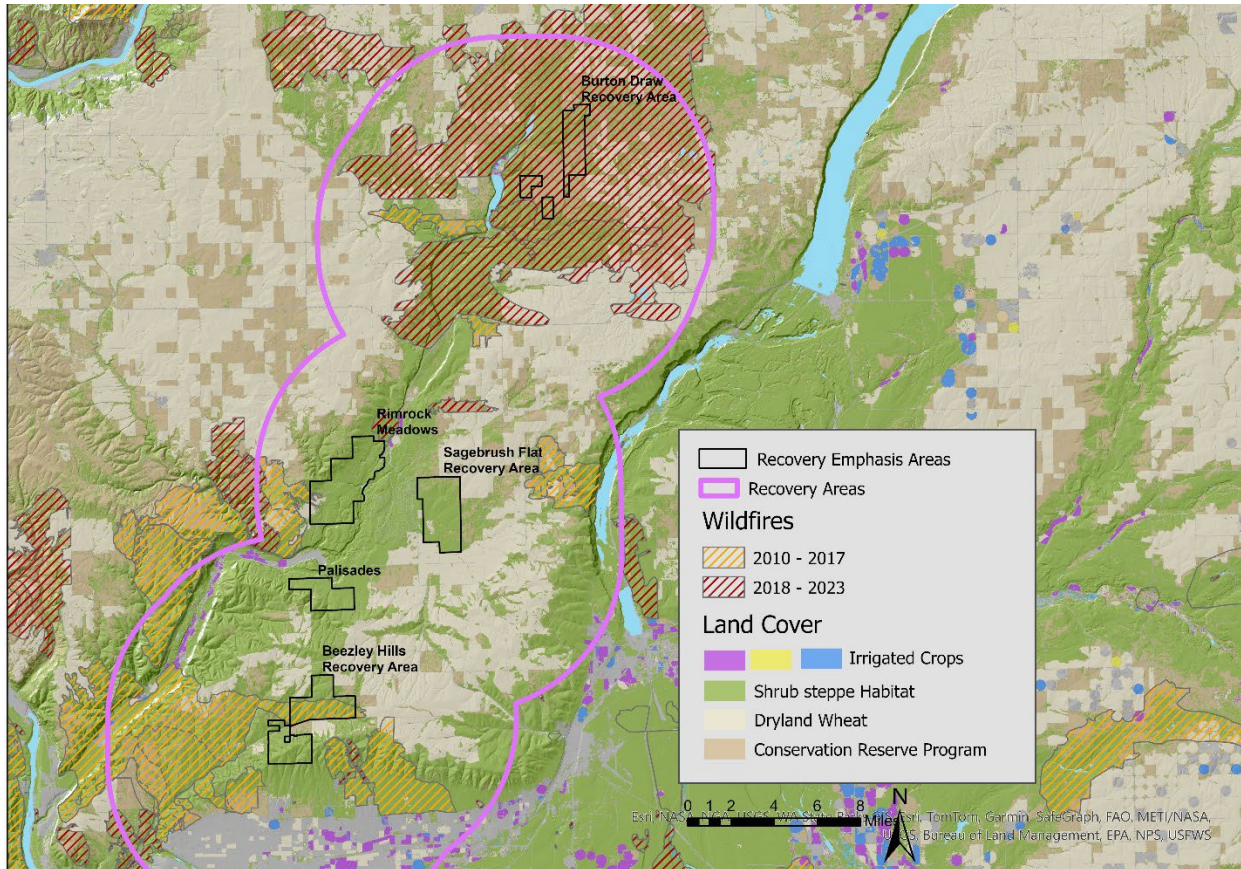


Figure 6. Extent of fires in the Burton Draw, Sagebrush Flat, and Beezley Hills Recovery Areas within the range of the Columbia Basin pygmy rabbit.

## FACTORS AFFECTING CONTINUED EXISTENCE

***Adequacy of existing regulatory mechanisms.*** The Columbia Basin pygmy rabbit receives protections through its endangered classification under federal and state laws. Washington State classification of the Columbia Basin pygmy rabbit as endangered makes it illegal to attempt to kill, injure, capture, harass, possess, or control individuals of the species (WDFW 1995). As a federally listed species under the ESA, section 9 of the Act provides prohibitions that make it illegal to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect pygmy rabbits, or attempt any such conduct (USFWS 2003).

***Habitat loss, degradation, and fragmentation.*** Large-scale loss, degradation, and fragmentation of native shrubsteppe habitat has played a primary role in the long-term decline of the Columbia Basin pygmy rabbit (WDFW 1995, Knick et al. 2003, USFWS 2003). By the mid-1900s, large portions of shrubsteppe habitat on deep soils within the Columbia Basin were converted to agricultural crops (Buechner 1953, Daubenmire 1988, Franklin and Dryness 1988, USFWS 2003). Urban and rural developments (e.g., housing, industrial facilities, transportation corridors) also result in permanent conversion of native shrubsteppe. An estimated 60% of Washington’s original shrubsteppe habitat has

been converted to agriculture resulting in high fragmentation of extant habitat and a disproportionate loss of deep-soil shrubsteppe communities (Dobler et al. 1996, Vander Haegen et al. 2000). Pygmy rabbits cannot occupy converted lands and conversion of native shrubsteppe habitat removes or severely limits dispersal corridors between suitable habitat areas (USFWS 2003). Wildfires also result in habitat loss for pygmy rabbits. Historic fires in the summer and fall of 2020 burned over 600,000 acres of shrubsteppe habitat in eastern Washington, including the Burton Draw RA.

Remaining stands of sagebrush are affected by other, often interacting, factors including historical overgrazing by livestock, invasion by non-native plant species, and altered fire frequency (USFWS 2003). Remaining stands of sagebrush used for grazing livestock were historically overgrazed or cleared of sagebrush to increase production of grasses and forbs as forage for livestock (Franklin and Dryness 1988, Harris 1991, WDFW 1995, Knick et al. 2011). Past overgrazing sometimes resulted in structural damage to dense stands of older sagebrush (Dobler and Dixon 1990). In addition, overgrazing often led to loss of perennial native grasses and forbs and contributed to invasions of annual grasses, such as cheatgrass (*Bromus tectorum*) (Franklin and Dryness 1988, Dobler and Dixon 1990, Harris 1991, WDFW 1995, Knick et al. 2003, Knick et al. 2011). Invasions of annual grasses, particularly cheatgrass, provide fine fuels that facilitate fire spread and result in more frequent fires in cheatgrass-dominated sagebrush communities (Miller et al. 2011). Sagebrush is easily killed by fire and when it occurs at increased frequency, sagebrush can be eliminated from the vegetation assemblage (Daubenmire 1988, Franklin and Dryness 1988, Miller et al. 2011). Absent a sufficient seed source, sagebrush cannot readily recolonize sites where it has been removed (Miller et al. 2011). Fire was not historically frequent in sagebrush, but instead burned at multi-century intervals (Baker 2011, Rottler et al. 2015). Cheatgrass invasion has altered fire regimes resulting in shorter fire return intervals, larger areas burned, and increased probability of fire (Miller et al. 2011, Balch et al. 2013).

Pygmy rabbits are associated with tall, dense stands of sagebrush; therefore, areas that are frequently burned or treated mechanically to remove sagebrush cover remove habitat patches potentially used by pygmy rabbits and further fragment remaining suitable habitat (USFWS 2003). Pygmy rabbits have not been found in recently burned areas (Rachlow and Svancara 2006). Fragmentation of sagebrush and corresponding increases in edge can result in a reduction in active burrows and relative abundance of pygmy rabbits near edges that may be attributable to an increase in occurrence of competitors and terrestrial predators near habitat edge (Pierce et al. 2011). Depending on timing and intensity, livestock grazing can reduce the biomass available and nutritional quality (e.g., less protein and greater fiber content of grasses) of native grasses and forbs (Camp et al. 2014, Thines et al. 2004), important seasonal foods of pygmy rabbits. In some study areas, pygmy rabbit presence decreased with increased occurrence of cheatgrass (Larrucea and Brussard 2008a). Cheatgrass is a poor food source, creates dense root mats that may make it difficult for pygmy rabbits to form burrows, and as it becomes more widespread it may form barriers to dispersal due to loss of shrub cover that provides protection from predators (Larrucea and Brussard 2008a,b). Shortened fire cycles and loss of native grasses and forbs eventually made overgrazed areas unsuitable for pygmy rabbits in the Columbia Basin (WDFW 1995).

**Small subpopulation size and isolation.** Once pygmy rabbit population numbers declined below a certain threshold, a combination of factors, including environmental events (e.g., extreme weather), catastrophic habitat loss (e.g., fire), predation, disease, loss of genetic diversity, and inbreeding, likely contributed to the eventual extirpation of wild populations in the state by 2004 (USFWS 2003, Wisniewski 2015, Gallie 2017). Genetic analyses have confirmed movement of pygmy rabbits among occupied sites in the Beezley Hills and Sagebrush Flats RAs and this connectivity will be critical in maintaining local subpopulations.

**Predation.** Predation is the main cause of pygmy rabbit mortality in the wild (42%, Sanchez 2007; 58% of juveniles, Estes-Zumpf and Rachlow 2009; 70%, Crawford et al. 2010; 69% of juveniles, Price et al. 2010). Known predators include Great Horned Owl (*Bubo virginianus*), coyote (*Canis latrans*), Northern Harrier (*Circus cyaneus*), weasels (*Mustela* spp.), badger (*Taxidea taxus*), and bobcat (*Felis rufus*); potential predators include short-eared Owl (*Asio flammeus*), Prairie Falcon (*Falco mexicanus*), Ferruginous Hawk (*Buteo regalis*), Golden Eagle (*Aquila chrysaetos*), and Common Raven (*Corvus corax*) (Gahr 1993, Crawford et al. 2010, USFWS 2012). Pygmy rabbits use crypsis to avoid detection and evade predators by maneuvering through dense shrub cover of their preferred habitat or by escaping into their burrows (USFWS 2003).

**Disease and parasites.** Many captive-bred pygmy rabbits died because of substrate-borne diseases, especially coccidiosis and mycobacteriosis (Harrenstien et al. 2006, USFWS 2010a, Elias et al. 2013). Coccidiosis is caused by protozoa that occur in soil and feces and which invade the intestines and other tissues of animals. Kits are particularly susceptible to coccidiosis which often leads to their death. A new strain of coccidian, *Eimeria brachylagia*, was identified in the captive pygmy rabbits (Duszynski et al. 2005). As the off-site captive breeding program was de-emphasized in 2011 and breeding transitioned to on-site semi-wild breeding in permanent enclosures in shrubsteppe, coccidia continued to limit kit production. Corresponding with the onset of widespread coccidia infection within the permanent breeding enclosures in 2015, kit production declined dramatically in 2016. Despite monitoring and treatment of coccidia with Amprolium, coccidia levels remained above threshold levels and reproduction remained below average. High coccidia levels in the permanent breeding enclosures was a key reason for transitioning to new mobile breeding enclosures that were relocated on the landscape every three years to reduce the build-up of this protozoan parasite in the soil. The transition to mobile breeding enclosures has largely addressed coccidia, with coccidia levels returning to normal levels in some enclosures and eliminated in other enclosures.

Rabbit hemorrhagic disease is a viral disease of lagomorphs (rabbits and hares) caused by rabbit hemorrhagic disease virus (RHDV), and its new variant (RHDV2; Abrantes et al 2012, Neimanis et al. 2018, Lankton et al. 2021). RHDV2 is fatal to lagomorphs (Hall et al. 2021). The first confirmed cases of RHDV2 in wild native lagomorphs in the US were in desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*) in New Mexico in April 2020 (Lankton et al. 2021). By April 2022, the virus had spread throughout the western US, affecting wild populations of hares (*Lepus* spp.), cottontails (*Sylvilagus* spp.) in at least 14 states (Lankton et al. 2021, USDA-APHIS 2022). In February



2022, RHDV2 was confirmed in the pygmy rabbit in Nevada and was suspected as the cause of a rapid decline in local pygmy rabbit populations where the disease was detected (Crowell et al. 2023). RHD is an acute and lethal virus with an 80% mortality rate in European rabbits (Capucci et al. 2017); the mortality rate among native North American lagomorphs is unknown. RHDV2 has not been reported in wild or domestic lagomorphs in eastern Washington. In the spring of 2021, WDFW staff began vaccinating all pygmy rabbits against RHDV2 in breeding enclosures, including kits prior to release, and of some pygmy rabbits in wild populations.

Three types of ectoparasites are common to pygmy rabbits, notably fleas (*Cediopsylla inaequalis*), ticks (*Dermacentor abdersoni*), and bot flies (*Cuterebra maculate*) (Gahr 1993). Plague is a bacterial disease transmitted by fleas infected with the bacterium, *Yersinia pestis* (USFWS 2010b). Plague was reported in a coyote taken from the site of one of the extirpated subpopulations of the pygmy rabbit in the Columbia Basin (USFWS 2003) and may represent a significant threat to the pygmy rabbit in the Columbia Basin (USFWS 2003).

**Overutilization for commercial, recreational, scientific, or educational purposes.** Under Section 10 of the Endangered Species Act, WDFW was issued a recovery permit for activities associated with the recovery program. In accordance with the permit, WDFW has tracked levels of incidental take associated with the program (defined as the amount of human-caused disability and mortality of pygmy rabbits as a percentage of the total captive population) and provided the Service with annual reports addressing these activities. The Service's Biological Opinion concluded that this level of incidental take is not likely to jeopardize the continued existence of the Columbia Basin pygmy rabbit (USFWS 2010a). Pygmy rabbits can be difficult to distinguish from species of cottontail rabbits (*Sylvilagus* spp.), therefore accidental shooting of Columbia Basin pygmy rabbits may occur in association with hunting of other small game species in Washington. However, this risk factor is relatively low based on low population numbers, localized distribution, association with dense shrub cover and relatively few small game hunters in these areas (USFWS 2003).

**Climate change.** Gradual climate change that affected the distribution and composition of sagebrush communities is thought to have contributed to the reduction of the Columbia Basin pygmy rabbit's range during the late Holocene (Lyman 1991). In the Great Basin, an upward shift in elevation of extant historical pygmy rabbit sites closely corresponded to the predicted elevation increase in average global temperature over the last century (Larrucea and Brussard 2008b). In addition, environmental changes resulting from climate change could facilitate the invasion and establishment of invasive species or exacerbate fire regimes that accelerate the loss of sagebrush habitats (USFWS 2010b). Distributions of pygmy rabbits modeled under two mid-century climate scenarios projected substantial decreases in habitat in five regions of Idaho and neighboring states (Rush et al. 2023).

## MANAGEMENT ACTIVITIES

**Conservation planning.** A state recovery plan was developed for the Columbia Basin pygmy rabbit in 1995 (WDFW 1995) and subsequently amended (WDFW 2001, WDFW 2003, WDFW 2011, Gallie and Hayes 2020). Shortly after publishing the final federal listing rule, a recovery team developed a federal recovery plan (USFWS 2012). In 2004, the Columbia Basin Pygmy Rabbit Recovery Team assessed and prioritized ten possible reintroduction sites for the Columbia Basin pygmy rabbit. One of the two highest priority sites identified for expanded reintroduction efforts is managed by WDFW (Sagebrush Flat Wildlife Area, 1,515 ha [3,740 acres]), and the other site is managed by The Nature Conservancy (Beezley Hills area, 1,374 ha [3,390 acres]); these two sites are referred to as recovery emphasis areas (USFWS 2010a). A third recovery emphasis area, Burton Draw (Fig. 4), was the focus of rabbit reintroductions beginning in 2018, but the Pearl Hill fire in 2020 burned all suitable habitat and it will no longer be considered as a functional RA in pygmy rabbit recovery for the foreseeable future. As a result of the loss of the third recovery emphasis area, identifying possible future reintroduction sites and conducting outreach with agency partners will be a priority in 2024. The Service has initiated a Species Biological Report for the Columbia Basin Pygmy Rabbit that will be followed by a five-year review of the Columbia Basin Pygmy Rabbit (D. Husband, USFWS, pers. comm.).

**Habitat protections and management.** In 2006, the Service and WDFW entered into a Safe Harbor Agreement for the Columbia Basin Pygmy Rabbit that provides a process whereby non-federal landowners and managers can voluntarily contribute to recovery efforts for the pygmy rabbit without incurring additional regulatory burdens or management requirements related to this species. To date, the Service has issued 32 Enhancement of Survival Permits under the Safe Harbor Agreement that cover management activities on 122,531 acres of private lands within the rabbits' historic range and another 32,974 acres of property managed by Washington Department of Natural Resources (Jesse Morris, WDFW, pers. comm.). Surveys of historical pygmy rabbit habitat in conjunction with Safe Harbor Agreement baseline surveys have occurred from 2006 to present (Wisniewski 2015, Gallie and Zinke 2018). A general conservation plan for Douglas County also provides best management practices to maintain or enhance pygmy rabbit habitat on private land (FCCD 2015). In recent years, most active pygmy rabbit burrows have been found in habitat established on lands enrolled in the Conservation Reserve Program (CRP). CRP lands can be highly productive pygmy rabbit habitat and could play a role in future release efforts with adequate outreach, permission from private landowners, and cooperation with the Washington Department of Natural Resources (Gallie 2017, Gallie and Zinke 2018). However, given that most of the wild pygmy rabbit population now occurs on CRP, the security of the population is subject to the ephemeral nature of enrolled lands in this program. Federal lands (e.g., BLM) could play an increasing role in future pygmy rabbit recovery. Within the Beezley Hills RA, WDFW began releasing pygmy rabbits in 2022 at the Palisades site on BLM land. In 2023, about 650 acres in the Chester Butte Unit of the Sagebrush Flat Wildlife Area in Douglas County were purchased to promote recovery of the Columbia Basin pygmy rabbit.

**Predator management.** WDFW implemented a predator control program around and including the Sagebrush Flat site during the winters of 1998-99 and 1999-2000. Numerous coyotes and several long-tailed weasels were removed by shooting, trapping, or snaring (USFWS 2003). The efficacy of the predator control program to protect the Columbia Basin rabbit population is unknown. Two obsolete windmills were removed to reduce the occurrence of predatory birds that could use the structures as perch or nest sites. Several measures have been taken (wire fencing of enclosures, overhead netting, perch deterrents, electrical wire along periphery of enclosures, and removal of problem northern harriers) to reduce the risk of predation on the population in breeding enclosures (Becker et al. 2011, J. Gallie, WDFW, pers. comm.).

**Research.** Studies conducted during the Columbia Basin pygmy rabbit recovery effort include: documenting survival of released pygmy rabbits; dispersal, and distribution of free-ranging rabbits (DeMay et al. 2017); DNA sampling to identify species and individual pygmy rabbits from fecal pellet samples (DeMay et al. 2013); population viability analysis (Zeoli et al. 2008); reproductive behavior (Elias et al. 2006, DeMay et al. 2016); effects of genetic management on demographics of the captive population (Elias et al. 2013); tradeoffs between security and thermal needs in sagebrush habitat (Camp et al. 2012, Camp et al. 2013, Milling et al. 2017); effects of land use practices on pygmy rabbit ecology (Thines et al. 2004, Camp et al. 2014); parasitology and disease (Duszynski et al. 2005, Harrenstien et al. 2006), and genetic monitoring, genomic analysis, and habitat selection (Nerkowski 2023).

**Recovery plan objectives.** The Washington State Recovery Plan (WDFW 1995) indicates pygmy rabbits could be considered for reclassified to threatened status when: 1) the state supports a minimum 5-year average of at least 1400 adult pygmy rabbits in six populations; two populations with at least 500 adults each and four populations with at least 100 adult rabbits each, and 2) the habitat supporting all six populations is secure.

## CONCLUSIONS AND RECOMMENDATION

The Columbia Basin pygmy rabbit, once found in portions of five counties, was considered extinct in the Washington by 2004. Through captive breeding of purebred Columbia Basin pygmy rabbits and later intercrossing with pygmy rabbits from populations outside Washington, pygmy rabbits were reintroduced to Washington. Reintroductions of pygmy rabbits in the Beezley Hills RA failed for unknown reasons in 2015 and again in 2017 due to wildfire, but subsequent reintroductions since 2018 have established a minimum of 61 pygmy rabbits in the wild. Reintroductions in the Sagebrush Flat RA were leading to the establishment of a small wild population, with an increasing population trajectory through the winter of 2018-2019, before experiencing a dramatic decline in early 2019. This population is beginning to recover, and the latest genetic data indicate a minimum of 64 pygmy rabbits in the wild population. Since the last periodic status review in 2018, the Burton Draw RA has been entirely lost due to the catastrophic Pearl Hill fire in the late summer of 2020 and wildfires remain an on-going threat. Since pygmy rabbits have not reached the population, distribution, or security criteria in the Washington State Recovery Plan for downlisting, it is recommended the species remain state-listed as endangered.

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The references cited in this document are categorized for their level of peer review pursuant to section 34.05.271 RCW, which is the codification of Substitute House Bill 2661 that passed the Washington Legislature in 2014. A key to the review categories under section 34.05.271 RCW is provided in Table A.

Table A. Key to 34.05.271 RCW categories.

| Category Code | 34.05.271(1)(c) RCW   |
|---------------|---|
| i             | Independent peer review: review is overseen by an independent third party.  |
| ii            | Internal peer review: review by staff internal to the Department of Fish and Wildlife.  |
| iii           | External peer review: review by persons that are external to and selected by the Department of Fish and Wildlife.   |
| iv            | Open review: documented open public review process that is not limited to invited organizations or individuals.   |
| v             | Legal and policy document: documents related to the legal framework for the significant agency action including but not limited to: (a) federal and state statutes; (b) court and hearings board decisions; (c) federal and state administrative rules and regulations; and (d) policy and regulatory documents adopted by local governments. |
| vi            | Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection.  |
| vii           | Records of the best professional judgment of Department of Fish and Wildlife employees or other individuals.  |
| viii          | Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).  |

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# WASHINGTON STATE STATUS REPORTS, PERIODIC STATUS REVIEWS, RECOVERY PLANS, AND CONSERVATION PLANS

## Periodic Status Reviews

|      |  |
|------|--|
| 2024 | Northern Spotted Owl                                     |
| 2024 | Mardon Skipper   |
| 2023 | Western Gray Squirrel                                    |
| 2023 | Woodland Caribou   |
| 2023 | Columbian White-tailed Deer                              |
| 2022 | American White Pelican                                   |
| 2022 | Brown Pelican  |
| 2022 | Snowy Plover   |
| 2022 | Cascade Red Fox  |
| 2021 | Ferruginous Hawk   |
| 2021 | Oregon Vesper Sparrow                                    |
| 2021 | Steller Sea Lion   |
| 2021 | Gray Whale   |
| 2021 | Humpback Whale   |
| 2021 | Greater Sage-grouse                                      |
| 2020 | Mazama Pocket Gopher                                     |
| 2019 | Tufted Puffin  |
| 2019 | Oregon Silverspot  |
| 2018 | Grizzly Bear   |
| 2018 | Sea Otter  |
| 2018 | Pygmy Rabbit   |
| 2017 | Fisher   |
| 2017 | Blue, Fin, Sei, North Pacific Right, and<br>Sperm Whales |
| 2017 | Sandhill Crane   |
| 2017 | Western Pond Turtle                                      |
| 2016 | Canada Lynx  |
| 2016 | Marbled Murrelet   |
| 2016 | Peregrine Falcon   |

## Conservation Plans

|      |      |
|------|------|
| 2013 | Bats |
|------|------|

## Status Reports

|      |                       |
|------|-----------------------|
| 2021 | Oregon Vesper Sparrow |
| 2019 | Pinto Abalone         |
| 2017 | Yellow-billed Cuckoo  |
| 2015 | Tufted Puffin         |
| 2007 | Bald Eagle            |
| 2005 | Aleutian Canada Goose |
| 1999 | Northern Leopard Frog |
| 1999 | Mardon Skipper        |
| 1999 | Olympic Mudminnow     |
| 1998 | Margined Sculpin      |
| 1998 | Pygmy Whitefish       |
| 1997 | Aleutian Canada Goose |

## Recovery Plans

|      |                               |
|------|-------------------------------|
| 2020 | Mazama Pocket Gopher          |
| 2019 | Tufted Puffin                 |
| 2012 | Columbian Sharp-tailed Grouse |
| 2011 | Gray Wolf                     |
| 2011 | Pygmy Rabbit: Addendum        |
| 2007 | Western Gray Squirrel         |
| 2006 | Fisher                        |
| 2004 | Sea Otter                     |
| 2004 | Greater Sage-Grouse           |
| 2003 | Pygmy Rabbit: Addendum        |
| 2002 | Sandhill Crane                |
| 2001 | Pygmy Rabbit: Addendum        |
| 2001 | Lynx                          |
| 1999 | Western Pond Turtle           |

Status reports and plans are available on the WDFW website at: <http://wdfw.wa.gov/publications/search.php>

