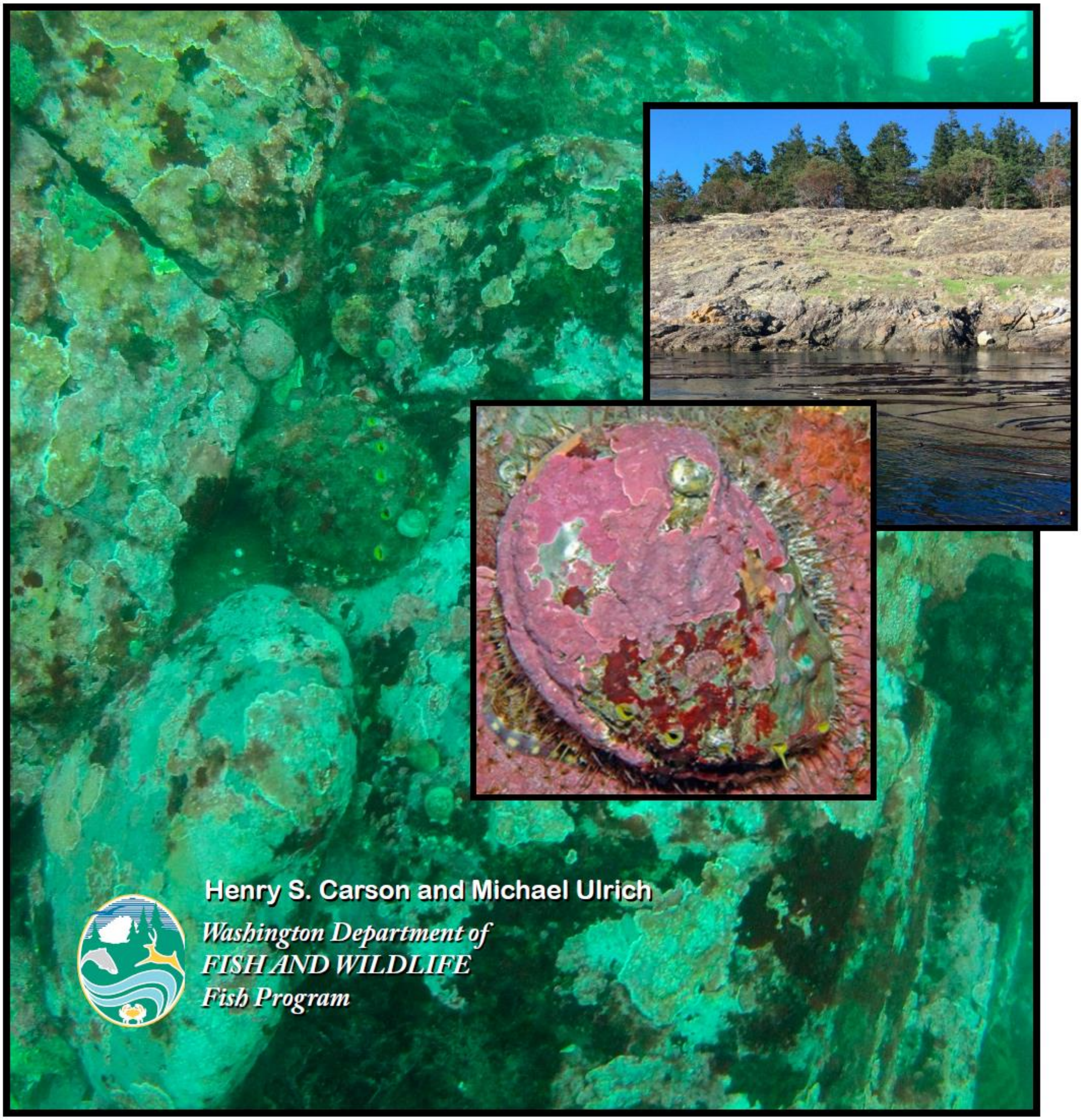
STATE OF WASHINGTON December 2018

Preliminary Status Report for the Pinto Abalone in Washington



Henry S. Carson and Michael Ulrich

Washington Department of FISH AND WILDLIFE Fish Program

The Washington Department of Fish and Wildlife maintains a list of endangered species (Washington Administrative Code 220-610-010, Appendix A). 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, Appendix A). The procedures include how species listings will be initiated, criteria for listing and delisting, public review standards, the development of recovery or management plans, and the periodic review of listed species.

The first step in the process is to develop a preliminary species status report. The report includes a review of information relevant to the species' status in Washington and addresses factors affecting its status. The procedures then provide for a 90-day public review opportunity for interested parties to submit new scientific data relevant to the draft status report and classification recommendation. At the close of the comment period, the Department incorporates new information and prepares the final status report and listing recommendation for presentation to the Washington Fish and Wildlife Commission. The final report and recommendations are then released for public review 30 days prior to the Commission's decision.

This preliminary status report for the Pinto abalone will be available for a 90-day public comment period from December 2018 through March 2019. All comments received will be considered during the preparation of the final status report. Submit written comments on this report by email to michael.ulrich@dfw.wa.gov, or by mail to:

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On the cover, inset photos of pinto abalone by Joshua Bouma and rocky shoreline by Henry Carson, background photo of abalone on coralline algae-encrusted rocky reef habitat by Michael Ulrich

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EXECUTIVE SUMMARY

The pinto abalone (*Haliotis kamtschatkana*) is a shallow-water marine mollusk native to the marine waters of Washington State, particularly the San Juan Islands and Strait of Juan de Fuca. It is a grazer, feeding on diatoms and kelp, living on bedrock or boulder reefs. Juveniles are cryptic but emerge as adults around the reproductive size of 40 – 70 mm shell length. Males and females spawn gametes directly into the water in spring and summer; fertilization occurs outside the body. After a relatively short drifting larval phase of 7 – 10 days, abalone settle into appropriate habitat, often bull kelp beds and on rock covered in crustose coralline algae.

Likely harvested for subsistence by early inhabitants of the Pacific Northwest for centuries, the Department authorized the state recreational harvest of abalone in 1959. In 1992, managers grew concerned about observed abundance trends and established ten fixed monitoring sites in the San Juan Islands. Upon a resurvey of those stations in 1994, and evidence of significant illegal harvest, managers closed the fishery. The population on these sites continued to decline despite the fishery closure. The most recent survey in 2017 found 12 total abalone remaining from an original tally of 359 in 1992 – a 97% decline. Furthermore, the average size of abalone has increased over time, and juveniles have not been sighted during Department surveys since 2008.

Available evidence suggests that the Washington population is aging and has experienced widespread reproductive failure. Since the animals spawn directly into the water, males and females must be in close proximity for fertilization to occur. Adults maintain a small home range and may not migrate long distances to spawn with other individuals. Therefore, when legal or illegal fishing reduces the density of adults below some fertilization threshold, successful reproduction is reduced and remnant populations are unlikely to recover naturally. In addition to a low density of adults, pinto abalone populations in Washington face threats from changing ocean conditions, illegal harvest, reduced genetic diversity, disease, contaminants, and native or introduced predators.

A captive breeding and reintroduction partnership was formed between the Department, Puget Sound Restoration Fund, the National Oceanic and Atmospheric Administration, treaty tribes, universities and others. Since 2009 the partnership has outplanted groups of hatchery-origin juveniles onto sites in the San Juan Islands. The growth and survival of these individuals suggests that this restoration strategy is a viable one. However, pinto abalone would have to be produced and outplanted in significantly greater numbers to achieve population-scale recovery.

Due to the dwindling numbers of wild individuals, their apparent lack of natural reproduction, and a number of identified threats, it is recommended that the pinto abalone be listed as endangered in the state of Washington.

INTRODUCTION

This status report summarizes the biology, population status, and threats to the pinto abalone (*Haliotis kamtschatkana*) in Washington and provides an assessment and recommendation as to whether the species should be listed as endangered, threatened, or sensitive under state law.

TAXONOMY AND DISTRIBUTION

Figure 1: Pinto Abalone (Photo by J. Bouma)

Abalone refers to the taxonomic assemblage of gastropod mollusks (i.e. “snails”) belonging to the genus *Haliotis*, the only genus in the Family Haliotidae. The 56 currently described species of abalone are strictly marine and worldwide in distribution. The Northeastern Pacific is home to seven species in the genus *Haliotis*: *H. corrugata* (pink), *H. cracherodii* (black), *H. fulgens* (green), *H. kamtschatkana* (pinto), *H. rufescens* (red), *H. sorenseni* (white), and *H. walallensis* (flat). Pinto abalone are the only species found in Washington, with the possible exception of a flat abalone sighting near Westport on the outer coast (Geiger, 2000). The known range of the northern subspecies, *Haliotis kamtschatkana kamtschatkana*, is from Point Conception, California to Sitka, Alaska (Geiger 2000) where they are patchily distributed in exposed and semi-exposed coasts. This subspecies is known as the “pinto abalone” in the United States or the “northern abalone” in Canada. The southern subspecies *Haliotis kamtschatkana assimilis*, or “threaded abalone”, extends the species’ range south onto the Baja California Peninsula (Geiger 2000). The nearshore depth distribution of the pinto abalone tends shallower with increasing latitude across its range (Sloan and Breen, 1988). In Washington, adult pinto abalone are most often found from 1 to 12 meters below mean lower low water (MLLW). Pinto abalone favor hard substrates of bedrock, boulders and large cobbles.

The observed distribution in Washington extends from Little Patos Island in the northern San Juan Islands (WDFW, 1988 unpublished data), out to Cape Flattery at the entrance to the Strait of Juan de Fuca. The western-most observation comes from just east of Box Canyon, offshore of Cape Flattery, sighted during the Reef Environmental Education Foundation (REEF) 2005 survey (unpublished). The southern extent of pinto abalone within inland waters are two observations on either side of the entrance to Admiralty Inlet, at Point Wilson (WDFW, 2006 unpublished data) and Point Hudson (REEF, 2018 unpublished) on the Quimper Peninsula and at Keystone on Whidbey Island (WDFW, 1997 unpublished data). There were also observations of pinto abalone at Keystone in 2006 and 2007 by recreational divers and 2011 by REEF surveyors. Pinto abalone observations were reported in two northern Hood Canal locations in 2003 by REEF surveyors. These reports are considered unconfirmed because the surveyors were classified as “novice level”; these data were not used to describe the geographic extent of the species.

The most northerly, westerly and southerly observations are indicated in Figure 2. The distribution of pinto abalone along the outer coast of Washington is unknown. It is possible that wave energy is too high on shallow rocky areas of the outer coast for pinto abalone to survive in significant numbers. Also, a growing population of reintroduced sea otters (*Enhydra lutris*), who prey on a variety of marine invertebrates, may have eliminated large populations of abalone there.

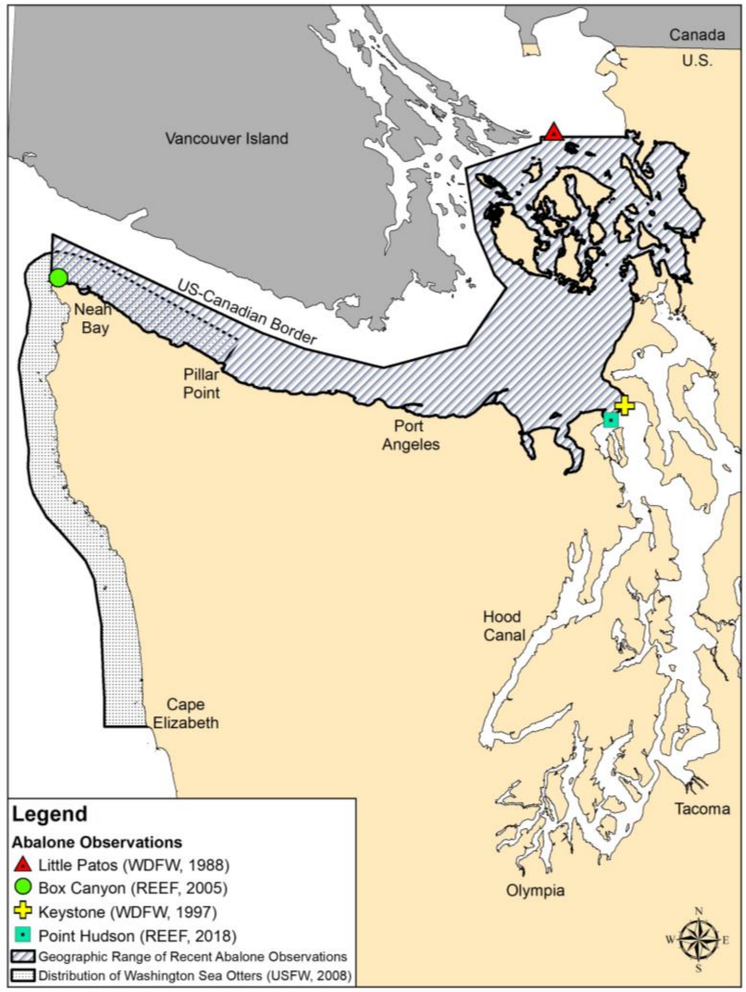

Figure 2: Known distribution of pinto abalone in Washington State

LIFE HISTORY

Pinto abalone, like other abalone species, are dioecious synchronous broadcast spawners; that is, males and females independently discharge gametes into the water timed to environmental cues in the spring and summer. Gamete viability is limited and therefore successful fertilization is necessarily dependent on a close aggregation of spawning adults (Babcock & Keesing 1999; Zhang 2008). Following a relatively short planktonic larval period of 7-10 days, settled juveniles can be highly cryptic and shelter into the interstices of the benthic habitat (Sloan & Breen 1988). At shell length between 40 and 70 mm pinto abalone become emergent to exposed areas of the benthos and mature to reproductive capability (Campbell et al. 1992, Larson and Blakenbeckler 1980, Paul and Paul 1981). The average life span of pinto abalone is unknown, however, specimens in captivity have been kept for longer than 20 years (Paul and Paul 2000). The maximum shell length for adults is approximately 160 mm (Neuman et al. 2018).

HABITAT AND DIET

Pinto abalone require shallow hard substrate such as bedrock, boulder, or large cobble in order to secure themselves to the benthos using their muscular foot. Juveniles may settle preferentially onto rock covered in crustose coralline algae (Rogers-Bennett et al. 2011), and adults may play a role in keeping such rock free of encrusting invertebrates through their grazing activity (Sloan and Breen 1988). Juveniles and subadults may prefer complex substrate that offers refuge from predation, which has been shown to increase survival (Read et al. 2013). Pinto abalone are generally found in waters with little freshwater input (COSEWIC 2009), and anecdotal evidence suggests they prefer areas that are well-flushed by tidal currents.

Abalone feed by scraping surfaces with a toothed structure inside the mouth called a radula. Juveniles use their radula to scrape diatoms and single-celled algae from rock or coralline-algae surfaces. Later, adults use the radula to feed on macroalgae. Adults are particularly associated with stands of the bull kelp *Nereocystis luetkeana*, on which they feed (Rogers-Bennett et al. 2011). For canopy-forming kelps such as *Nereocystis, Macrocystis,* or *Pterygophora*, pinto abalone feed on drifting, detached blades on the benthos (rather than ascend the stipes to feed directly). For understory red and brown kelps, they may feed directly on attached blades.

MOVEMENT

Adult abalone may move in response to predator cues, in search of food, or in aggregating behaviors during spawning. When disturbed, they can move relatively quickly for a snail (meters per minute), however, net movement may be close to zero for many adults (Sloan and Breen 1988). Abalone are known to occupy "home ranges" which they may seldom leave, and which may be only a few square meters in area. Population-scale exchange of individuals for abalone, like many marine invertebrates, is primarily achieved through the drift of their planktonic larvae.

Radio-tagging the pink abalone *Haliotis corrugata* in California confirmed that movement of that species is limited with some exceptions (Coates et al. 2013). Another study confirmed the relative site fidelity of pink abalone in California, but contrasted it with low fidelity and greater movement in the green abalone *Haliotis fulgens* (Taniguchi et al. 2013). Tagged red abalone *Haliotis rufescens* in California also exhibited greater movement than the pinks, although almost 90% remained in their approximate 50 m "zone" of release on annual timescales (Ault and DeMartini, 1987).

WDFW has been marking hatchery-origin juvenile pinto abalone since 2009 to assess survival, growth, and movement (see Management Actions section below). Small, colored circles with a two-digit number are glued to top of each shell to identify individuals. Outplant sites are each 8 x 10 m wide, and are divided with line into 5 "lanes", each 2 m wide. During dive surveys of sites on which tagged abalone have been placed, the lane location of the individual has been noted. To assess movement, an individual must be sighted twice. In the year or more between surveys, 77% of the individuals showed little or no net movement (zero or one lane), whereas this would be expected to have been found 52% of the time under the random expectation (Fig. 3). Similarly, net movement across the plot (three or four lanes) occurred 7% of the time, compared to a 24% random expectation (Carson et al. *in press*). On weekly timescales, net movement was even more restricted, with 73% of observations occurring in the same lane, and over 95% moving either zero or one lane. These results apply only to abalone that remained on the study sites to be re-sighted, and therefore excludes any individuals that may have moved completely off site.

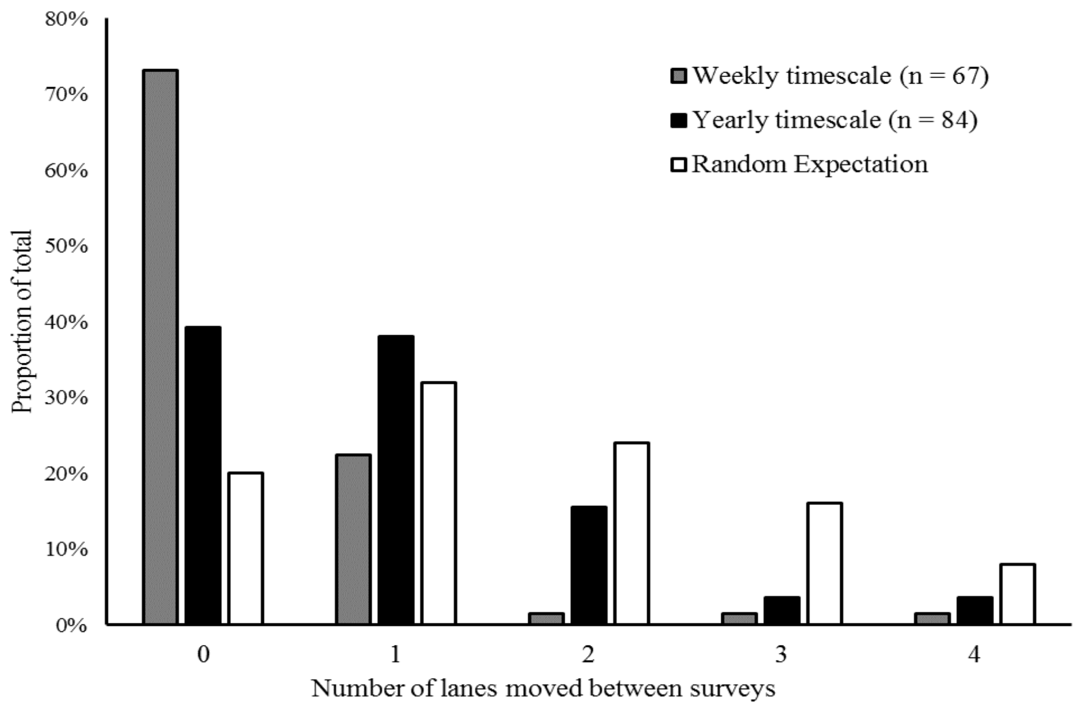

Figure 3: Results of movement studies on tagged pinto abalone in Carson et al. (*in press*).

If most adult pinto abalone occupy small home ranges over their lifetimes, the average density of adults is important for reproduction on the population scale. Areas that historically held a high density of abalone may have been fished down to the point where remaining individuals are sparsely distributed and there is little chance they would spawn in close enough proximity to a member of the opposite sex to achieve fertilization.

POPULATION DEMOGRAPHY

Fecundity

Much of the information on pinto abalone reproduction in Washington comes from the captive breeding program administered by WDFW and the Puget Sound Restoration Fund (PSRF). Like many broadcast-spawning marine invertebrates, pinto abalone have high fecundity, with females containing up to several million eggs. Females may spawn a portion of their eggs at any one event, ostensibly spawning the rest during subsequent events the same year. In the wild, only a portion of eggs may encounter sperm from nearby spawning males and achieve fertilization. Of those fertilized embryos, only a tiny fraction are likely to survive the veliger larval stage of about a week in length, and also be transported to appropriate settlement habitat.

Growth

Information on pinto abalone growth in Washington also comes from the hatchery program; limited information exists on wild abalone. In the hatchery, with ample food but also unnaturally high densities, juvenile abalone reached an average shell length of 23 mm in approximately 20 months since settlement. In the year after release into the wild, those abalone that survived the first year grew at an average rate of 0.05 mm per day, to an average size of 44 mm (Carson et al. *in press*). Tagged, hatchery-origin abalone had variable growth, with some individuals reaching near-maximum size in four years after release, with others from the same cohort surviving but growing very little over that time (Fig. 4). Abalone collected for hatchery broodstock have been successfully spawned as small as 40 mm (J. Bouma personal communication), probably the minimum size at which sexual maturity is reached.

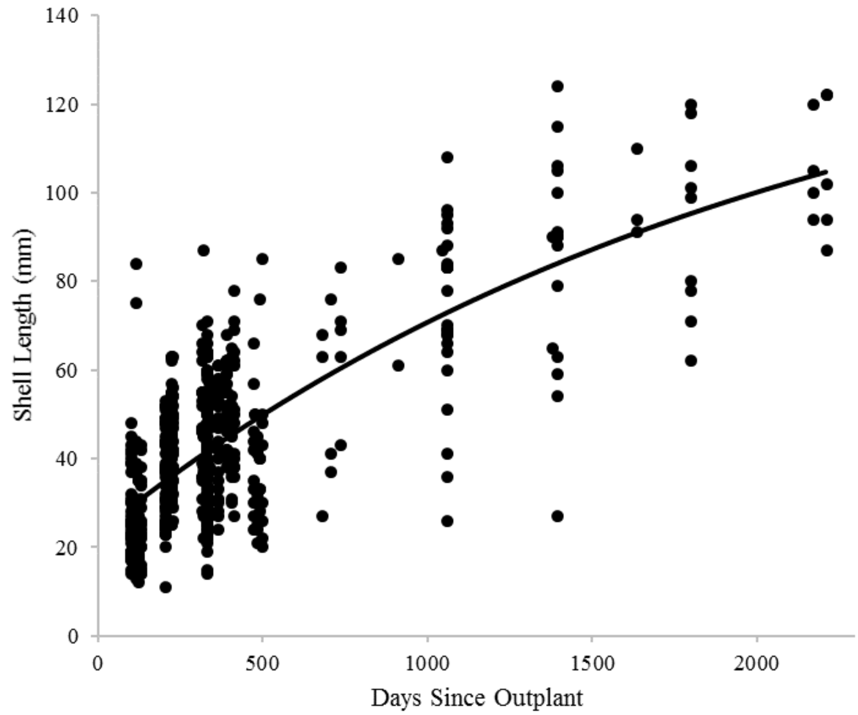

Figure 4: Shell lengths (mm) at age (days since outplant) for all recaptures (n= 535) of hatchery-origin pinto abalone in the San Juan Islands. The fit line was calculated using a Von Bertalanffy growth model. From Carson et al. (in press).

Mortality

There is little information on natural mortality of adults in wild populations of pinto abalone in Washington. Survival of hatchery-origin pinto abalone is discussed in the Management Actions section below. The most common non-human agent of natural mortality is probably direct predation. Prior to the 2013 outbreak of sea star wasting syndrome (Montecino-Latorre et al. 2016), large sea stars were an abundant potential predator of abalone. A known common consumer was the sunflower star *Pyncopodia helianthoides*, which grows to a size large enough to consume adult abalone, and to which abalone show a consistent behavioral response of rapid escape movements. Crabs are likely an important predator, particularly of juvenile abalone (Griffiths and Gosselin 2008). Multiple species of octopus are likely pinto abalone predators, as they are on other abalone species (Hofmeister et al. 2018). Other potential predators include otters and other marine mammals, fish, and drilling whelks.

Disease is another potential source of natural mortality in pinto abalone. Cultured and wild abalone are susceptible to a variety of diseases, particularly Abalone Withering Syndrome, which has been studied in captive pinto abalone (Crosson and Friedman 2018). No infectious diseases have been reported in Washington abalone, although two diseases have been detected in farmed abalone populations in British Columbia (*reviewed in* Neuman et al. 2018).

LEGAL STATUS

The U.S. National Marine Fisheries Service (NMFS) conducted a comprehensive status review of pinto abalone in 2014 for potential listing as threatened or endangered under the Endangered Species Act (Neuman et al. 2018). The panel did not list the species, citing, among other things, insufficient evidence that it is distinct from the threaded abalone (*Haliotis kamtschatkana assimilis*), which if correct would substantially extend the range. Since the Endangered Species Act does not permit listing of distinct population segments for invertebrates, the panel found that "the pinto abalone is not currently in danger of extinction throughout all or a significant portion of its range." Given considerable uncertainty about the severity of threats and demographic risks, the panel retained it as a "species of concern" (Neuman et al. 2018). It has been listed as an endangered species in Canada since 2009 (COSEWIC 2009). Washington State added pinto abalone as a state candidate species in 1998, but this is the first status review to formally consider listing the species as threatened or endangered in the state.

POPULATION STATUS AND TREND

Global Status

The NMFS status review of pinto abalone in U.S. waters (Neuman et al. 2018) concluded that both abundance and population growth has declined throughout the species range. However, there has been documented reproduction and recruitment in isolated populations. They acknowledge that the lack of baseline information about population densities or growth rates from before extensive fisheries makes it difficult to interpret the available information. Despite this uncertainty, the authors determined that range-wide extinction risk was low to moderate over 30- or 100-year time scales. However, there is more detailed information about pinto abalone specific to Washington State, and that shows an unambiguous decline in abundance, a lack of observed reproduction, and an aging population devoid of juveniles.

Washington

Harvest history. A commercial fishery for pinto abalone was never developed in Washington State. Historically, an intertidal subsistence fishery existed from native and early Euro-American Washington residents but the magnitude and extent are not well reported. Pinto abalone were first classified in Washington as harvestable shellfish in 1959 with a daily possession limit of three (Washington Department of Fisheries, now WDFW, Order 483). In 1980 the daily possession limit was increased to five and a 3.5 inch minimum harvest size was imposed (WDFW Order 80-12). Harvest gear restrictions were limited to hands or abalone "irons" with specific dimensions and configuration requirements in 1990 (WDFW Order 90-13). In 1992, the daily possession limit was reduced to three and the minimum size was increased to four inches with an additional requirement for the use of a caliper to predetermine size prior to removal from the rock (WDFW Order 92-19). In 1994, the fishery was closed (WDFW Orders 94-41 and 95-10).

Pinto abalone harvest data were obtained from sport diver interviews for the period April 1982-March 1983 (Bargmann 1984) and September 1989-August 1990 (Gesselbracht 1991). Total Washington annual pinto abalone harvest was estimated to be 38,200 and 40,934 individuals for these respective periods. These diver self-reported surveys may have under-estimated true recreational exploitation rates and do not account for cumulative harvest over several decades. A San Juan Islands based recreational dive charter observer survey was completed for the period November 1979-March 1985 (Palsson et al. 1991). Estimates of pinto abalone take per dive peaked in 1981 when an average of 2.28 pinto abalone were taken per dive on "shellfish-targeted" dives. The average take of pinto abalone per dive for "shellfish-targeted" dives during the entire seven-year study period was 1.57 abalone per day.

***Abundance over time*.** All available information from Washington shows a steep decline in pinto abalone abundance over time. There are few data on historic abundance of pinto abalone in Washington. Efforts to quantify abundance began in 1979 with surveys made by WDFW (formerly the Washington Department of Fisheries) at 30 sites within the San Juan Islands. Maps or locations of past and present survey sites are considered 'sensitive' (Policy 5210, RCW42.56.430) and will not be published as part of this status review out of concern for illegal harvest. These surveys were 20 minute timed swims by scuba divers within known pinto abalone habitat, and the mean encounter rate was about 25.5 abalone per swim. In contrast, recent efforts to collect pinto abalone broodstock by WDFW in 2010 and 2011 had a mean encounter rate of about 1.1 abalone for every 20 minutes of searching (WDFW unpublished data), a 96% reduction in the encounter rate. There was no adjustment for time spent measuring the shell lengths of abalone in situ on the 1979, 2010, or 2011 timed surveys. The encounter rate on the 1979 survey could significantly under-estimate the relative abundance of abalone due to the time needed to measure the large number of abalone during the 20 minute fixed survey period.

In 1992, WDFW established 10 permanently fixed survey stations throughout the San Juan Islands, in areas known to have high quantities of pinto abalone, as an abundance index for the population in this region. A trend in pinto abalone abundance from 1992 through 2006 has been previously reported by Rothaus et al. (2008). Overall mean density of pinto abalone declined from 0.16 to 0.03 abalone m^{-2} between 1992 and 2006. Additional surveys of the same 10 index stations occurred in 2009, 2013, and 2017 (Carson et al. *in press*). The mean density from the 2017 survey was 0.005 abalone m^{-2}, which amounts to a 97% decline in mean density since 1992 (Fig. 5). In 1992, the stations collectively held 359 abalone; they now hold 12.

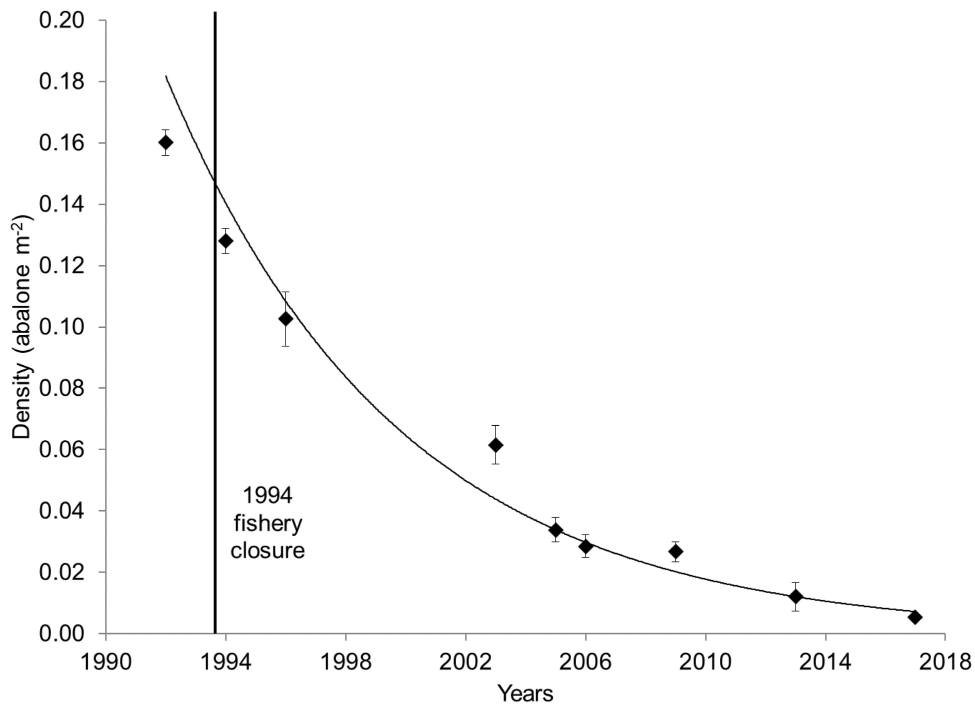

Figure 5: Average density of pinto abalone on ten fixed survey stations in the San Juan Islands

WDFW does not have abalone-specific survey data to demonstrate any trends in abundance in the abalone populations of the Strait of Juan de Fuca. Incidental data from surveys of fixed red sea urchin index sites in the Strait indicate that 39 abalone were sighted on these stations during the 1980s, at a rate of 0.27 abalone per site visit. During the 1990s, this encounter rate had dropped to 0.18 abalone per visit on the same stations. These index stations were phased out in the 2000s, with only 72 site visits, but the encounter rate for those visits were further decreased to 0.15 abalone per visit during that era.

Size Distribution. All available information on changes in abalone size over time in Washington indicates an aging population that is not reproducing. During the 1979 to 1981 WDFW timed-swim surveys of pinto abalone at 30 locations in the San Juan Islands, divers also measured shell lengths. Shell length measurements are taken from the margin near the apex to the margin that gives the greatest length. Note that the recreational fishery had been in place for 20 years at the time of these "baseline" measurements, but this is the earliest size distribution information available. Pinto abalone encountered during the 1979 timed survey (n= 755 pinto abalone) had a mean shell length of 97.6 mm (+/- 19 mm standard deviation), the smallest abalone encountered during the 1979 survey was 29 mm, and 2.5% of measured abalone were 50 mm or less. Though likely a gross underestimate of the number of juvenile abalone due to the cryptic nature of smaller individuals, the data indicate that natural reproduction was occurring in 1979 and juveniles were recruiting to the population.

In 1992, WDFW established the ten fixed index stations, and measured shell lengths for 351 of the 359 abalone encountered on them. Though there are differences between the timed swim and index station survey methods, these data may still be useful when comparing shifts in size frequency over time. The 1992 average shell length had increased to 105.3 mm (+/- 16 mm standard deviation), and the smallest individual encountered was 42 mm. That individual was the only one found that could be considered a "juvenile" less than 50 mm.

The most recent survey of the San Juan Island index stations was in 2017, when only 12 abalone were found. These individuals had an average size of 127.3 mm (+/- 18 mm standard deviation), and the smallest one was 83 mm. The second-smallest individual was 113 mm. Using size as a proxy for the age, the average age of pinto abalone seems to be increasing through time, indicating a lack of natural reproduction. A summary of the shifting size distribution by decade is depicted in Figure 6.

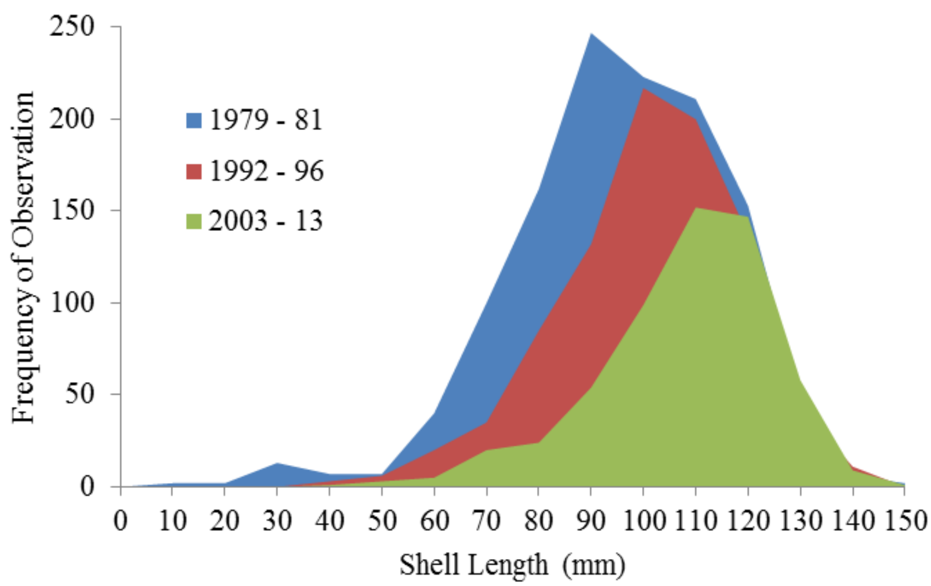

Figure 6: Shell size frequency distribution from timed swim and index station surveys in the San Juan Islands

Bouma et al. (2012) set out to quantify the abundance of juvenile pinto abalone in the San Juan Islands to see if they could find evidence of recent significant natural reproduction. They installed 66 abalone recruitment modules in areas of known historic abalone abundance, using a design that had been demonstrated to quantify juveniles in California and British Columbia. They surveyed each module 6 times over 26 months between

2004 and 2006, and found a total of 3 abalone of juvenile size. WDFW has received reports of juvenile abalone sightings by sea cucumber and sea urchin fishery divers, however follow-up surveys from WDFW staff of the reported areas have been unable to confirm the reports. The last time a juvenile-sized abalone was observed by a WDFW diver was 2008. Overall, the available evidence suggests that pinto abalone populations have experienced widespread "recruitment failure" for longer than a decade, indicating a lack of natural reproduction.

FACTORS AFFECTING CONTINUED EXISTENCE

The NMFS status review of pinto abalone as a species (Neuman et al. 2018) identified several threats to pinto abalone in all U.S. waters including low population densities due to overfishing, impacts from climate change, illegal harvest, diminished genetic diversity, introduction of disease from aquaculture, and catastrophic events such as oil spills. Some of these same threats have affected Washington State's pinto abalone populations in the past, and all may affect them in the future.

Low Population Density from Legal and Illegal Harvest.

Prior to the closure of the recreational fishery in 1994, legal and illegal harvest was the most-likely cause of population decline, as suggested by the estimates of 38,000 and 41,000 individuals harvested annually in the recreational fishery made by Bargmann (1984) and Gesselbracht (1991). Palsson et al. (1991) documented the popularity of dive charters specifically for finfish and shellfish collection, during which abalone were frequently targeted. The efficiency of recreational harvest is not unprecedented; Rogers-Bennett et al. (2013) demonstrated the ability of recreational fishers to quickly and severely impact a previously unfished red abalone population in California.

Although it is difficult to quantify the amount of illegal harvest during this era, it was undoubtedly significant. In one high-profile case from 1994, an illegal harvester evidently profited enough from abalone sales to name a new vessel the "Abalone Made" (Fig. 7). The extremely low densities of pinto abalone that exist now in Washington State probably preclude a commercial-scale illegal harvest operation. However, opportunistic take by commercial or recreational divers is still a concern. Furthermore, as recovery activities increase the density of abalone on restoration sites (see Management Actions below), the frequency of encounter between humans and abalone is likely to increase.

Figure 7: 1992 WDFW enforcement photo of a seized abalone-poaching vessel

After the fishery closure in 1994, pinto abalone populations continued to decline. It is possible that threats other than low adult densities (identified below) contributed to the decline of pinto abalone populations since the fishery closure. However, Rothaus et al. (2008) reviewed various causes for post-fishery population declines, and concluded that the most parsimonious explanation was recruitment failure due to the low remaining density of broadcast spawning adults, known as the Allee effect (reviewed in marine systems by Gascoigne and Lipcius 2004). Due to the massive volume of seawater, the density of even a large number of sperm or eggs released during spawning drops considerably within a few meters down current. Therefore, if males and females do not spawn in close proximity at the same time, little or no fertilization occurs. For sedentary organisms such as pinto abalone, then, maintaining a high density of adults in spawning aggregations is crucial to replenishing the population with recruits.

The critical density of adults to allow for fertilization in Washington pinto abalone is not known. Babcock and Keesing (1999) note that certain Australian abalone populations collapsed when average adult density dropped below 0.30 to 0.15 individuals per meter^2. Zhang (2008) simulated fertilization rates for the pinto abalone in a computer model, but the results for a particular adult density vary considerably according to assumptions about the time span of egg viability, the degree the adults are aggregated, and the total area of the spawning ground. A population growth model developed for endangered white abalone in California found that recovery was poor for a stocking density less than 0.23 individuals per meter^2, in general agreement with the evidence from Australia. Although uncertainty remains about the specific threshold for pinto abalone, it is clear that monitored populations of wild abalone in Washington are well below the estimates available. The average density on ten index stations in the San Juan Islands in 2017 was 0.005 individuals per meter^2, 30 times lower than the lowest Allee threshold estimate reported (0.15; Babcock and Keesing 1999). Even at the time of fishery closure in 1994, the density on these same stations was 0.13 individuals per meter^2. The population had likely been fished past their Allee threshold, as evidenced by the continued decline after legal harvest stopped.

Climate Change: ocean acidification and seawater temperature

Pinto abalone populations in Washington could be affected by the dual implications of global climate change: seawater temperature increase and ocean acidification. Changing ocean conditions may already be causing declines in both pinto and flat abalone populations in the southern parts of their range (Rogers-Bennett 2007). To date, seawater temperature at monitored sites in the San Juan Islands has remained well within the reported thermal tolerances for pinto abalone (Carson et al. *in press*). October – March temperatures on monitored sites averaged 8.5 – 9.0°C, and April – September temperatures averaged 9.9 – 11.0°C. The all-time minimum temperature of 6.2° is well above the 2° threshold for behavioural abnormalities documented in Alaska (Paul and Paul 1998). The all-time maximum temperature recorded (16.3°) is well below the thermal tolerance thresholds derived for adult (24°; Paul and Paul 1998) and larval pinto abalone (21°; Bouma 2007). Since current maximum temperatures have not approached thermal tolerances, seawater temperatures in Washington would have to increase significantly to directly impact pinto abalone. However, indirect impacts via the ecosystem on which they depend could happen before that occurs. For instance, bull kelp, on which pinto abalone feed, have vulnerable early life stages that may not persist above 17°C (Vadas 1972). This threshold is likely to be exceeded within pinto abalone habitat in Washington State during episodic events in the near future.

Ocean acidification is likely to harm Washington's pinto abalone. Marine mollusks including abalone are particularly vulnerable to low-pH seawater compared to other marine invertebrate groups (Kroeker et al. 2013). Difficultly with the calcification process by which mollusks form their shells, particularly as larvae, is likely to be the mechanism of impact. Crim et al. (2011) showed that pinto abalone larvae are negatively affected by elevated CO_2 concentration in seawater. The laboratory treatment level tested, 800 parts per million (ppm), was meant to simulate conditions in the year 2100. However, upwelling events over the continental shelf of the Pacific Coast of the United States have already exceeded this concentration (Feely et al. 2008). Mortality of larval oysters in the Pacific Northwest has already been attributed to the CO_2 concentration in coastal seawater pumped into shellfish hatcheries (Barton et al. 2015).

A key uncertainty in the assessment of climate change effects on pinto abalone is the species' ability to adapt and survive in warmer or lower-pH water and an altered ecosystem. If conditions continue to change rapidly, the species may be unable to shift habitat, behavior, diet, or physical tolerance soon enough to avoid devastating results.

Reduced Genetic Diversity

Populations of organisms may lose genetic diversity when their numbers are reduced to a fraction of the former population size. Once lost, the genetic traits likely cannot be regained on a relevant timescale – a genetic "bottleneck". Retaining genetic diversity, on the other hand, may allow populations to persist during physical or biological shifts in the ecosystem when conditions favor a different set of traits than previously. In laboratory populations of spawning pinto abalone, it was observed that some individuals were responsible for more of the resulting embryos than would be expected given the number of abalone spawning (Lemay and Boulding 2009). In every case, one "family" of full siblings dominated each of the resulting groups of offspring, indicating that factors other than the concentration of eggs and sperm affected fertilization success (Lemay and Boulding 2009). Therefore, a diverse spawning population does not necessarily ensure commensurate genetic diversity in the next generation. Studies of wild populations of pinto abalone in British Columbia did not find evidence of a loss of genetic diversity despite an estimated 80% population reduction (Withler et al. 2003). The Washington population of pinto abalone has likely been reduced even further than in Canada (surveyed populations in Washington are down 97%). Planned genetic analyses may provide more information on the degree to which wild and hatchery populations of pinto abalone are experiencing a genetic bottleneck in Washington.

Introduction of Invasive Species or Disease

It is difficult to assess the threat to pinto abalone from the introduction of a new species to the marine ecosystem of Washington because so many permutations of the scenario are possible. A new introduced species might be a predator of abalone such as a drilling whelk or a crab. It could be a competitor for space, such as a fouling invertebrate, or a competitor for food, such as another herbivore. The vectors of such an introduction are equally myriad – for instance, larval stages in ballast water, adults mixed with seafood imports, or a release from an aquarium. The threat would depend on the severity of the invasion and the amount to which the new species inhibits the growth or survival of pinto abalone. One potential invader, the sabellid polychaete worm *Terebrasabella heterouncinata* introduced to California from South Africa, grows on abalone shells and caused deformities in farmed abalone there (Kuris and Culver 1999). Although the worms do not feed on abalone, they can weaken the shell, exposing the animal to infection or predation.

A more specific threat comes from the introduction of a disease to which abalone are susceptible, and such diseases are already present on the West Coast of North America. Disease threats to pinto abalone range-wide include two that have caused mortality in juvenile farmed abalone in British Columbia, a protist *Labyrinthuloides haliotidis* and a coccidian *Margolisiella haliotis* (Neuman et al. 2018). Neuman et al. (2018) listed three other possible diseases: Withering Syndrome caused by a rickettsiales-like organism, ganglioneuritis, and vibriosis. Withering Syndrome is particularly concerning, as in a laboratory study, all the pinto abalone exposed to the syndrome died (Crosson and Friedman 2018).

With population densities of pinto abalone extremely low in Washington, the risk that an introduced disease could spread to all individuals may be low. However, places where pinto abalone exist in significant densities, such as the hatchery (see Management Activities below), restoration sites, or remaining wild spawning aggregations, are also where any hope of reproduction and persistence is located. An infection and associated mortalities to one or more of those populations could be a devastating setback to abalone recovery.

Oil or Contaminant Spills

A catastrophic spill of oil or another harmful substance could severely affect pinto abalone populations through direct mortality or ecosystem impacts. The San Juan Island and North Puget Sound Geographic Response Plan (Washington Department of Ecology 2003), for instance, points out the abalone's vulnerability to oil spills because of their shallow depth distribution and reliance on kelp as food. Although the chance of a catastrophic spill in Washington in any given year is remote, oil tanker traffic through the Strait of Juan de Fuca and past the San Juan Islands (the entire documented range of the species in Washington) could increase. If a planned expansion of the Trans Mountain Pipeline terminating in Burnaby, British Columbia is completed, the increased capacity could raise the number of oil tanker transits per month seven-fold compared to the current level (National Energy Board Canada 2016). The range of pinto abalone does not extend far enough north to have been impacted by the 1989 Exxon Valdez oil spill in Alaska. However, that spill had extensive and long-term effects on intertidal and subtidal communities that would be likely to also occur during a spill in Washington. In particular, the loss of intertidal algae at oiled sites was implicated in community-wide impacts from which there had not been full recovery through at least 2014 (Exxon Valdez Oil Spill Trustee Council 2014). Impacts were not restricted to the intertidal zone; an estimated 13% of the oil spill was deposited onto subtidal habitats (Exxon Valdez Oil Spill Trustee Council 2014). The Trans Mountain pipeline oil being transported past Washington's abalone populations is even more likely to sink onto subtidal habitats in large quantities because of its density. "Tar sands" or "dilbit" oil from Alberta is denser and must be diluted with volatile compounds to facilitate transport. During a spill, these dilutants may quickly evaporate, leaving the dense oil to sink more readily, as was the case during a 2010 spill of this type of oil on the Kalamazoo River in Michigan (U.S. Environmental Protection Agency 2016). Additionally, oil spill cleanup efforts may make extensive use of dispersants to make oil more biologically available in the waters below the surface. These compounds, used during the 2010 Deepwater Horizon oil spill in the Gulf of Mexico, were shown to have a variety of potential toxic and developmental effects on marine organisms (e.g. Almeda et al. 2014, Vignier et al. 2015).

MANAGEMENT ACTIVITIES

Protection

The take of pinto abalone for recreational or commercial purposes has not been allowed in the state of Washington since 1994. Harvesting of abalone in Washington is penalized under RCW 77.15.380 – unlawful fishing in the second degree, which is a misdemeanor offense. In 1998, WDFW added pinto abalone as a Washington Species of Concern with a status designation of 'State Candidate Species'. This designation includes fish and wildlife species that the Department considers for possible future listing as State Endangered, Threatened, or Sensitive if provided evidence meets defined listing criteria. As a Candidate Species, pinto abalone are included on WDFW's Priority Habitats and Species Program. As such, their populations and habitats are considered for protection when counties and municipalities fulfill planning requirements for marine development under the Shoreline Management Act. Pinto abalone also receive *de facto* protection in that floating canopy forming kelp beds (*Nereocystis luetkeana* and *Macrocystis integrifolia*), an important abalone habitat component, are designated Environmentally Sensitive Areas and, a priority habitat type under WDFW's Priority Habitats and Species Program. Also, all or nearly all pinto abalone habitat in Washington overlaps with critical habitat designations for salmon, orcas, forage fish, or other species.

Recovery Partnership

In response to evidence that pinto abalone populations were unlikely to recover on their own, a collaboration was developed in the early 2000s between WDFW, the Puget Sound Restoration Fund, National Oceanic and Atmospheric Administration (NOAA), universities, other non-governmental organizations, treaty tribes, and private aquaculture. A captive breeding program was established and hatchery propagation methods were developed for the species. Hatchery activities were based in the NOAA Mukilteo Research facility until 2016, when they were moved and expanded at the Kenneth K. Chew Center for Shellfish Research and Restoration at the NOAA Manchester Research Facility. The goal of the program is to produce genetically diverse, disease-free pinto abalone to supplement wild stocks and reverse trends in declining abundance. The program operates under the principal of "do no harm" and accepted standard restoration hatchery protocol and disease screening practices are followed to avoid negative impacts to remnant wild populations. Broodstock collection occurs in the San Juan Islands, and only spatially isolated "singleton" animals are removed from the wild so there is minimal disruption to spawning aggregations. Given the lack of large-scale movements for most pinto abalone (Carson et al. *in press*), singleton animals are likely reproductively isolated and would not contribute to natural reproduction. To minimize genetic effects on the wild population, only the first generation of juveniles produced from each pair of wild broodstock is released into the wild. New broodstock are collected each year to produce a different set of families for each release. When possible, previous year's broodstock are released back into the wild in artificial spawning aggregations.

Restoration Outplants

Beginning in 2009, recovery program collaborators initiated pilot-scale outplants of hatchery reared juvenile pinto abalone. Carson et al. (*in press*) review the methods and results of these outplants through 2017. The partnership has placed over 15,000 juveniles from 76 families onto 12 sites in the San Juan Islands. Survival and growth of outplanted juveniles has been regularly monitored and results indicate that this approach is a viable restoration strategy. Eight of the 12 sites are now likely mature spawning aggregations, in that they hold pinto abalone of reproductive size at a density greater than the assumed fertilization threshold (0.3 abalone per meter^2). Significant scale-up of the program is necessary in order to affect population-scale restoration and many logistical and basic research issues must be addressed in order to implement a cost-effective and responsible statewide restoration program. Research is underway to increase the efficiency of the program including outplant trials of younger individuals and larvae.

Research

Despite the initial success of restoration outplants, there are key gaps in the information needed to achieve population-scale recovery. Although there are many potential research areas, WDFW has identified three priorities. The first is a better understanding of the specific habitat needs of pinto abalone. Carson et al. (*in press*) report that site was by far the most important determinant of hatchery abalone survival compared to family or size when outplanted. However, it is not clear what differentiates more- and less-successful outplant sites, since all were chosen using the same criteria. Research into the physical (i.e. current regimes) or biological (i.e. predator density) differences among sites would aid the selection of future restoration sites and long-term planning.

There is also little information specific to pinto abalone about the adult density needed to achieve robust fertilization during spawning and increase reproductive output. The current target (at least 0.3 individuals per meter^2) are based on computer simulations and anecdotal evidence from other species. Having a more accurate target density would help economize restoration planning by tailoring stocking densities more closely to the fertilization threshold.

Lastly, we do not have sufficient information on the population genetics of hatchery-produced and remnant wild populations. If pinto abalone are undergoing significant genetic bottlenecks, the partnership could explore the use of broodstock from other regions to increase diversity and potential resilience.

CONCLUSIONS AND RECOMMENDATION

All available evidence demonstrates that pinto abalone populations in Washington have declined dramatically from their historic levels. This steep decline continued after the recreational fishery was closed in 1994. The continued decline absent of harvest, combined with evidence that the remnant populations are aging and not producing juvenile abalone, suggest that reproductive failure is the most likely cause of the decline. This failure may be the result of low adult density in a sedentary species that requires spawners to be adjacent in order for fertilization to occur. If reproductive failure is indeed the cause of the decline, the trend is unlikely to reverse without intervention. The captive-breeding and wild release program developed by restoration partners has been successful on the pilot scale, but significant scale-up would be necessary to affect recovery on the population scale. Furthermore, additional threats such as ocean acidification, illegal harvest, disease introduction, contamination, or reduced genetic diversity may impact recovery.

For these reasons, it is recommended that pinto abalone be listed as an endangered species in the state of Washington. Such a listing would accurately reflect the current population status and risk of extinction faced by the species in Washington, and more easily communicate those concepts to the public.

Literature cited for the Preliminary Status Report for Pinto Abalone in Washington

Table B presents the literature cited in the *Preliminary Status Report for the Pinto Abalone in Washington*. Each reference is categorized for its 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	(i) Independent peer review: review is overseen by an independent third party.
ii	(ii) Internal peer review: review by staff internal to the department of fish and wildlife.
iii	(iii) External peer review: review by persons that are external to and selected by the department of
iv	(iv) Open review: documented open public review process that is not limited to invited organizations or individuals.
v	(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
vi	(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)
vii	(vii) Records of the best professional judgment of department of fish and wildlife employees or
viii	(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).

Table B Reference	34.05.271 Review Category
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<u>Appendix A. Washington Administrative Codes:</u> 220-610-010. Wildlife classified as endangered species; 220-610-110. Endangered, threatened and sensitive wildlife species classification.

WAC 220-610-010 Wildlife classified as endangered species. Endangered species include:

Common Name	**Scientific Name**
pygmy rabbit	*Brachylagus idahoensis*
fisher	*Pekania pennanti*
gray wolf	*Canis lupus*
grizzly bear	*Ursus arctos*
killer whale	*Orcinus orca*
sei whale	*Balaenoptera borealis*
fin whale	*Balaenoptera physalus*
blue whale	*Balaenoptera musculus*
humpback whale	*Megaptera novaeangliae*
North Pacific right whale	*Eubalaena japonica*
sperm whale	*Physeter macrocephalus*
Columbian white-tailed deer	*Odocoileus virginianus leucurus*
woodland caribou	*Rangifer tarandus caribou*
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*
sandhill crane	*Grus canadensis*
snowy plover	*Charadrius nivosus*
upland sandpiper	*Bartramia longicauda*
spotted owl	*Strix occidentalis*
western pond turtle	*Clemmys marmorata*
leatherback sea turtle	*Dermochelys coriacea*
mardon skipper	*Polites mardon*
Oregon silverspot butterfly	*Speyeria zerene hippolyta*
Oregon spotted frog	*Rana pretiosa*
northern leopard frog	*Rana pipiens*
Taylor's checkerspot	*Euphydryas editha taylori*
streaked horned lark	*Eremophila alpestris strigata*
tufted puffin	*Fratercula cirrhata*
North American lynx	*Lynx canadensis*
marbled murrelet	*Brachyramphus marmoratus*
loggerhead sea turtle	*Caretta caretta*
yellow-billed cuckoo	*Coccyzus americanus*

[Statutory Authority: RCW 77.04.012, 77.04.013, 77.04.055, 77.12.020, and 77.12.047. WSR 18-17-153 (Order 18-207), § 220-610-010, filed 8/21/18, effective 9/21/18. Statutory Authority: RCW 77.04.012, 77.04.055, 77.12.020, and 77.12.047. WSR 17-20-030 (Order 17-254), § 220-610-010, filed 9/27/17, effective 10/28/17. Statutory Authority: RCW 77.04.012, 77.04.013, 77.04.020, 77.04.055, and 77.12.047. WSR 17-05-112 (Order 17-04), recodified as § 220-610-010, filed 2/15/17, effective 3/18/17. Statutory Authority: RCW 77.04.012, 77.04.055, 77.12.020, and 77.12.047. WSR 17-02-084 (Order 17-02), § 232-12-014, filed 1/4/17, effective 2/4/17; WSR 16-11-023 (Order 16-84), § 232-12-014, filed 5/6/16, effective 6/6/16; WSR 15-10-022 (Order 14-95), § 232-12-014, filed 4/27/15, effective 5/28/15. Statutory Authority: RCW 77.12.047, 77.12.020. WSR 06-04-066 (Order 06-09), § 232-12-014, filed 1/30/06, effective 3/2/06; WSR 04-11-036 (Order 04-98), § 232-12-014, filed 5/12/04, effective 6/12/04. Statutory Authority: RCW 77.12.047, 77.12.655, 77.12.020. WSR 02-11-069 (Order 02-98), § 232-12-014, filed 5/10/02, effective 6/10/02. Statutory Authority: RCW 77.12.040, 77.12.010, 77.12.020, 77.12.770, 77.12.780. WSR 00-04-017 (Order 00-05), § 232-12-014, filed 1/24/00, effective 2/24/00. Statutory Authority: RCW 77.12.020. WSR 98-23-013 (Order 98-232), § 232-12-014, filed 11/6/98, effective 12/7/98; WSR 97-18-019 (Order 97-167), § 232-12-014, filed 8/25/97, effective 9/25/97; WSR 93-21-026 (Order 616), § 232-12-014, filed 10/14/93, effective 11/14/93. Statutory Authority: RCW 77.12.020(6). WSR 88-05-032 (Order 305), § 232-12-014, filed 2/12/88. Statutory Authority: RCW 77.12.040. WSR 82-19-026 (Order 192), § 232-12-014, filed 9/9/82; WSR 81-22-002 (Order 174), § 232-12-014, filed 10/22/81; WSR 81-12-029 (Order 165), § 232-12-014, filed 6/1/81.]

WAC 220-610-110 Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or
sensitive. DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long-term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person.
The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section
3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g. food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g. survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall
prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.
8.1.1 The agency shall allow at least 90 days for public comment.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within 5 years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended.

[Statutory Authority: RCW 77.12.047, 77.12.655, 77.12.020. 02-02-062 (Order 01-283), § 232-12-297, filed 12/28/01, effective 1/28/02. Statutory Authority: RCW 77.12.040. 98-05-041 (Order 98-17), § 232-12-297, filed 2/11/98, effective 3/14/98. Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]

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

Periodic Status Reviews

2018 Sea Otter
2018 Pygmy Rabbit
2018 Grizzly Bear
2017 Sharp-tailed Grouse
2017 Fisher
2017 Blue, Fin, Sei, North Pacific Right, and Sperm Whales
2017 Woodland Caribou
2017 Sandhill Crane
2017 Western Pond Turtle
2017 Green and Loggerhead Sea Turtles
2017 Leatherback Sea Turtle
2016 American White Pelican
2016 Canada Lynx
2016 Marbled Murrelet
2016 Peregrine Falcon
2016 Bald Eagle
2016 Taylor's Checkerspot
2016 Columbian White-tailed Deer
2016 Streaked Horned Lark
2016 Killer Whale
2016 Western Gray Squirrel
2016 Northern Spotted Owl
2016 Greater Sage-grouse
2016 Snowy Plover
2015 Steller Sea Lion

Conservation Plans

2013 Bats

Recent Status Reports

2017 Yellow-billed Cuckoo
2015 Tufted Puffin
2007 Bald Eagle
2005 Mazama Pocket Gopher, Streaked Horned Lark, and Taylor's Checkerspot
2005 Aleutian Canada Goose
1999 Northern Leopard Frog
1999 Mardon Skipper
1999 Olympic Mudminnow
1998 Margined Sculpin
1998 Pygmy Whitefish
1997 Aleutian Canada Goose
1997 Gray Whale
1997 Olive Ridley Sea Turtle
1997 Oregon Spotted Frog
1993 Larch Mountain Salamander
1993 Oregon Silverspot Butterfly

Recovery Plans

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
1996 Ferruginous Hawk
1995 Pygmy Rabbit
1995 Upland Sandpiper
1995 Snowy Plover

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