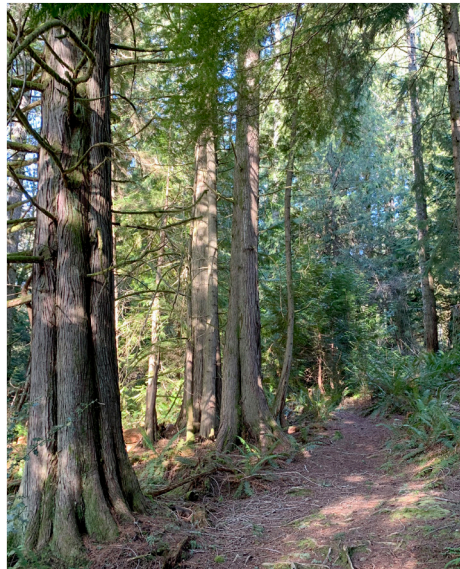


September 2021

South Puget Sound Wildlife Area Management Plan



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Wayne Chapin	Citizen – hunting, fishing
Mary Dodsworth	City of Lakewood
Herb Gerhardt	Citizen – Mason County
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Draft South Puget Sound Wildlife Area Management Plan

September 2021

DRAFT

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Acronyms

DAHP	Washington State Department of Archaeology & Historic Preservation
DNR	Washington State Department of Natural Resources
DOC	Department of Corrections
DPS	Distinct Population Segment
EIA	Ecological Integrity Assessment
EIM	Ecological Integrity Monitoring
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
GSA	U. S. General Services Administration
HCSEG	Hood Canal Salmon Enhancement Group
IMW	Intensively Monitored Watershed
IPM	Integrated Pest Management
LWCF	Land and Water Conservation Fund
MHHW	Mean Higher High Water
NAWCA	North American Wetland Conservation Act
NPS	National Park Service
NRCS	National Resources Conservation Service
PHS	Priority Habitats and Species
RCW	Revised Code of Washington
RCO	Washington State Recreation and Conservation Office
SEPA	State Environmental Policy Act
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WAAC	Wildlife Area Advisory Committee
WDFW	Washington Department of Fish and Wildlife
WLA	Wildlife Area
WWRP	Washington Wildlife and Recreation Program

Wildlife Area management planning overview

Introduction and agency mission¹

Welcome to your fish and wildlife lands!

The Washington Department of Fish and Wildlife (WDFW) provides active management for more than a million acres of publicly-owned land, most of which falls within 33 wildlife areas across the state (<https://wdfw.wa.gov/about/wdfw-lands>). These diverse lands contain nearly all species and habitats present in Washington. With the loss of natural habitat posing the single greatest threat to native fish and wildlife, these wildlife areas play a critical conservation role. The wildlife area management plan addresses all aspects of resource management, highlights areas for public access, education, and stewardship, and aligns with statewide conservation goals.

In addition to protecting lands and water for habitat and people, WDFW manages land to preserve Washington's natural and cultural heritage, provide access for hunting, fishing, and wildlife-related recreation, and foster outdoor experiences and exploration throughout the state. We do this to support the species and habitats of Washington and ensure they prosper for the sake of the species and for our collective enjoyment well into the future.

An interdisciplinary team of WDFW staff members, including fish, habitat, and wildlife biologists, as well as enforcement and management, developed the South Puget Sound Wildlife Area Management Plan with significant public involvement. This included input from the local stakeholder-based South Puget Sound Wildlife Area Advisory Committee, public agencies, and interested residents.

Wildlife area management planning framework

Management of wildlife areas is guided by WDFW's mission and strategic plan, as well as by state and federal laws. Each new plan is guided by the Wildlife Area Management Planning Framework (Framework), which summarizes the agency's mission, laws, policies, and approaches to management of fish and wildlife, as well as public use and recreation. To read the framework: (<https://wdfw.wa.gov/publications/01810>).

¹ Under state law, the Washington State Department of Fish and Wildlife (WDFW) is charged with “preserving, protecting, and perpetuating” the state’s fish and wildlife species, while also providing sustainable recreational opportunities that are compatible with fish and wildlife stewardship.

Purpose and organization of the plan

The purpose of the management plan is to guide management activities, including conservation and recreation, occurring on the South Puget Sound Wildlife Area for the next 10 years. Management goals, objectives, and performance measures are defined in the plan and are consistent with WDFW's mission, strategic plan, and requirements associated with the funds used to purchase the wildlife areas. The plan provides a clear vision of how these lands are managed to a variety of audiences, including WDFW staff members and the public. Objectives in the plan depend on available budget. Budget reductions made during the life of this plan may delay implementation of some actions.

The plan is organized into four parts. Part I provides an overview of the wildlife area and associated units including size, location, purpose, and other features. It also includes success stories, which showcase conservation, restoration, and partnerships with volunteers.

Parts II and III cover the wildlife area in more depth, including information to guide management activities and document the history, land ownership, stewardship, and recreation activities. Part II concludes with goals and objectives for the planning area, summarizing the priority actions, owners, and timelines for implementation. This section of the plan is reviewed and updated every two years.

Part III focuses on species and habitat management. It also describes the physical setting, such as soils, geology, hydrology, and climate, as well as the effects of climate change. This section also describes the importance of the wildlife area as habitat for native game and non-game species.

Part IV is a compendium of appendices that include resources to support different areas of the plan, including species and habitat information, weed, fire response, research, and other studies.

Welcome to the wildlife area

Vision

Recognizing the wildlife area is surrounded by dense population centers, we envision the South Puget Sound Wildlife Area as a showcase for conservation through preservation while providing environmental education and improved access on public lands and ecosystem friendly recreation, which is dependent on healthy estuaries, shorelines, prairies, wetlands, and forest habitats.

Introduction to the wildlife area

The South Puget Sound Wildlife Area is in Mason, Kitsap, Pierce, and Thurston counties and is comprised of eight units totaling 5,790 acres.

The South Puget Sound Wildlife Area's eight units are located to the east of the Olympic Mountains near the Olympic Peninsula, adjacent to the shorelines of the Puget Sound and near the confluences of the Nisqually, Skokomish, and Union rivers. Units include urban habitat, forests, wetlands, freshwater waterbodies, marine intertidal habitat, island, historic prairie, and riparian habitats. The primary management focus on these units is estuary and floodplain conservation, forest restoration, recovery of federal and state listed species, and recreation.

South Puget Sound Wildlife Area supports recreation activities such as fishing, hunting, wildlife viewing, hiking, walking, photography, boating, and swimming.

Success stories at the South Puget Sound Wildlife Area



Union River Estuary. Photo by Sarah Wolfe.

Union River restoration and recreation

The Union River Estuary restoration is a success story for both Hood Canal salmon and the local community. In 2013, full tidal exchange was returned to 32 acres of former salt marsh and tidelands at the mouth of the Union River, completing a joint habitat-restoration project by WDFW and Hood Canal Salmon Enhancement Group (see page 94). The estuarine habitat is recovering and with the help of community volunteers, WDFW has documented an increased number of threatened ESA listed Hood Canal Summer Chum in the Union River. For two months of each year, community volunteers monitor a trap on the Union River and collect data to help track the habitat's recovery. This ongoing volunteer effort cultivates a positive culture of environmental stewardship and community within Belfair and the surrounding areas.

In addition to volunteer opportunities, the Union River Estuary provides several miles of walking trails open to the public and receives hundreds of visitors year-round from across western Washington. Some groups include Boys and Girls Clubs, home school groups, public school groups, and social groups for mothers, walking, photography, birding, painting and more. The Union River Estuary also serves as a space for the Hood Canal Salmon Enhancement Group (HCSEG) to conduct environmental education programs. But ultimately, the Union River Estuary and its trails have helped the community foster a love for the outdoors, as well as serve as an encouraging example of how nature can recover and thrive.

The Union River Estuary trails are located next to the Salmon Center (HCSEG headquarters) and the Farm at Water's Edge, a small organic farm operated by HCSEG. Farm at Water's Edge also provides

a unique benefit to the community, with organic U-Pick produce and eggs available by donation only, a community garden, and a variety of farm animals for public education and 4-H programs.

South Puget Sound western pond turtle recovery



Western pond turtle hatchlings. Photo by Emily Butler.

The western pond turtle, one of only two turtle species native to Washington, historically ranged from the Puget Sound lowlands in Washington to Baja California. By the 1980s, the western pond turtle essentially disappeared from the Puget Sound lowlands and by 1990, fewer than 200 individuals remained in Washington. The western pond turtle was on a trajectory to disappear entirely from the state without immediate and significant conservation efforts.

The year 2021 marks the 30th year of the western pond turtle recovery project in Washington. In 1993, the western pond turtle was listed as state endangered jump-starting conservation efforts. The South Puget Sound Unit became home to the first western pond turtle recovery site in the Puget Sound lowlands welcoming the initial release of 16 turtles in 1996.

The initial turtle releases were part of the Woodland Park Zoo's captive breeding program. Once nesting was observed on site, the captive breeding program was replaced with the head-start program in which eggs were collected and then hatched and reared at the zoo. Turtle releases have occurred annually since 1996 and the population has expanded from 16 to more than 250 individuals.

Western pond turtle populations have a slow rate of growth, largely due to the high mortality of eggs and young. Predation is primary cause of mortality for hatchlings, and loss of eggs, while the failure of eggs to develop is often associated with unfavorable soil conditions. The loss or degradation of suitable

habitat is a key factor limiting the recovery of this species. The emergence of a new shell disease also impedes management actions to establish new populations. The South Puget Sound Unit population will be one of the primary sources of western pond turtles for establishing new populations when suitable sites are found. Maintaining and improving habitat conditions for western pond turtles on the South Puget Sound Unit is vital for the recovery of this species.



Nisqually Reach Nature Center environmental education. Photo by Daniel Hull.

Nisqually Reach Nature Center/National Wildlife Refuge partnerships



The Nisqually Reach Nature Center (NRNC), a local non-profit education center, is located at the Luhr Beach on the Nisqually Unit, which can be found on the western shore of the Nisqually Estuary adjacent to the Billy Frank Jr. Nisqually National Refuge. For over 35 years, the Nisqually Reach Nature Center has offered environmental education to thousands of youth and young adults. In a typical year, around 3,000 school-age kids visit the Nature Center with their teachers and parents. Research activities include citizen science monitoring of pigeon guillemots, forage fish, larval crabs, and water quality. Emphasis has expanded from public outreach to providing supplemental classroom, laboratory, and field trip opportunities for schools in Thurston and Pierce counties and beyond.

The Billy Frank Jr. Nisqually National Refuge was established in 1974 to protect the delta and its diversity of fish and wildlife habitats. The Refuge directly adjoins the WDFW Nisqually Unit where cooperative management benefits both the conservation of critical natural resources and the recovery of imperiled species and habitats. This area provides critical habitat for migratory birds, waterfowl, seabirds, shorebirds, songbirds, and raptors. In 2009, the Nisqually estuary was

restored by the removal of a dike and the reconnection of 762 acres with the tides of Puget Sound benefiting salmon. The Refuge is an important partner to WDFW, NRNC, and the Nisqually Tribe in conservation and education.

The Billy Frank Jr. Nisqually National Refuge and WDFW's Nisqually Unit serves as an important background landscape for programs at the Nisqually Reach Nature Center.

https://www.fws.gov/refuge/Billy_Frank_Jr_Nisqually/

WDFW stewards the adjacent public boat launch, a part of the Luhr's Landing Access Area on the Nisqually Unit, and maintains a 10-year cooperative land use agreement for use of the Nature Center facility. The center is operated by an executive director and a board of directors. The center is run by staff volunteers, they help maintain the facility and aquariums. Onsite care takers help monitor use and help educate the public at the public boat launch. The Nisqually Nature Center is funded through education grants and donations. Please see their website for more information: <http://nisquallyestuary.org/>

McNeil Island multiagency coordination and cleanup



Italian beehive frame and beekeepers. Photo by DOC.

The Department of Corrections (DOC) has maintained an active presence on McNeil Island since 2013. Under a stewardship agreement, the DOC in partnership with WDFW and WDNR, is working to restore habitat, providing transport, and maintaining essential infrastructure. Habitat restoration efforts on the island provide career and professional growth opportunities to the incarcerated population.

Over the past year, DOC staff and incarcerated worker crews have reclaimed nearly 60 acres previously overrun by scotch broom and blackberry. These efforts maintain critical firebreaks and provide sources of forage for wildlife.

In 2018, Incarcerated Beekeepers started hives for Carniolan and Italian honeybees with assistance by the Olympia Beekeepers Association and Evergreen College. The hives establishment has been a sweet success for all involved, as well as providing insect diversity to the island's ecosystem.

The DOC Diesel Shop successfully spearheaded multiple side projects in conjunction with DOC grounds crews to recycle scrap metals and remove vehicles and dated equipment for state surplus. Working with the Department of Ecology, 56 electrical powerline transformers and more than 1,730 tires scattered across the island were collected and recycled. DOC continues to work with stakeholders, including WDFW, Department of Archaeology and Historic Preservation, Department of Social and Health Services, Department of Enterprise Services, General Services Administration, and Department of Natural Resources to remove debris, dilapidated structures and waste across the island and its shores.

These and other efforts have succeeded in providing incarcerated workers with opportunities to rebuild and restore old equipment back to its functioning state, offering both a professional growth opportunity and a cost savings to the state. The equipment restored includes mowers, tractors and other assets that assist in the efforts to maintain McNeil Island.

These are just a few of the recent successes that can be highlighted on the McNeil Island Correctional Industries programs. The island continues to flourish in restoration efforts while operational needs are navigated.

Big Beef Creek instream restoration

An extensive floodplain reconnection and large woody debris placement project occurred in lower Big Beef Creek between 2015-2017, as part of the Intensively Monitored Watersheds (IMW) study, to monitor life-stage changes in coho salmon abundance, survival, and growth. The project was in partnership with the Hood Canal Salmon Enhancement Group and Hood Canal Coordinating

Committee. Habitat restoration included removal of roads in the floodplain and installation of over 30 large wood log jams to improve channel complexity. The site includes a fish weir on the HCSEG property which provides salmonid data, specifically marine survival data of wild coho. This is a rare and valuable dataset used for harvest management in Hood Canal and for salmon recovery science. The site is part of the IMW project which evaluates salmon population response to restoration actions. The acquisition occurred on land owned by the Washington Department of Natural Resources (DNR) and the University of Washington (UW). Forterra funded the initial acquisition from UW to hold the land in conservation until HCSEG was able to purchase.

The IMW study evaluates salmonid response to restoration treatments in four stream complexes in western Washington. Big Beef Creek harbors several populations of native fish including summer chum, fall chum, and coho salmon, steelhead, and cutthroat trout. Of these, summer chum and steelhead are currently listed as threatened under the Endangered Species Act (ESA). Though abundant historically, summer chum had been extirpated from Big Beef Creek and were re-introduced in 2005.

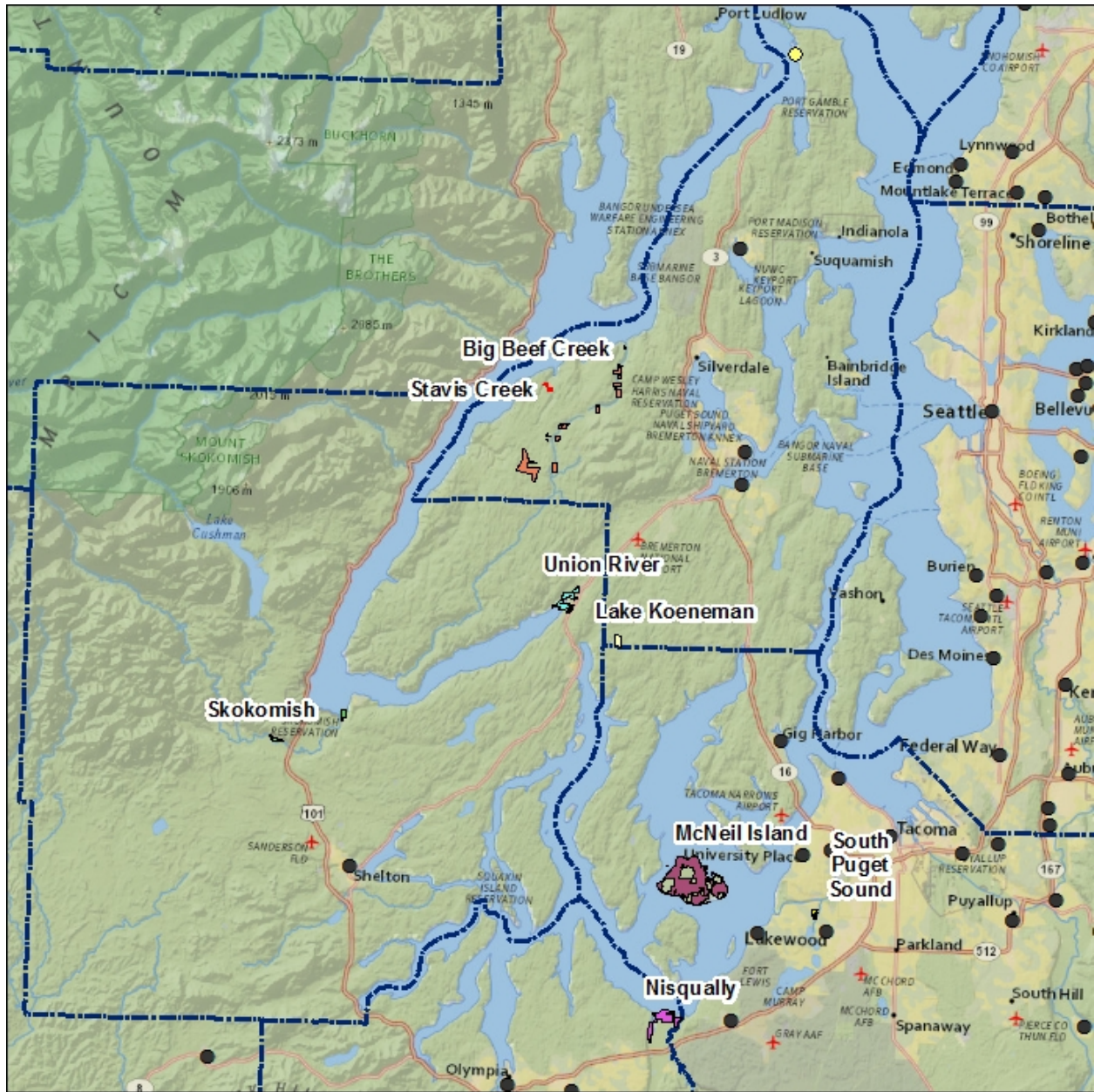
Wildlife Area Description

The South Puget Sound Wildlife Area includes eight units: Big Beef Creek, Lake Koeneman, McNeil Island, Nisqually, Skokomish, South Puget Sound, Stavis Creek, and Union River (Figure 1). This section includes an overview of the size and location of each unit as well as the types of resources, recreation/public use, land ownership, and land management that occur in each unit. The South Puget Sound Wildlife Area is in Mason, Kitsap, Pierce, and Thurston counties totaling 5,819 acres. The units range from 41 to 3,119 acres and vary in elevation from 0 - 645 feet.









South Puget Sound Wildlife Area Information

Acres	5,790
Acquisition Dates	1929 - 2014
Acquisition Funding	U.S. Fish and Wildlife Service – <i>Pittman Robertson, Dingell-Johnson National Coastal Wetlands Conservation, North American Wetlands Conservation Act, National Fish and Wildlife Foundation.</i> National Park Service – <i>Land and Water Conservation Fund.</i> Recreation and Conservation Office – <i>Washington Wildlife and Recreation Program; Aquatic Lands Enhancement Account, Boating Facilities Program, Bonds.</i> Washington Department of Fish and Wildlife – <i>Wildlife Fund, donation, and transfer</i>
Elevation Range	0 – 645 ft
Recreational Opportunities	Waterfowl hunting, fishing, wildlife viewing, hiking, walking, photography, boating, and swimming.

Figure 1. South Puget Sound Wildlife Area vicinity



**South Puget Sound
Wildlife Area**

- | | | | |
|---|----------------|---|-------------------|
|  | Big Beef Creek |  | Skokomish |
|  | Lake Koeneman |  | South Puget Sound |
|  | McNeil Island |  | Stavis Creek |
|  | Nisqually |  | Union River |



6/23/2021

Big Beef Creek/ Stavis Creek Units



Big Beef Creek Unit. Photo by Alan L. Bauer.

Acres	1,071
Acquisition Dates	1997 - 2011
Acquisition Funding	Recreation and Conservation Office – <i>Washington Wildlife and Recreation Program</i> ; Donation
Purpose	Wetland and riparian preservation/ conservation and salmon protection
Elevation Range	7 – 645 ft
Recreational Opportunities	Hunting, fishing, wildlife viewing, canoeing, kayaking, and mountain biking.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/big-beef-creek-wildlife-area-unit

The Big Beef Creek Unit consists of multiple parcels throughout the Big Beef Creek and Stavis Creek watersheds in Kitsap County, three miles west of Silverdale. The unit was acquired in the late 1990s as part of an effort to acquire additional sections on the Kitsap Peninsula for the Hood Canal Salmon Sanctuary Area, identified as critical habitat for coho and chum protection. In addition, three conservation easements (13 acres) purchased from RCO provide additional protection.

In the upper watershed of Big Beef Creek, WDFW owns land in the headwaters at Morgan's Marsh. This land is generally in a natural condition, with high functioning habitat, but there is a network of logging roads throughout the property. A culvert removal was conducted there circa 2018 that restored hydrogeomorphic process between a wetland and a tributary stream.

The Morgan Marsh tract is the largest parcel, encompassing 562 acres. Habitats include mixed conifer uplands, headwater open water, shrub, forested wetlands, beaver ponds, floodplain, riparian habitat, and second-growth evergreen forest. Species known to occur on the unit include coho, fall and summer chum, steelhead, cutthroat trout, rainbow trout, waterfowl, great blue heron, purple martin, bald eagle, osprey, pileated woodpecker, beaver, black-tail deer, cougar, coyote, bobcat, and black bear.

Between 2015 and 2017, the Hood Canal Salmon Enhancement Group (HCSEG) sponsored a phased large-scale restoration project on Big Beef Creek as part of the Intensively Monitored Watersheds (IMW) study (see success story and Fish Management section). The UW property was acquired by HCSEG in 2019. WDFW will ultimately acquire the property from HCSEG for long-term stewardship and when that occurs, additional restoration opportunities can be considered.

Access to Hintzville Ponds and Morgan Marsh sites are walk- or bike-in only, and are located off Lost Highway West. The Lost Highway is mostly a gravel road that winds through several private, residential parcels for about two miles where visitors arrive at a yellow gate and the boundary of the Unit. There is a small parking pull off located near this gate. Walk-in access to Hintzville Ponds from here is along an old road grade, then trail to the west. There is no designated access point for Morgan Marsh, however visitors may find unmanaged trails beyond the gate and to the east of the gravel road. Common recreational activities include hunting, fishing, canoeing/kayaking, hiking, and wildlife viewing.

Management priorities identified in this plan include:

- Restore natural function and processes of aquatic systems on the wildlife area that benefit focal species, including maintaining and encouraging beaver presence where appropriate (1D).
- Develop a plan to address access and enhanced parking for Big Beef Creek Unit, Morgan Marsh by 2024 (7L).
- Include Big Beef Creek Unit in annual mid-winter waterfowl surveys (4B).
- Conduct a wetland inventory on the wildlife area by 2025 and prioritize waterfowl management. (4C).
- Reduce illegal and unauthorized activities within two years and continue to reduce violations over the term of the plan (11A).
- Assess target shooting needs and opportunities, and implement site plan in accordance with new statewide target shooting standards by 2025 (7I).

Stavis Creek Unit



Stavis Creek Unit. Photo by Alan L. Bauer.

Acres	41
Acquisition Dates	2000
Acquisition Funding	Recreation and Conservation Office – <i>Washington Wildlife and Recreation Program</i>
Purpose	Endangered species habitat Conservation
Elevation Range	26 - 323 ft
Recreational Opportunities	Hunting, fishing, hiking, and wildlife viewing.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/big-beef-creek-wildlife-area-unit

The Stavis Creek Unit is located west of Seabeck off Stavis Bay Road NW in Kitsap County and consists of two parcels in the Stavis Creek watershed. The property is located near the WDNR Stavis Creek Natural Area (<https://www.dnr.wa.gov/stavis-natural-resources-conservation-area>).

The Stavis Creek parcels are part of an interconnected network of public land in the watershed, which provides high quality intact habitat in rural west Kitsap. Habitats include mixed conifer uplands, headwater open water, shrub, forested wetlands, beaver ponds, floodplain, riparian habitat, and second-growth evergreen forest. Stavis Creek is the control stream for the IMW study, making it integral to the success of that study.

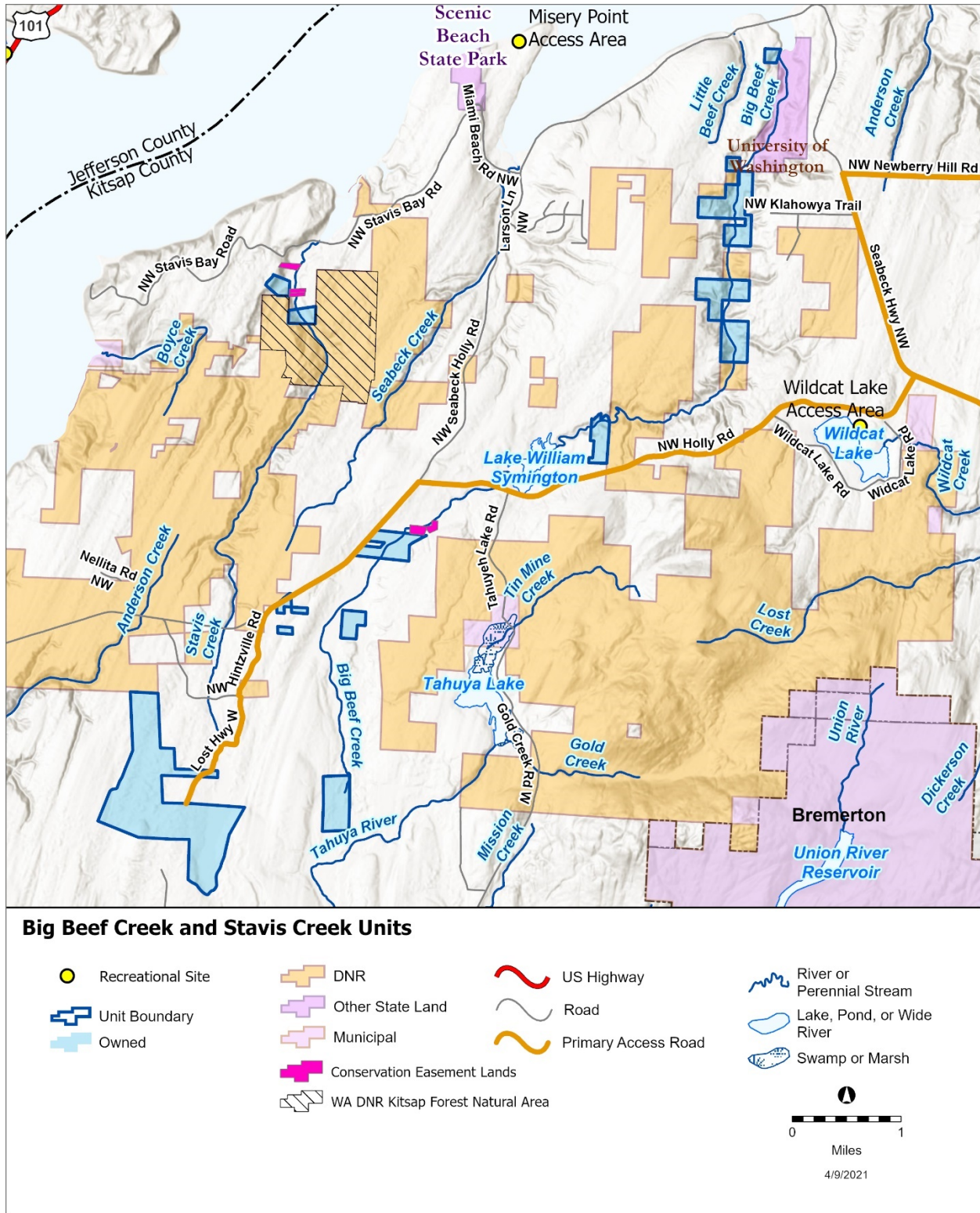
Species known to exist on the unit include coho, fall and summer chum, steelhead, cutthroat trout, rainbow trout, waterfowl, great blue heron, purple martin, bald eagle, osprey, pileated woodpecker, beaver, black-tail deer, cougar, coyote, bobcat, and black bear.

There is limited walk in access to the Stavis Creek Unit and common recreational activities include hunting, fishing, hiking, and wildlife viewing. There is no official wildlife area entry point.



Bear peering through the grass. Photo by WDFW staff.

Figure 2. Big Beef / Stavis Creek units.



Lake Koeneman Unit



Lake reflections – Lake Koeneman Unit. Photo by Alan L. Bauer.

Acres	150
Acquisition Dates	1952
Acquisition Funding	U. S. Fish and Wildlife Service – <i>Dingell-Johnson</i> Washington Department of Fish and Wildlife – <i>Wildlife Fund</i>
Purpose	Water access, fishing, and hunting
Elevation Range	196 - 312ft
Recreational Opportunities	Hunting, fishing, wildlife viewing, and hiking
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/lake-koeneman-wildlife-area-unit

Although previously listed as a WDFW water access site, the Lake Koeneman Unit now joins the wildlife area and is located on the Kitsap Peninsula in Kitsap County, about six miles southeast of Belfair, and west of Carney Lake. This property was formerly managed as a water access area prior to 2020 and is currently managed as a separate unit. This change was made to improve general management and increase conservation actions this unique property.

Lake Koeneman is one of the few protected and relatively undisturbed natural lakes in the vicinity and is part of the headwaters of the Rocky Creek watershed, which is relatively intact and has

received conservation investments by Great Peninsula Conservancy and the Salmon Recovery Funding Board, among other entities. The unit includes riparian habitat, scrub wetlands, open water, small meadows, and mature second-growth evergreen forest. Lake Koeneman is considered a lowland lake about 19 acres in size. The lake and associated wetlands provide valuable water quality, hydrology, and habitat functions for the Rocky Creek watershed.

The property provides habitat for western toad, great blue heron, osprey, black-tail deer, bear, cougar, coyote, bobcat, waterfowl, bald eagles, beaver, coho, steelhead, and cutthroat.

Access is provided through an agreement with Alpine Evergreen Timber Company and is limited to walk-in only on a 1.4-mile primitive trail with parking available at the Carney Lake public access point on Wright-Bliss Road. The lake is stocked annually with rainbow trout.

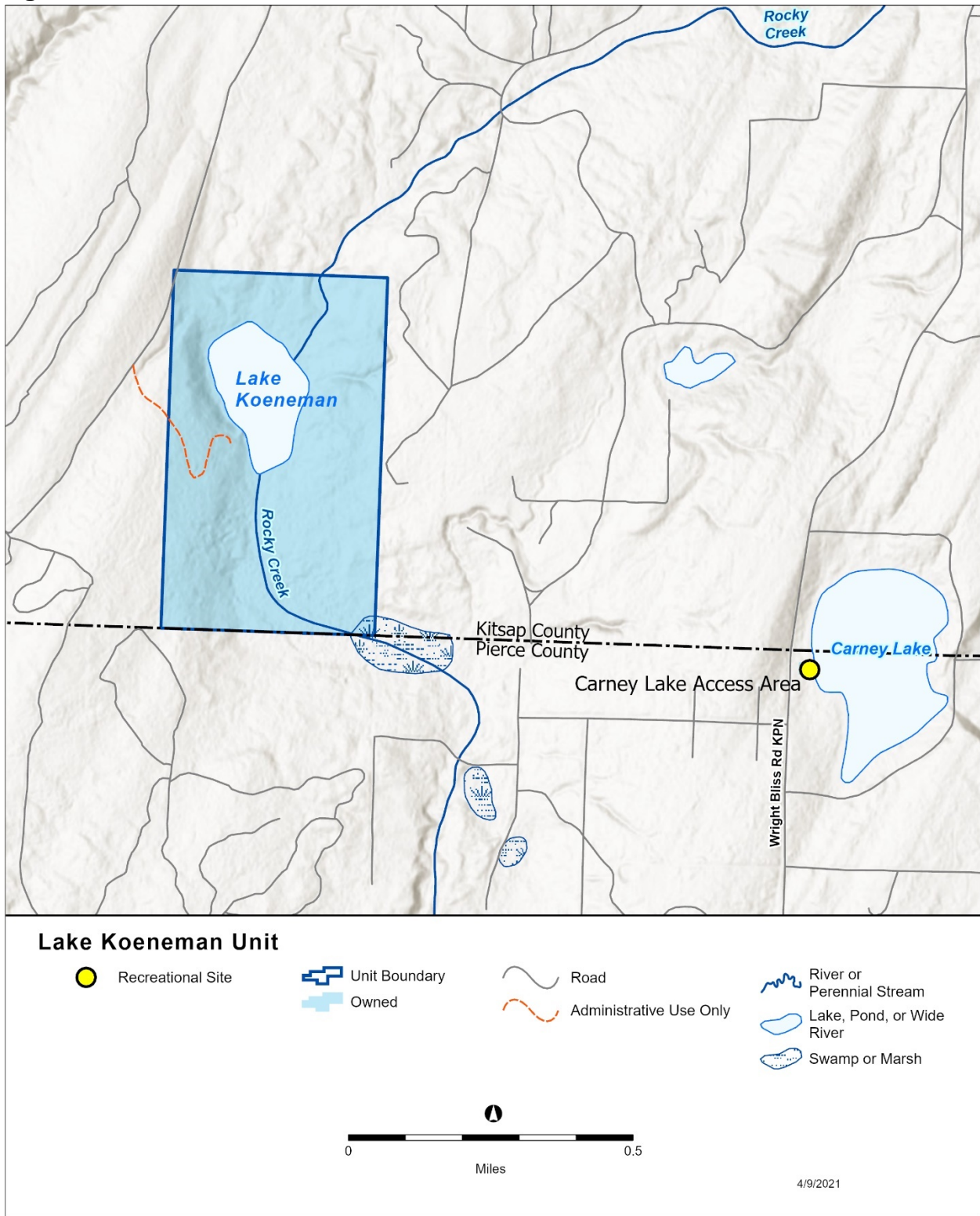
Management priorities include:

- Develop a plan to manage access and establish recreation priorities on Lake Koeneman by 2022 (7H).
- Include Lake Koeneman Unit in annual mid-winter waterfowl surveys (4B).
- Conduct a wetland inventory on the wildlife area by 2025 and prioritize waterfowl management. (4C).
- Conduct species surveys at Lake Koeneman (e.g., amphibian, waterfowl, fish, mammals, butterflies, etc.) by 2022 (3H).



Lush forest hike – Lake Koeneman Unit. Photo by Alan L. Bauer.

Figure 3. Lake Koeneman Unit



McNeil Island Unit



Harbor seals on Gertrude Island, Still Harbor, McNeil Island. Photo by Dyanna Lambourn, WDFW.

Acres	3,119
Acquisition Dates	1984
Acquisition Funding	Transfer
Purpose	Habitat Conservation, preservation of natural shoreline, and marine mammal protection
Elevation Range	0 – 335 ft
Recreational Opportunities	Recreation access restricted
Access	--

The McNeil Island Unit is located in South Puget Sound approximately seven miles southwest of Tacoma in Pierce County. WDFW currently manages the McNeil Island Unit for wildlife and habitat conservation for the betterment of endangered species. In 1984, the federal government conveyed a deed for over 3,100 acres (approximately 70% of McNeil Island) to WDFW for wildlife conservation use. The other 30% of the Island is deeded for correctional facility use under the operation of the Department of Corrections (DOC), currently there are no incarcerated individuals

residing on McNeil Island. From 1875 until 2011 the island was the site of a former federal penitentiary and was later operated by the Department of Corrections (DOC). The entire island has been federally owned since 1940 and was transferred to state ownership in 1984. The island is currently managed by DOC and WDFW. McNeil Island is closed to the public under the deed restrictions and in agreement with DOC.

McNeil Island has approximately 14 miles of coastline and 2,300 acres of forestland that provides habitat for a broad range of fish and wildlife species. Many species of fish, seabirds, and marine mammals benefit from the intact shoreline. The upland areas of McNeil Island include forested and wetland habitats. Waterfowl and marine birds commonly seen around McNeil Island include loons, cormorants, gulls, grebes, scoters, harlequin ducks, goldeneyes, bufflehead, long-tailed ducks, great-blue heron, mergansers, mallard, American widgeon, Canada geese, and black brant. Bald eagle, band-tailed pigeon, and purple martins are also present. Although California and Stellar sea lions are occasionally seen in the area, harbor seals are the most frequent and abundant marine mammal here. At present, because of its closed harbor status, Still Harbor is the only harbor seal rookery in south Puget Sound where the population is free from human disturbance and boat traffic.

WDFW collaborates with NOAA, DNR, DOC, DSHS, and other resource agencies to identify locations for large whale carcasses to naturally decompose, and McNeil Island has been successfully utilized numerous times in the past. There are two sites that have been primarily used for this purpose, Baldwin and Hyde Points. There are very few remote locations in the Salish sea where large whale carcasses can be allowed to decompose naturally without major concerns from the public about odors and health issues. Marine mammal carcasses have historically been an important component of marine and coastal ecosystems. Placing a whale carcass on land also allows for the bones to be collected for educational displays.

Historic use of the island for a federal penitentiary resulted in locations being highly impacted by relict structures and debris. WDFW collaborates with WDNR and WDOC on habitat restoration on much of the island. Two marine shoreline habitat restoration projects were completed along Still Harbor (2018) and the vehicle barge landing (2019). Additional marine shoreline habitat restoration efforts are in planning and design stages at Milewa Creek estuary, Bodley Creek, and Floyds Cove.

A portion of the unit is within the Nisqually Reach Aquatic Reserve, extending from the Nisqually River Delta across Nisqually Reach and around Anderson Island and Ketron Island to the shores of McNeil Island (Figure 5).

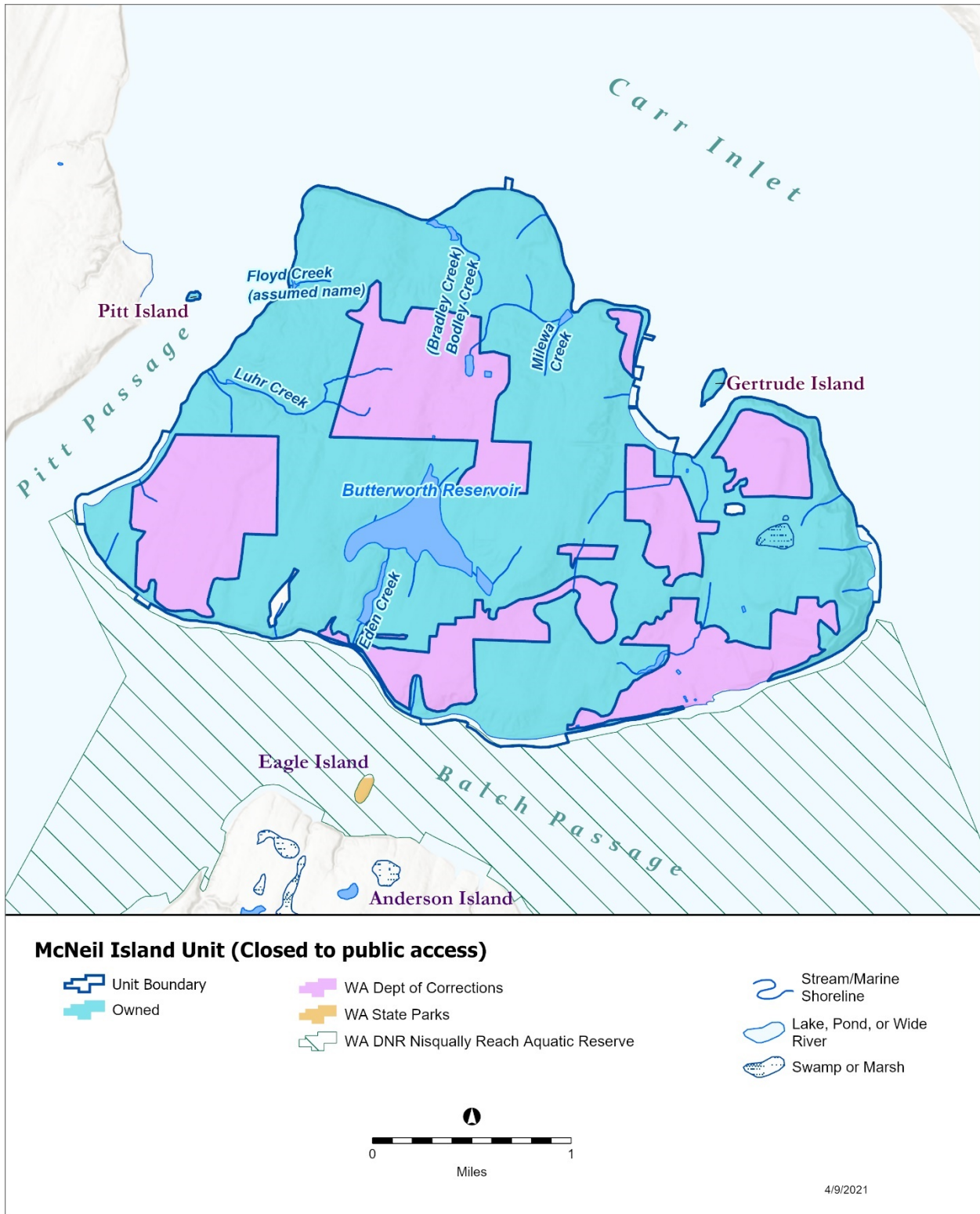
Management priorities include:

- Identify and implement forest health treatments for the wildlife area over the next 10 years (2A).
- Conduct species surveys at Lake Koeneman (e.g., amphibian, waterfowl, fish, mammals, butterflies, etc.) by 2022 (3H).
- Include McNeil Island Unit in annual mid-winter waterfowl surveys (4B).
- Develop a strategy to reintroduce streaked horn lark on McNeil Island by 2026 (3I).
- Complete habitat restoration projects along the marine shoreline at McNeil Island by 2031 (6B).
- Determine and evaluate the need, feasibility and potential conflicts with land use and formalize working relationships with DOC, and other agencies regarding McNeil Island by 2025 (9A).
- In collaboration with DNR and DOC, develop a strategy for addressing whale disposal at McNeil Island (9E).
- Develop a plan to assess the removal of the Buttersworth dam and associated reservoir – and Ellen Creek Dam by 2023 (11G).



Common murre – McNeil Island Unit. Photo by Dyanna Lambourn.

Figure 4. McNeil Island Unit



Nisqually Unit



Nisqually Unit - McAllister Creek (left) taken from the boardwalk on the Refuge. Photo by Alan L. Bauer.

Acres	654
Acquisition Dates	1966 -1970
Acquisition Funding	National Park Service – <i>Land and Water Conservation Fund</i> ; Recreation and Conservation Office – <i>Aquatic Lands Enhancement Account, Boating Facilities Program, Bonds</i>
Purpose	Habitat Conservation, multipurpose outdoor recreation area including public hunting and fishing, sightseeing, photography, nature study (public education), and boating
Elevation Range	0 - 257 ft
Recreational Opportunities	Waterfowl hunting, fishing, wildlife viewing, walking, photography, boating, nature study.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/nisqually-wildlife-area-unit

The Nisqually unit is located nine miles northeast of Olympia in Thurston County near the confluence of the Nisqually River within the Puget Sound and adjacent to the Billy Frank Jr. Nisqually National Wildlife Refuge. In 1965, the Port of Tacoma proposed to convert 1,100 acres of the Delta into a deepwater port. In 1967, the Port of Olympia proposed to construct an aluminum mill on the Delta. Finally, in 1974, the Delta was recognized for its unique estuarian, aquatic, and wildlife resources. Due in large part to citizen action, 1,285 acres of the Delta adjacent to the

Nisqually Unit were purchased by USFWS and became the Billy Frank Jr. Nisqually National Wildlife Refuge.

Habitat types include estuarian marine wetlands and marine deepwater habitats in the Nisqually River delta (Delta), saltmarsh, open mud flats, freshwater marsh, shoreline, open grassland, riparian woodland and upland forest.

The Nisqually estuary provides important transitional and rearing zones for Federally threatened Chinook, steelhead and bull trout, chum, coho, coastal resident sea-run cutthroat, sockeye, Pacific sand lance, surf smelt, shorebirds, raptors, waterfowl and various species of marine mammals.

In 2009 a dramatic estuary restoration project occurred on the wildlife refuge when the Brown Farm dike was removed, and 762 acres have been returned to tidal influence reconnecting the historic slough system in the delta to Puget Sound ([https://www.fws.gov/refuge/Billy Frank Jr Nisqually/about/habitat restoration.html](https://www.fws.gov/refuge/Billy_Frank_Jr_Nisqually/about/habitat_restoration.html)). The reconnecting of tidal marsh and floodplains increased saltmarsh in the southern reach of Puget Sound by 55 percent.

Nisqually estuary is a birding showcase for large concentrations of shorebirds, wintering waterfowl, and raptors. Additionally, the unit offers opportunities for waterfowl hunting and fishing, sightseeing, walking/hiking, photography, nature study, and boating. Luhr's Landing Access Area provides water access to recreational, tribal, and commercial boaters.

The Luhr's Landing Access Area and Nisqually Reach Nature Center are both located within this unit. An RCO Boating Facilities Program grant is funding renovation of the Luhr's Landing Access Site, enhancing the boat launch, restroom, and parking area and is expected to be completed by 2021. The facility used by the Nisqually Reach Nature Center (NRNC) is owned by WDFW and leased out to the non-profit education organization.

A portion of the unit is within the NRNC Nisqually Reach Aquatic Reserve, extending from the Nisqually River Delta across Nisqually Reach and around Anderson Island and Ketron Island to the shores of McNeil Island (Figure 5). Designated in 2011, the Nisqually Reach Aquatic Reserve is part of a network of protected ecosystems in the Nisqually Reach area, which includes the Billy Frank Nisqually National Wildlife Refuge. <https://www.dnr.wa.gov/managed-lands/aquatic-reserves/nisqually-reach-aquatic-reserve>

Management priorities include:

- Continue to support the Nisqually Reach Nature Center (9C).
- Monitor eelgrass on the wildlife area (6E).
- Conduct internal scoping on upgrades/re-development and implementation of Luhr's Landing,
- Develop feasibility and design analysis to redesign or replace Nisqually Nature Reach Center by 2027 (11D).
- Monitor project success of the re-development at Luhr's Landing by 2023 (11C).

Figure 5. Nisqually Reach Aquatic Reserve

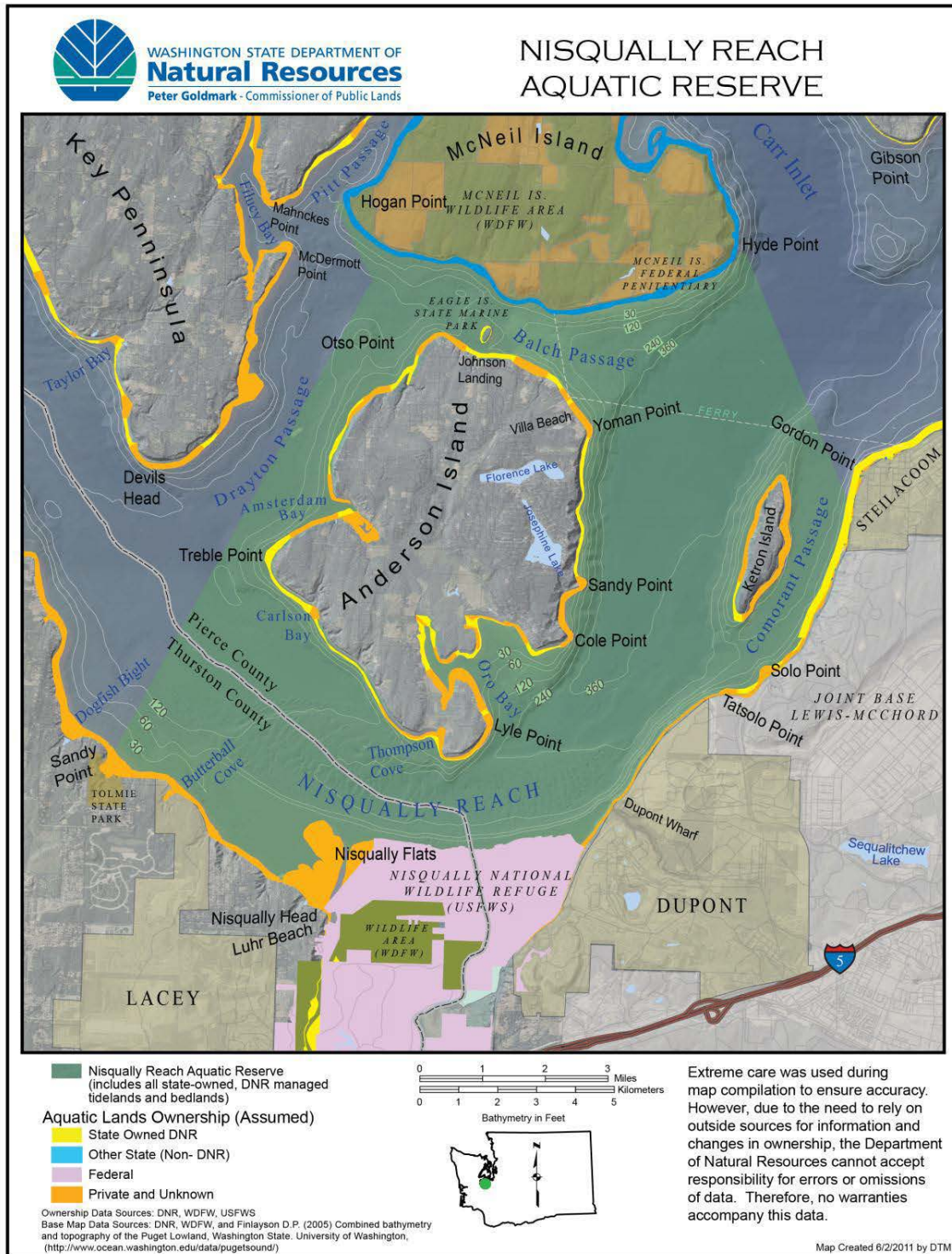
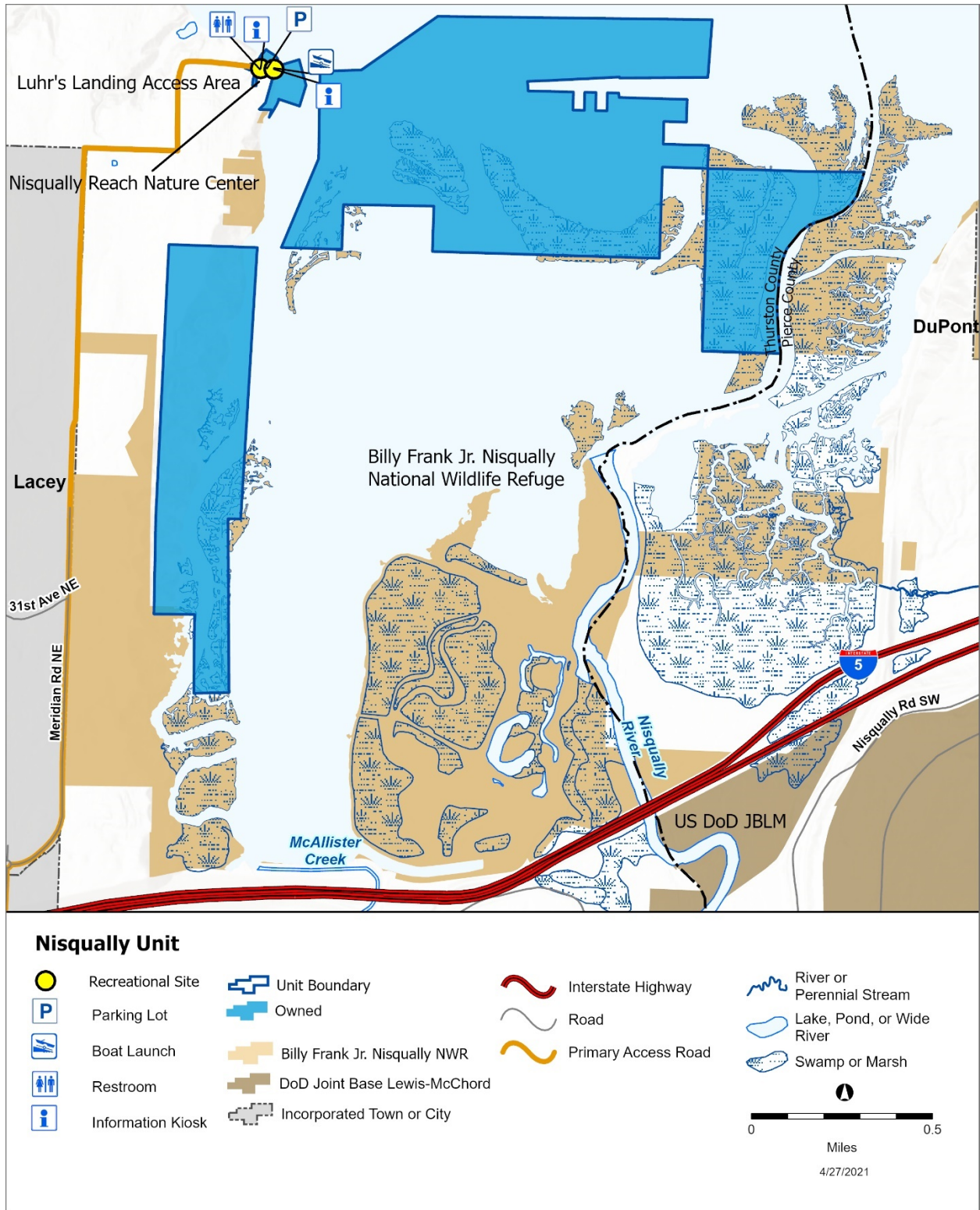


Figure 6. Nisqually Unit



Skokomish Unit



Skokomish River Delta. Photo by Alan L. Bauer.

Acres	225
Acquisition Dates	1968 - 1991
Acquisition Funding	National Park Service – <i>Land and Water Conservation Fund</i> ; Recreation and Conservation Office – <i>Bonds</i> ; WDFW – <i>Wildlife Funds, transfer</i>
Purpose	Boat-in waterfowl hunting and fishing access, public shooting
Elevation Range	0 - 4 ft
Recreational Opportunities	Waterfowl hunting, fishing, wildlife viewing, photography, boating, hiking, walking, and swimming.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/skokomish-wildlife-area-unit

The Skokomish Unit consists of two non-contiguous properties. One is located 1.5 miles south of Union on Highway 106 in Mason County. Access to this portion of the unit is by water only. This area includes 95 acres of estuarian and marine wetlands flanked by estuarian marine deep water habitats of the river’s main channel and a side tributary of the estuary. The second area, located west of Highway 101 off North Sunnyside Road, is a 65-acre tract access site commonly referred to as the Smith Access Area.

Habitat features include marine estuary, floodplain, and riparian. The unit supports marine mammals, waterfowl, migratory birds, shorebirds, salmonids, and other aquatic species benefit for the conservation of this intertidal habitat.

WDFW is collaborating with the Mason Conservation District, Floodplains by Design, and U.S. Forest Service Cooperative on floodplain restoration projects. The unit offers opportunities for boating, waterfowl hunting, hiking, wildlife viewing and swimming. Road access is limited and primitive. The Smith Access Area offers a non-paved small parking area and provides river access for hand launching of small boats.

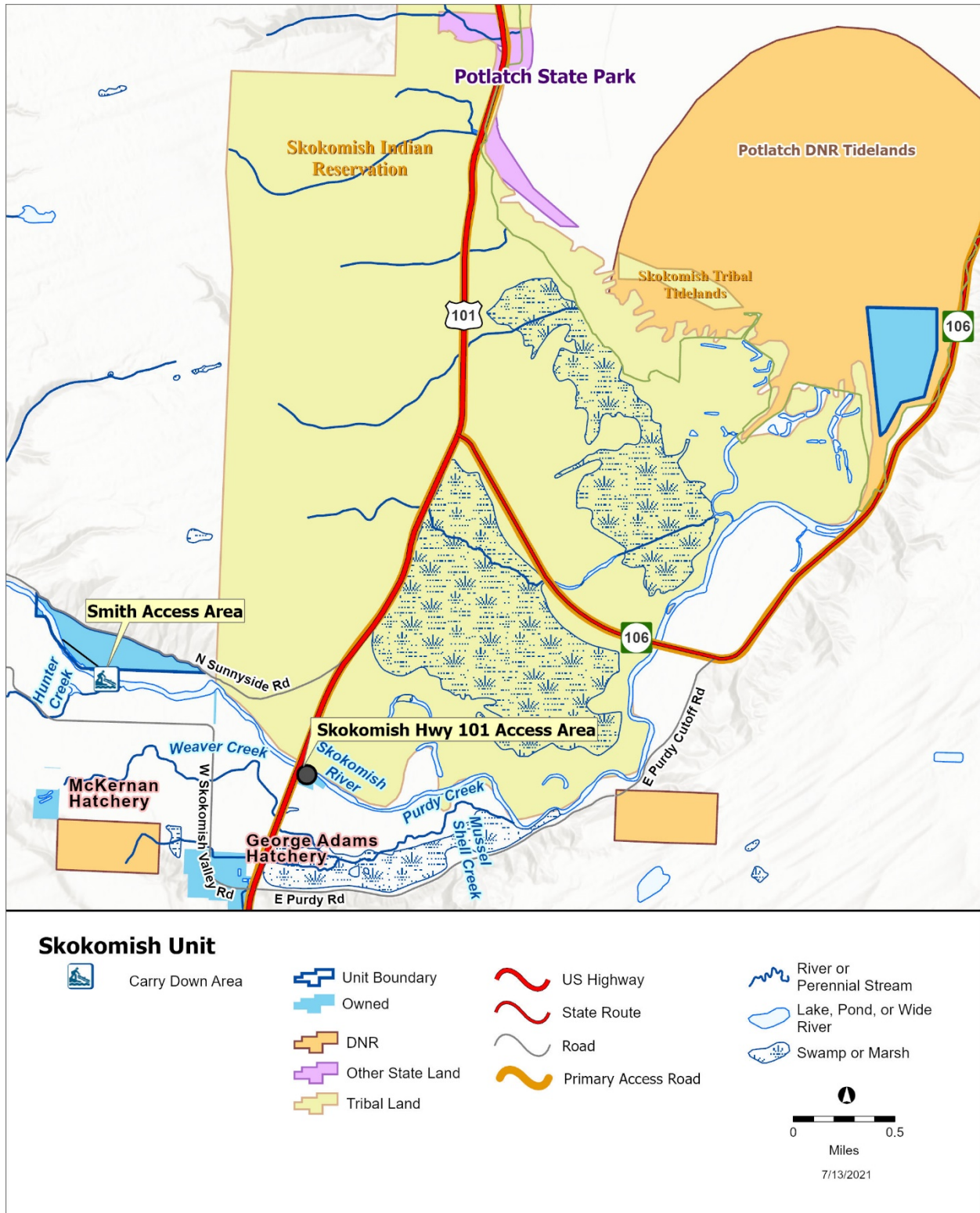
Management priorities include:

- Collaborate with the Mason Conservation District on restoration activities at RM 6.5 on the Skokomish River by 2024 (6A).
- Develop a plan to manage public use on the Smith Access by 2022 (7F).
- Evaluate recreational opportunities on the wildlife area by 2022; and establish unit rules to designate access by 2023 (7B).
- Complete four projects to improve recreational access on the WLA within the life of the plan (7G).



Long-billed dowitcher. Photo by Alan L. Bauer.

Figure 7. Skokomish Unit



South Puget Sound Unit



Meadow area – South Puget Sound Unit. Photo by Alan Billingsley.

Acres	72
Acquisition Dates	1929 - 1976
Acquisition	Washington Department of Fish and Wildlife – <i>Wildlife Funds, transfer</i>
Funding Purpose	Hatcheries and game farm
Elevation Range	153 - 254 ft
Recreational Opportunities	Wildlife viewing, running, walking, and dog walking.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/south-puget-sound-wildlife-area-unit

The South Puget Sound Unit is within the city limits of Lakewood in Pierce County and includes the Lakewood Hatchery. The unit was purchased and then used as a game farm where pheasants were raised for the WDFW pheasant release program until the 1980s. Additionally, a fish hatchery was installed on the unit which provides trout and salmonids to support fisheries. Another purpose of this unit is to provide a local urban wildlife interpretative center.

The unit includes one of the last remnants of the South Puget Sound prairie ecosystem in the region that once stretched across thousands of acres. Although now surrounded by urban development the

property continues to support a variety of species adapted to open grasslands. This wildlife area unit also supports several imperiled, state listed threatened, or endangered species such as the western pond turtle, Oregon spotted frog, and Oregon white oak.

There is a half mile paved trail on the west side of the unit. Recreation includes walking, wildlife viewing, and on-leash dog walking. The entire South Puget Sound Unit is a designated safety zone. It is unlawful to hunt at this unit. The hatchery maintains limited visitor hours, but the remainder of the facilities and associated administrative areas are closed to the public.

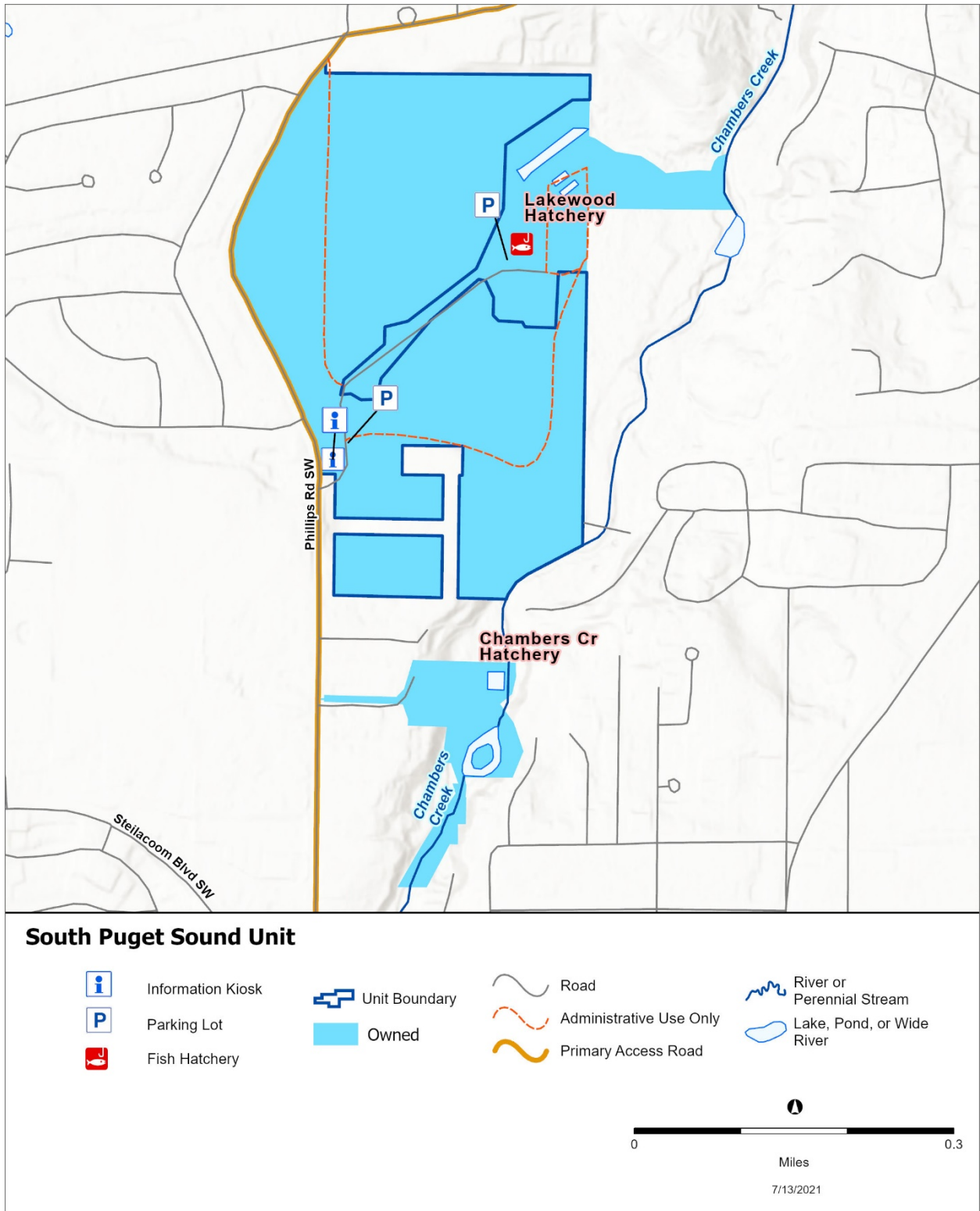
Management priorities include:

- Evaluate oak prairie habitat and develop a strategy for oak recruitment by 2024 (1C).
- Monitor Oregon spotted frog and western pond turtle populations (3B/3C).
- Improve nesting habitat for western pond turtles (3D).
- Limit public access to western pond turtle area (3F).
- Develop a plan to create an urban wildlife center using other successful models and case studies by 2023 (9B).
- Maintain strong working relationships with current volunteer groups (9D).
- Reduce illegal and unauthorized activities within 2 years and continue to reduce violations over the term of the plan (11A).
- Develop a strategy to resolve water supply issues on the South Puget Sound Wildlife Area by 2028 (11H).
- Develop a strategy to address conflict between pets and wildlife by 2023 (7M).



Dog walkers at South Puget Sound Unit. Photo by Alan L. Bauer.

Figure 8. South Puget Sound Unit



Union River Unit



Union River Unit pedestrian bridge. Photo by Alan L. Bauer.

Acres	458
Acquisition Dates	1962 - 2014
Acquisition Funding	U.S. Fish and Wildlife Service – National Coastal Wetlands Conservation, North American Wetlands Conservation Act; National Fish and Wildlife Foundation; Recreation Conservation Office – <i>Washington Wildlife and Recreation Program, Aquatic Lands Enhancement Account</i> Washington Department of Fish and Wildlife – <i>Wildlife Funds, transfer</i>
Purpose	Habitat for waterfowl and endangered species, estuary protection, saltwater, and freshwater fishing
Elevation Range	0 - 52 ft
Recreational Opportunities	Wildlife viewing, hiking, running, walking, boating, and photography.
Access	https://wdfw.wa.gov/places-to-go/wildlife-areas/union-river-wildlife-area-unit

The Union River Unit is near the Town of Belfair in Mason County at the inland terminus of Hood Canal. The unit is part of the larger complex of conservation and recreation lands that encompass Lynch Cove, the mouth of the Union River, and surrounding forested shorelines. The unit is designated for the purpose of perpetuating the coastal wetland ecosystem that benefits waterfowl and endangered species. Adjacent conservation lands owned by the Hood Canal Salmon

Enhancement Group (HCSEG) and North Mason School District (Theler Community Center) offer additional access points and similar recreation opportunities.

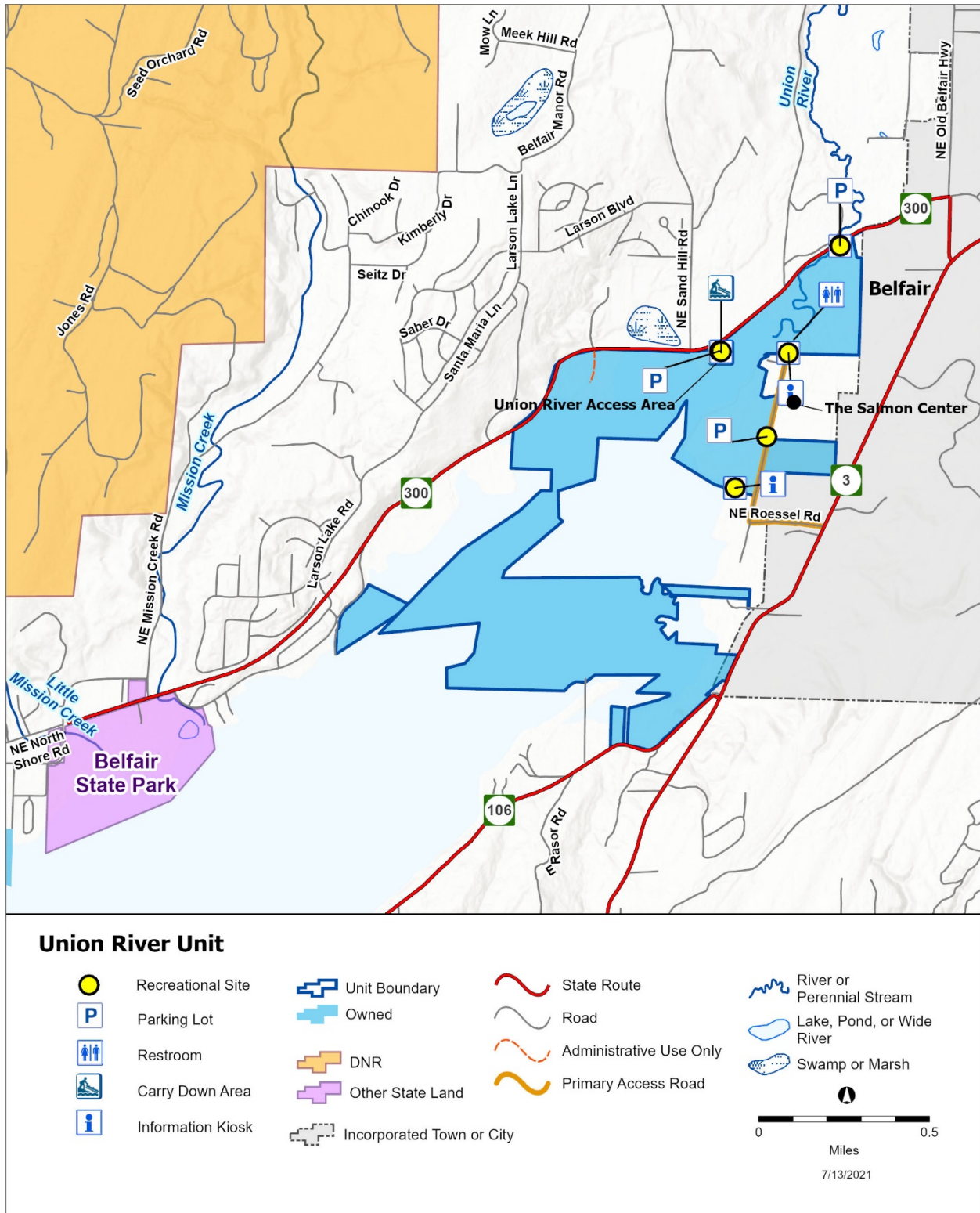
The unit is comprised mostly of estuarian and marine wetlands and, to a lesser extent, freshwater emergent and freshwater forested scrub/shrub wetlands, lowland mixed forest, and riparian areas. Species known to occur here include coho, fall chum and Hood Canal summer chum, steelhead, cutthroat trout, rainbow trout, sturgeon, waterfowl, shorebirds, great blue heron, bald eagle, osprey, beaver, and black-tail deer. In 2013 WDFW partnered with the Hood Canal Salmon Enhancement Group to restore 31 acres estuary habitat.

The Union River Unit offers great opportunity to view wildlife and enjoy nature from the extensive well-maintained trails, 1.5 mile on WDFW lands and 2 miles on adjoining conservation land that surround the Union River estuary. Recreation includes hunting, fishing, canoeing, kayaking, hiking, walking, running, wildlife viewing, photography, and education. Access features include four waterfowl hunting blinds (accessed by boat). A Special Area Restriction limits hunting to designated blinds and shooting must be directed toward Lynch Cove. A majority of the unit can be accessed via Rossel road, SR300, and SR3. There is a primitive walk-in access from SR 106 near the intersection of SR 3.

Management priorities include:

- Improve seven acres of Union River Estuary interconnectivity by 2025 (6D).
- Monitor eelgrass on the wildlife area (6E).
- Increase waterfowl hunting opportunities on the Union River Unit by improving /adding additional blinds and evaluating access off HWY 106 by 2025.
- Increase public awareness of wildlife viewing opportunities by 2025 (7C).
- Participate in Belfair Chamber of Commerce's proposed Lower Hood River Canal Discovery Trail on Union River (7D).
- Maintain strong working relationships with current volunteer groups (9D).
- Develop a strategy to address conflict between pets and wildlife by 2023 (7M).
- Develop a plan to address access and enhance parking for Union River by 2024 (7L).

Figure 9. Union River Unit



Wildlife Area Management and Planning

Land Ownership and Management

Acquisition history, funding, and purpose

WDFW used funding from the following state and federal agencies to acquire properties in the wildlife area: Recreation and Conservation Office (RCO) – Washington Wildlife and Recreation Program (WWRP), Aquatic Lands Enhancement Account; U.S. Fish and Wildlife Service (USFWS) – Dingell-Johnson, North American Wetland Conservation Act, Section 6; National Park Service (NPS) – Land and Water Conservation Fund; and Washington Department of Fish and Wildlife - State Wildlife Fund. Lands are also acquired through government transfers and donations.

Consistent with the agency mission, the department looks for opportunities to acquire lands where it is consistent with the agency's land acquisition policy. WDFW only purchases lands from willing landowners. As opportunities arise, WDFW is adding more lands to the wildlife area, for example the North Mason School District's Theler wetlands in 2021.

Leases

There are two active leases on the South Puget Sound Wildlife Area. WDFW owns and manages the facility on the Nisqually Unit that is currently leased, through a cooperative agreement, to the Nisqually Reach Nature Center which is a non-profit organization for the purpose of public education, environmental interpretation, and citizen science related to fish, wildlife, and habitat in the Nisqually Reach of Puget Sound. WDFW also has a 15-year lease with Gotcha Covered Media for a billboard lease on the Union River Unit State Route 3 in Belfair.

Easements

The South Puget Sound Wildlife Area includes a total of five conservation easements. Big Beef Creek and Stavis Creek easements were developed in the late 1990s as part of an effort to acquire contiguous lands on the Kitsap Peninsula identified as critical habitat for coho and chum protection. They consist of two conservation easements totaling 13 acres on the Big Beef Unit, and three conservation easements totaling 12.5 acres on Stavis Creek. All CEs were purchased with RCO Washington Wildlife Recreation Program (WWRP) – Critical Habitat funding. The Nisqually Unit has one public recreation road access easement near McAllister Springs (3.6 miles) that is currently non-accessible due to a dispute with the local landowners.

Agreements

A land use maintenance agreement is in place for the purpose of maintain public recreation resources, supporting wildlife viewing, ensuring habitat protections are in place, and providing environmental education to visitors. The agreement with the Hood Canal Salmon Enhancement Group (HCSEG), a non-profit organization, that routinely conducts maintenance on the existing trails and bridge surfaces, as well as maintains the interpretive signs and the vault toilet on the Union River Unit.

In 1984, USFWS transferred management of the federally owned McNeil Island to WDFW (70% of parcels) and DOC (30%). DNR owned tidelands, that were not included with the transferred parcels. The deed from USFWS to WDFW and DOC specifies that the island be dedicated to fish and wildlife protection. A condition of the deed to both WDFW and DOC states “Management of the sanctuary will be oriented to the maintenance of the passive and natural wildlife which now exists. Existing farmlands may be cultivated. It is considered that such agricultural use would provide additional seed and food sources for the benefit of the wildlife. However, no new development whatsoever will take place, i.e. no new roads, no new buildings or any other improvements shall be built in the restricted area.” Per the deed, the transfer included provisions indicating that “McNeil, Gertrude and Pitt Islands be managed as a sanctuary for the unmolested feeding and breeding of wildlife and will be unavailable to the public”.

Water Resources

Water resources in the South Puget Sound Wildlife Area include two surface water rights, one groundwater right, three groundwater claims, and 19 permit exempt wells. The main purpose of the surface water rights on the South Puget Sound Unit includes fish propagation at the Lakewood Hatchery, and spring water used in maintaining the ponds. Water from exempt wells is used for domestic use in staff residences and at educational facilities.

Management Setting

Administration and staffing

The South Puget Sound Wildlife Area is located within WDFW’s Region 6, headquartered in Montesano, Washington. Supervision at the regional level is provided by the Regional Wildlife Program Manager. The wildlife area has one full-time permanent wildlife area manager, and one 4-month career seasonal Natural Resource Technician who both cover two additional wildlife areas as well. The Olympic Wildlife Area complex, Region 4 water access program, Region 6 District Wildlife biologists, and Habitat program restoration section provide additional staff and equipment support as needed.

Facilities and maintenance

Wildlife area staff members restore and maintain habitat (including weed control), manage public use and recreation, maintain equipment, and repair and improve facilities and other wildlife area infrastructure (Table 1) to support fish and wildlife management consistent with agency objectives.

A new wildlife area headquarters office and shop was constructed completed in 2021 on the Scatter Creek Unit Unit within the Scatter Creek Wildlife Area which serves as the headquarters for the South Puget Sound Wildlife Area. Most of the administration and maintenance resources for the wildlife area are located at the headquarters office.



South Puget Sound Unit – renovated parking area completed by Clover Park Rotary. Photo by Alan Billingsley.

Most of the South Puget Sound Wildlife Area units have minimal amounts of fencing except for the South Puget Sound Unit which is fence on its perimeter with a fair amount of cross fencing around sensitive areas or around key infrastructure. Fencing and gates on all units, need to be assessed for repairs, removal, and/or replacement.

Table 1. Management facilities and recreational structures associated with each wildlife area unit

Unit	Management facilities	Recreational structures
Big Beef/Stavis	Gates, fencing and roadblocks.	Primitive trails and roads.
Lake Koeneman	Old water control structures.	Primitive trails and roads.
McNeil Island	Inventory warranted. Water treatment/storage structures, pump houses, two earthen dams. Over 20 abandoned buildings – multistory residences and outbuildings, pier, bulkheads, boat ramps.	N/A
Nisqually	Leased building with residence, offices and classrooms, septic system, public water supply, wellhouse, retaining walls, and a 225 ft bulkhead.	Luhr’s Landing Access Area – boat ramp, paved launch parking area, partial pier, vault toilet.
Skokomish	N/A	Concrete vault bathroom, primitive road/ trail to river, and gravel parking area.
South Puget Sound	WDFW Lakewood Hatchery and field offices, storage buildings, marine mammal investigation and necropsy lab, water control structures and fencing. Entire perimeter of property has fencing that needs to be replaced	1 restroom (closed), the interpretative center has two sitting areas. Paved roads to the hatchery and other buildings.

	or removed along with most of the gates and pass throughs.	
Union River	Levees, pedestrian bridges, boardwalks and gates.	Trails 1.5 miles, boardwalks, and bridges. Unimproved hand launch and restroom at the Union River Access Area on the north end of the unit.

Road Management

Access to the South Puget Sound Wildlife Area (with exception of McNeil Island and Lake Koeneman) includes county, state, and privately-owned roads. Each entity maintains their roads consistent with their respective operations and rules. Public roads provide access to the parking areas. Roads on the wildlife area units are closed to motorized access and opened on an as needed basis via permit, easement right, or with the wildlife area managers approval. Access to most roads are limited to minimize disturbance to wildlife and their habitats, as well as reduce road maintenance issues.

Department of Corrections conducts maintenance on the McNeil Island roads in collaboration with WDFW. Road access is limited to private roads for the Big Beef Creek Unit, and a long-term lease is needed to access Morgan Marsh. On the South Puget Sound Unit, roads include a paved road/parking area open to the public, but several other paved and gravel roads are administrative use only. The Union River Unit has 1.2 miles of administrative roads.

Trails

The Union River Unit has 1.5 miles of formally designated trail connected to 2 miles of trails linked to conservation lands cooperatively managed by the HCSEG. The designated trails are located on levees, bridges, and boardwalks adjacent to the estuary restoration site. Primitive trails also occur on the unit. The South Puget Sound Unit has a 0.5-mile paved walking trail overlooking grasslands, wetlands, and the hatchery complex. Several benches are scatter along the trail for wildlife viewing and resting. Lake Koeneman and Big Beef Creek units each have primitive unmarked trails. WDFW manages and maintains trails on an as needed basis.

Local land use compliance and threats to ecological function

The South Puget Sound Wildlife Area falls under the jurisdiction of Thurston, Mason, Pierce, and Kitsap counties, and land use must be consistent with county Comprehensive Plans, Natural Resource Ordinances, Critical Areas Ordinances, and Shoreline Master Program. Table 2 identifies applicable land use regulations for each wildlife area unit.

Table 2. Land use designations by wildlife area unit

Wildlife Area Unit	WA Department of Revenue Land Use Codes*	Comprehensive Plan Land Use Designation and Zoning **	Shoreline Management Plan Designation
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Kitsap County			
Big Beef Creek/Stavis Creek	RP – Rural Protection; RW – Rural Wooded; RR – Rural Residential	RP – Rural Protection (1 DU/10 Ac); RW – Rural Wooded (1 DU/20 Ac) RR – Rural Residential (1 DU/5 Ac)	Natural Rural Conservancy
Lake Koeneman	PF – Public Facility	RW – Rural Wooded (1 DU/20 Ac)	Natural
Mason County			
Skokomish*	91 – Undeveloped Land	RR5 – Rural Residential 5 acres	Conservancy Residential
Union River*	91 – Undeveloped Land	RR5 – Rural Residential 5 acres AGR – Agricultural Resource Lands.; now estuary restoration	Natural Conservancy Residential – Minor component
Thurston County			
Nisqually*	91 – Undeveloped Land	RRR 1/5 – Rural Residential/ Resource RR 1/5 – Rural residential R 1/20 Rural RL 1/2 – Residential Lamird RL 2/1 – Residential Lamarid PP - Public Parks Trails and Preserves NA – Nisqually Agriculture	Natural Conservancy Rural
Pierce County			
McNeil Island	R40 -Rural 40	R40-Rural 40	Natural/Conservancy Area by correctional facility – High Intensity
South Puget Sound*	11 – Household, single-family units 12 – Household, 2-4 units 14 – Residential condominiums 18 – All other residential not elsewhere coded 68 – Educational services 76 – Parks 84 – Fishing activities and related services 91 – Undeveloped land 94 – Open space land classified under chapter 84.34 RCW	Open Space and Recreation Residential Estate Public and Semi-public Institutional Single Family Multi-family	

*The Units in this table fall outside of Mason and Thurston County Urban Growth Areas (UGA). County Assessors only provide designated land use codes from the WA Dept. of Revenue. **Information obtained from the City of Lakewood Comprehensive Plan (rev 2019); Mason County 2036 Comprehensive Plan (2017); Thurston County Comprehensive Plan (2020).

Big Beef Creek Unit

The Big Beef Creek Unit lies approximately two miles west of the Silverdale Urban Growth Area (UGA). Although current zoning and comprehensive plan designations do not indicate future development, the Seabeck area is growing and westward expansion of the UGA may occur in the future. Big Beef Creek is one of the few creeks in Kitsap County that has a true channel migration zone. Protecting as much of the Big Beef Creek watershed in conservation as possible will help prevent additional threats to safety and property and preserve the habitats, ecological functions, and connectivity needed to perpetuate fish and wildlife species for the future. Additionally, preserving habitat corridors in the Big Beef Creek watershed will help minimize human-wildlife conflicts as development expands westward in Kitsap County.

Stavis Unit

The Stavis parcels lie further west of Seabeck in the Stavis Creek watershed. With a zoning and comprehensive plan designation of Rural Residential (1 dwelling unit/acre), there is a moderate risk of development. Adjacent parcels to the north are developed with rural residential homes. Adjacent parcels to the south and east are DNR state trust lands zoned Rural Wooded. The upper Stavis Creek watershed is primarily zoned Rural Wooded as well, making development in this watershed less of an immediate threat than in the Big Beef watershed.

Lake Koeneman Unit

The Lake Koeneman unit is located in the southwest corner of Kitsap County. Adjacent land use is zoned Rural Wooded and consists of timberland owned primarily by private timber companies. Although zoning and comprehensive plan designations for the unit and surrounding areas do not indicate an immediate threat of development, many of the parcels have been divided into 20-acre parcels, indicating rural residential development may eventually occur. Additionally, there are large areas of nonconforming lots in the vicinity, such as at Wye, Carney, Alpine, and Wicks Lakes that could make this area conducive to future rural development. Growth projections by Kitsap County indicate this area will likely see significant residential development over the next 20 years.

Nisqually Unit

This unit is divided into four parts; east, north and northwest parcels, and Luhr's Landing. With the exception of Luhr's Landing, all parcels are essentially inholdings within the boundary of the Billy Frank Jr. Nisqually National Wildlife Refuge. The east, north, and northwest parcels are entirely natural with a land use designation of undeveloped. The Thurston County Comprehensive Plan designates the parcels as Public Parks, Trails, and Preserves. Land uses surrounding the unit and the Refuge is mostly residential with some Tribal agriculture and City of Dupont green space.

McNeil Island Unit

McNeil, Gertrude, and Pitt Islands are state-owned islands of approximately 3,119 acres in south Puget Sound near Fox and Anderson Islands. McNeil Island is technically zoned as R40-Rural 40 under the Pierce County Comprehensive plan, but development is not a current concern due the ownership by WDFW and DOC. Due to the special circumstances of limited public access and development on McNeil, Gertrude, and Pitt Islands, continued conservation and restoration of the wildlife area will help preserve the habitats, ecological functions, and connectivity needed to perpetuate fish and wildlife species for the future.

Skokomish Unit

Land use along the eastern boundary is primarily rural residential. Commercial shellfish operations occur in the tidelands to the north and Skokomish Tribal lands border the area to the west and southwest. Most of the properties bordering the unit are undeveloped and likely undevelopable because they are composed in whole or in part of emergent tidal wetlands. Sixteen parcels on tribal lands are zoned as Agricultural Resource Lands but only one larger parcel shows signs of active agriculture. The shoreline along Highway 106 is mostly armored with large riprap to protect the roadway. Several (<10) dwellings break up the road armor and are themselves protected mostly by concrete or rock bulkheads. Water quality on the unit has been a concern in the past. In 2005, Anna's Bay near Potlatch State Park was closed to shellfishing because of fecal coliform bacteria contamination. The source of contamination was likely agricultural activities upstream along the river. Anna's Bay and the surrounding river delta area has since been reopened to shellfishing. However, the lower Skokomish River basin upstream of the delta is currently listed on the Washington Department of Health's Clean Water Act 303(d) list of imperiled waters because of bacterial contamination (Ecology 2016). Therefore, the entire river delta and Anna's Bay remain areas of concern for water quality.

South Puget Sound Unit

Lands to the east of the unit are undeveloped or classified as open space lands with fishing activities and related services. Lands to the south, west, and north are comprised of mixed residential and education (A.G. Hudtloff Middle School). The unit hosts an urban wildlife interpretation center and a paved ADA accessible trail for the public to learn about and view this vestige of South Puget Sound prairie.

Union River Unit

The shoreline encompassing the unit is almost entirely natural with a significant portion in designated conservancy. Only one undeveloped property is designated residential shoreline. The unit is bordered to the east by the Belfair Urban Growth Area (UGA) that is comprised of Low Density Residential and Mixed-Use zoning. Comprehensive Plan Development Areas outside of the UGA include designations of Rural Residential 5 and Agricultural Resource Lands (ARG). However, the ARG lands are currently owned by WDFW and the Salmon Center and are currently in conservancy. Lands along the west and south borders of the unit are mostly undeveloped larger parcels ranging from 6 to 40 acres, which provides a buffer from nearby higher density single

family residential units. Similarly, most of the eastern border consists of undeveloped larger parcels. Only one parcel is developed with high density single family residences. Both the Union River and Lynch Cove are on the Washington Department of Health's Clean Water Act 303(d) list of impaired waters due to bacterial contamination. The source of the contamination is likely failing septic systems upstream.

Cultural resources

State and federal law requires the protection of cultural, geological, and other non-renewable resources. Such resources may not be removed unless determined to be beneficial to wildlife, habitat, or scientific or educational purposes. WDFW coordinates with appropriate agencies and tribes for the protection of such resources if any activity affects cultural, archaeological, or historic resources. This includes the removal of various rock formations, Native American artifacts, plants, seeds, and other items.

The South Puget Sound Wildlife Area is within the area of interest for several northwest Indian tribes, including the Suquamish, Port Gamble S'Klallam, Skokomish, Squaxin Island, and Puyallup tribes. The salmon habitat provided on the wildlife areas is essential to maintaining harvestable populations of fish for both tribal and non-tribal fisheries.

Enforcement

Fish and Wildlife Officers are responsible for law enforcement on all eight units of the South Puget Sound Wildlife Area. Officers patrol the wildlife area and regularly check for compliance with land use, hunting, and fishing rules. Officers spend most of their time within these units enforcing laws related to pheasant hunting, waterfowl hunting, big game hunting, litter, and land use. Officers also answer questions related to fish and wildlife rules and laws, animal species within the area, feeding patterns, best areas to hunt, and suspicious activity. Constituents often provide feedback that they appreciate the presence of the WDFW officers on the wildlife area and would like to see them more often. Officers have addressed malicious activities, dogs off leash, public safety, hunting/entering the area before hours (8:00 AM), off-road travel, litter, land use rule violations, and poaching. Fish and wildlife officers spend much of their time educating and informing the public about the reasons for the laws in addition to enforcing them. They also work closely with WDFW biologists and local land stewards to anticipate where and when a problem may occur.

Stewardship and volunteerism

The South Puget Sound Wildlife Area offers a wide variety of volunteer opportunities, including education and outreach, facility maintenance, and restoration activities (Table 3). For example, the Clover Park Rotary is working with the local community to replace park benches, repair fences, clean up the paved trail and garbage stations, and enhance picnic shelters. Additionally, the Nisqually Reach Nature Center and Salmon Center provide a great deal of educational and volunteers opportunities such as citizen science, educating visitors, trail upkeep, and site cleanup located on units in the South Puget Sound Wildlife Area. The work provided by these volunteers contributes to the health of the wildlife area and is greatly appreciated. Volunteers can contact the wildlife area manager directly for information about how to be involved.

Table 3. Stewardship and volunteer opportunities for South Puget Sound Wildlife Area

Activity	Units	Time of year
Vegetation management/brush removal	All	Year-round
Oak protection - from beavers and other pests. Clearing competing vegetation such as grasses and noxious weeds. Release oaks from overshadowing by non-native species trees and brush.	South Puget Sound	Year-round
Native plantings	South Puget Sound and Union River	Fall/Winter
Trail maintenance	South Puget Sound, Union River	Spring/Fall/Winter
Facility maintenance	All	Year-round
Litter pick-up	All	Year-round
Duck blind maintenance	Union River	Spring/Summer/Winter
Education and outreach	South Puget Sound, Nisqually, and Union River	Year around
Fish and wildlife surveys (e.g. Union River - chum surveys and some other bird/waterfowl efforts. Nisqually Unit - through NRNC pigeon guillemot, forage fish, and purple martin surveys. South Puget Sound – western pond turtle, Oregon spotted frog.)	Union River, Nisqually, South Puget Sound	Spring/Summer/fall



Clover Park Rotary volunteer event – South Puget Sound Unit. Photo by Alan Billingsley.

Recreation

The South Puget Sound Wildlife Area offers a wide variety of recreational opportunities (see Table 4). The South Puget Sound Wildlife Area is a wildlife viewing and nature appreciation destination for all ages. The Nisqually Reach Nature Center (Nisqually Unit) offers field trip opportunities, classroom activities, summer camps, and maintains open hours for visitors to learn and view aquatic life up close in aquariums. Additionally, on this unit a newly renovated water access area and small pier for saltwater related recreation are open to all during daylight hours. The Salmon Center at the Union River Unit provides education, research, and sustainable agriculture for the public and K-12 school children (activities managed by the Hood Canal Salmon Enhancement Group). This organization supports and leads maintenance on the nature trails, kiosks, and interpretive material used by recreationalist. The South Puget Sound Unit offers local trails for walking, biking, and wildlife viewing in an urban setting. A key objective of this plan is to build a wildlife interpretive center on this unit.

All units open to the public (excluding McNeil Island Unit) offer wildlife viewing opportunities. Wildlife viewing hot spots include Nisqually, Union River, Lake Koeneman, and South Puget Sound. Designated trails occur at Union River (boardwalk and improved gravel), Lake Koeneman (primitive), and South Puget Sound units all designed to enhance the wildlife viewing experience. The South Puget Sound Unit has an ADA paved trail.

For hunting related recreation, the wildlife area is most known for its quality waterfowl hunting opportunities. Access for waterfowl hunting is primarily by boat at the Skokomish, Nisqually, and Union River units, but walk-in opportunities do exist at the Union River, Big Beef Creek, and Lake Koeneman Units. One of the unique opportunities is hunting sea ducks at the Union River, Nisqually, and Skokomish Units. Hunting for black bear, deer, and small game occurs at the Big Beef

Unit and, to a lesser extent, at the Lake Koeneman Unit. Two units in the wildlife area do not allow hunting, the South Puget Sound Unit is located within the City of Lakewood urban area where hunting is not allowed under local ordinance, and the McNeil Island Unit is closed to public access.

Fishing occurs on all units except McNeil Island and South Puget Sound units. The Nisqually and Skokomish units provide access for recreational, commercial, and tribal fisheries. Freshwater fishing occurs on the Big Beef Creek, Stavis, and Lake Koeneman units; saltwater fishing occurs at Nisqually, Skokomish, and Union River.

A hand launch is available at Union River for kayaks, canoes, small boats, and paddle boards. Boating opportunities at Nisqually (Luhr's Landing), and Union River include motor boating, kayaking, canoeing, and paddle boarding. With funding received from the Boating Facilities Program (Recreation Conservation Office), construction of a new and improved ramp, ADA loading platform, ADA compliant vault toilet, and paved parking will begin at Luhr's Landing Access Area in 2021.



Kayakers near the Nisqually Unit. Photo by Alan L. Bauer

The Big Beef Creek Unit currently opens for game fish on the Saturday before Memorial Day, closing Aug. 31st in the anadromous zone and Oct. 31st above the anadromous zone. This fishery falls under selective gear rules and is catch-and release for cutthroat trout and wild rainbow trout. These regulations are intended to provide recreational opportunity while minimizing impacts to wild steelhead and cutthroat trout populations. In addition to the stream and its tributaries, there are numerous beaver and kettle ponds in the watershed. Beaver ponds impounding streams open for fishing with their respective streams, while kettle ponds west of State Highway 3 currently open on the last Saturday in April and close on Oct 31st. Some of these kettle ponds are stocked with coastal cutthroat trout. This stocking program has been operating since the 1970s and has been refined over the years so that stocked waters have limited connectivity and are stocked bi-annually.

Skokomish - a sport fishery opens above the Highway 101 bridge for game fish on the Saturday before Memorial Day, closing Oct. 31st. This fishery falls under selective gear rules and is catch-and release for cutthroat trout and wild rainbow trout. The primary public access points for the lower river are the Smith Access Area at river mile 7 on the north side of the river off Sunnyside Road and the Skokomish Highway 101 Access Area.

Union River - a sport fishery opens for game fish on the Saturday before Memorial Day, closing Aug. 15th in the anadromous zone and on Oct. 31st above the anadromous zone. This fishery falls under selective gear rules and is catch-and release for cutthroat trout and wild rainbow trout. The Union River estuary also provides a popular sport fishing opportunity for cutthroat trout as well as occasionally sturgeon, which have been reported in the estuary on rare occasions.

Several of the units include tideland habitat that hosts shellfish—including McNeil Island, Nisqually, Union River, and Skokomish River—but none are significant shellfishing sites. The sites generally do not host the habitat preferred by targeted species like Manila clams, butter clams, native littleneck clams, or Pacific oysters; have access limitations; have water quality limitations; or lack shellfishing value due to a combination of factors. Of the units, McNeil Island holds the most potential for shellfishing value, with substantial tidelands—some of which likely host popularly-targeted species—but public access is restricted in the deed and due to the adjoining land use. Also, water quality issues in some areas currently preclude/limit recreational value.

The Nisqually Unit's tidelands are closed to shellfish by the Washington Department of Health (WDOH) due to non-point pollution concerns, but eelgrass beds associated with the delta are likely important habitat for juvenile crab, shrimp, and other shellfish and there are likely bivalves present as well. Much of the Union River unit is similarly classified as prohibited to shellfish harvest by WDOH and while bivalves are likely present on tidelands here, the sediment is soft and muddy and unlikely to host significant abundances of targeted species; eelgrass beds here likely hold ecological value to a variety of shellfish species. Just west of the unit is Belfair State Park—an important recreational and tribal shellfish harvest site, hosting an abundance of Pacific oysters and Manila clams. The Skokomish River unit similarly features habitat unlikely to support targeted species and also lacks convenient access, though productive and important tribal, commercial, and recreational sites exist to the west on Skokomish Tribal tidelands and Potlatch State Park.

All units mentioned hold ecological value that potentially connects to recreational value at other sites. Nisqually, Union River, and Skokomish River units all host eelgrass, which serves an important role in the life history of many shellfish, including some valuable to recreational harvest, like crab, shrimp, and bivalves. Additionally, there are productive shellfish sites near the deltas of Big Beef (geoduck) and Stavis (clams and oysters) Creeks, so the units upstream may have relevant influences on healthy upstream conditions that may affect shellfish beds downstream.

Table 4. Recreation use on the South Puget Sound Wildlife Area

Wildlife Area Unit	Hunting and Fishing Opportunities	Other Recreation	Restrictions	Education/ Interpretation	Parking and other facilities
Big Beef Creek	Big game, small game, and water-fowl hunting Fishing	Wildlife viewing	No motorized vehicles.	None	One designated access point – no parking. Old logging roads
Lake Koeneman	Big game, small game, and water-fowl hunting Fishing	Hiking, walking, wildlife viewing	No motorized vehicles	None	Park at Carney Lake Access Area, trailhead across the road. Walk in access only in cooperation with landowner.
McNeil Island	Closed to the public	--	--	--	--
Nisqually	Waterfowl hunting Fishing	Wildlife viewing, boating, kayaking, paddle boarding, photography, swimming	Area closed from 10PM – 4AM.	Nisqually Nature Center and interpretative signs	Parking fits ~30 vehicles, restroom located at Lühr’s Landing Access Area. Boat ramp
Skokomish	Waterfowl hunting Fishing - check with BC co management issues	Wildlife viewing, hiking and walking, swimming, photography	Motorized vehicle access only on designated road	None	Parking area sized for 12 cars and includes a bathroom.
South Puget Sound	--	Wildlife viewing, walking, hiking, ADA trail	Closed during hours of darkness No hunting allowed	Interpretative sign at the hatchery	One paved parking area holds 12 vehicles.

Wildlife Area Unit	Hunting and Fishing Opportunities	Other Recreation	Restrictions	Education/ Interpretation	Parking and other facilities
			(entire unit in city limits). Portions of the unit are closed to the public (Field office, Hatchery operations, endangered species recovery area)		
Stavis Creek	Hunting Fishing	Wildlife viewing	--	No	Walk in access at the end of Stone Farm Ln NW, Seabeck. No formal parking area.
Union River	Waterfowl hunting Fishing	Wildlife viewing, boating, hiking – 3.5 miles of trails	Daylight hours only (year-round) Dogs not allowed on designated trails east of Lynch Cove and Union River. Motorized vehicles and bicycles prohibited. No Fireworks or open fires Overnight parking and	Interpretative trail, 3 information kiosks.	Most parking occurs on Salmon Center site. Officially 8 vehicles Union River Access Area - Hand launch boat access - Parking for ~ 4 vehicles

Wildlife Area Unit	Hunting and Fishing Opportunities	Other Recreation	Restrictions	Education/ Interpretation	Parking and other facilities
			camping prohibited		

Water access areas




WDFW manages water access areas primarily for recreation associated with fishing and boating. Fifty-two access areas are located on 43 waterbodies in the planning area of Kitsap, Mason, Pierce, and extreme northeastern Thurston County. Thirty-seven provide access to lakes, four to rivers, and six to Puget Sound. Collectively, 42 launching ramps provide trailered boat access to 41 waterbodies across these four South Puget Sound counties. Three access areas are embedded within the wildlife area across three units (Table 5).

Luhr's Landing Access Area in the Nisqually Unit is heavily used for accessing the southern reaches of Puget Sound and is the primary boating access to the unit and the adjacent Billy Frank Jr. Nisqually National Wildlife Refuge. The Landing supports waterfowl hunting, salmon fishing, and other fishing and boating activities throughout Nisqually Reach, Case Inlet, Carr Inlet, and beyond.

Smith Access Area, located on the left bank of the Skokomish River just above US 101, is part of a newly established 65-acre tract of the Skokomish Unit. This access area provides ≈2,000 feet of bank fishing and a hand launch for small watercraft.

The Union River Access Area is located on State Route 300 along the northern and western boundary of the Union River Unit. A hand launch for small watercraft provides direct access to the mouth of the Union River at Lynch Cove, waterfowl hunting blinds, and to other areas of the inland terminus of Hood Canal. This access area is not suitable for launching boats on trailers requiring a boat ramp.

Table 5. Water access areas on and near the South Puget Sound Wildlife Area

County	Waterbody	Access Area	WLA Unit	Public Fishing Easement	Fishing and Boating Opportunities			Access Area Facilities			
					 Fishing*	 Hand launch	 Trailered boat launch	Boat Ramp Surface	Toilet ^ = ADA	Parking ^ = ADA	
Kitsap	Buck Lake	Buck Lake			•		•	Gravel		•	
	Horseshoe Lake	Horseshoe Lake			•		•	Concrete	•	•^	
	Kitsap Lake	Kitsap Lake			•		•	Concrete	•	•^	
	Long Lake	Long Lake			•		•	Concrete	•	•^	
	Mission Lake	Mission Lake			•		•	Gravel	•	•	
	Puget Sound	Misery Point			•		•	Concrete	•	•^	
	"	Point No Point			•				•^	•^	
	"	Ross Point			•						
	Tiger Lake	Tiger Lake			•		•	Gravel	•	•^	
	Wildcat Lake	Wildcat Lake			•		•	Concrete	•	•^	
	Wye Lake	Wye Lake			•		•	Concrete	•	•	
	Mason	Benson Lake	Benson Lake			•		•	Concrete	•	•^
		Cady Lake	Cady Lake			•		•	Gravel		•
Devereaux Lake		Devereaux Lake			•		•	Concrete	•	•^	
Haven Lake		Haven Lake			•		•	Gravel	•^	•	
Isabella Lake		Isabella Lake			•		•	Gravel	•	•	
Island Lake		Island Lake			•		•	Concrete	•	•	
Lake Limerick		Lake Limerick			•		•	Concrete	•	•	
Lake Wooten		Lake Wooten			•		•	Concrete	•	•^	

	Lost Lake	Lost Lake			•		•	Concrete	•	•^
	Maggie Lake	Maggie Lake			•		•	Gravel	•	•
	Nahwatzel Lake	Nahwatzel Lake			•		•	Concrete	•	•
	Panther Lake	Panther Lake			•		•	Gravel	•	•^
	Phillips Lake	Phillips Lake			•		•	Concrete	•^	•^
	Puget Sound	North Bay			•				•^	•^
	"	Oakland Bay			•					•
	"	Sherwood Creek			•					•
	Skokomish River	Skokomish R - Hwy 101			•		•	Unimproved		•
	"	Smith	Skokomish		•	•			•	•
	Spencer Lake	Spencer Lake			•		•	Concrete	•	•
	Tahuya River	Tahuya River			•					•
	Tee Lake	Tee Lake			•		•	Gravel		•
	Trails End Lake	Trails End Lake			•		•	Gravel	•	•
	Twin Lakes	Twin Lakes			•		•	Gravel		•
	Union River	Union River	Union River		•	•				•
Pierce	American Lake	American Lake			•		•	Concrete	•	•
	Bay Lake	Bay Lake			•		•	Gravel	•	•
	Bonney Lake	Bonney Lake			•		•	Gravel		•
	Carney Lake	Carney Lake			•		•	Gravel	•	•
	Clear Lake	Clear Lake			•		•	Concrete	•	•
	Crescent Lake	Crescent Lake			•		•	Gravel	•	•
	Harts Lake	Harts Lake			•		•	Concrete	•	•
	Jackson Lake	Jackson Lake			•		•	Gravel	•	•
	Lake Kapowsin	Lake Kapowsin			•		•	Concrete	•	•^
	Ohop Lake	Ohop Lake			•		•	Concrete	•	•

	Puyallup River	Sumner Sportsmen's		•	•					•
	"	Weiss			•		•	Unimproved		•
	Rapjohn Lake	Rapjohn Lake			•		•	Gravel	•	•
	Tanwax Lake	Tanwax Lake			•		•	Concrete	•	•
Thurston	Nisqually River	Nisqually			•	•			•	•
	Puget Sound	Boston Harbor					•	Concrete	•	•
	"	Luhr's Landing	Nisqually		•		•	Concrete	•	•

*** Fishing opportunities on department land. Refer to current WDFW sport fishing rules, as fishing seasons change and may not occur at all sites.**



The Luhr's Landing – Nisqually Unit. Photo by Alan L. Bauer.

Research and other studies

Consistent with WDFW's mission to preserve, protect, and perpetuate fish, wildlife, and habitat, WDFW supports independent studies to achieve wildlife area objectives. Appendix E describes studies that have occurred on the wildlife area.



Western pond turtle trapping. Photo by Emily Butler.

Wildlife Area Goals, Objectives, and Monitoring

Goals, objectives, and performance measures

This plan sets management priorities for the South Puget Sound Wildlife Area for the next 10 years. Regional and headquarters staff members, with input from the South Puget Sound Wildlife Area Advisory Committee and the public, collaboratively developed the goals, objectives, and performance measures in this plan (Table 6). The objectives in this plan may or may not yet be fully funded.

Monitoring and adaptive management

Wildlife area objectives will be evaluated and updated annually with input from the wildlife area advisory committee and regional district team. The update reports progress on goals and objectives and identifies any new actions to meet plan goals. Every two years, WLA staff prepare a summary of management highlights and new issues published on the agency website. Further, over the term of the plan (10 years), the agency will evaluate the funding level required to maintain the capacity needed to successfully manage the wildlife area.

DRAFT

	Goal	Draft Objective	Unit	Performance Measure	WDFW Lead	Tasks
1.	Maintain or improve the ecological integrity of priority sites.	A. Establish an ecological integrity baseline and associated goals for ecological systems of concern/priority systems by 2026.	All	1. Baseline established (y/n); 2. EI goals established (y/n)	Ecological integrity Monitoring Team <i>Support</i>	- Work with WLA manager to design monitoring plan to achieve objectives - Conduct data collection to determine baseline within 5-year plan - Provide EI baseline report to WLA manager prior to start of subsequent plan - Work with WLA manager to establish EI goals. - Work with WLA manager and cultural resource staff to include cultural resource in monitoring plan.
		B. Consistent with guidance from the weed management plan, conduct weed control activities annually.	All	1. # acres inspected; 2. # acres treated; 3. produce annual weed control report. ----- 2. Reduce scotch broom by 50% from baseline in 10 years (South Sound); 3. Japanese knotweed reduced by 100%; 4. Poison hemlock by 100%; 5. Spurge laurel by 100%; 6. English ivy by 50%	WLA Manager	-Annually develop work plan in coordination with Assistant Manager - Complete annual reporting requirements. - Inventory documented via GPS and/or mapping. - Meet state and county requirements for noxious weed control. - Address aquatic weeds where applicable.
		C. Evaluate oak prairie habitat and develop a strategy for oak recruitment by 2024.	South Puget Sound	1. # acres of existing oak seedlings; 2. Strategy developed (y/n); 3. # of acres of oak understory restored prairie grasses and forbs.	WLA Manager	- Identify acreage that contains oak seedlings. - Control competition once a year. - Restore native prairie grasses and forbs in the oak understory. - Weed management - Engage partners for capacity support.
		D. Restore natural function and processes of aquatic systems on the wildlife area that benefit focal species, including maintaining, and encouraging beaver presence where appropriate.	South Puget Sound, Big Beef Creek, McNeil Island, Lake Koeneman	1. # of beaver dams maintained; 2. Presence of beaver activity (y/n)	WLA Manager, Game Division, Habitat Program	- Monitor and maintain beaver presence. - Discuss with Game Division access rules for the WLA, and beaver habitat management - Install pond levelers or Beaver Dam Analogs (BDA as needed).

		E. Work with partners to acquire property at the mouth of Big Beef Creek by 2022.	Big Beef	1. Property acquired (y/n)	WLA Manager/RES	- Acquisition approved through the Lands 20/20 process and now - Communicate regularly with real estate section, landowners, and
2.	Improve ecological integrity of forests while maintaining and/or improving habitat for wildlife.	A. Identify and implement forest health treatments for the wildlife area over the next 10 years.	McNeil Island	1. # acres non-commercial treatment completed; 2. # of acres of commercial treatment; 3. # acres of prescribed broadcast burning completed; 4. # acres of reforestation.	Forester/WLA Manager/ Lands Agent/District Team	- Forest health work on McNeil Island, which is prohibited in the de language updated with GSA. - Coordinate with District Team on project development. - Layout, permitting, implementation, and oversight of contract ar - Draft and submit grant applications to fund projects, as needed. - Submit requests for other state funding as available to fund proje
		B. Thin 28 acres of Douglas fir plantation on Lake Koeneman Unit by 2031.	Lake Koeneman	1. 28 acres of trees thinned (y/n)	Forester, WLA Manager	- Write harvest prescription and secure permits. - Write and administer contract. - Oversee and monitor project.
3.	Achieve species diversity at levels consistent with healthy ecosystems	A. Integrate new Diversity or Game priorities into district biologist work plans every two years that benefits the wildlife area.	All	1. Work plans updated (y/n)	WL District Biologist/ WLA Manager	- District biologist coordinates with Diversity and Game staff from activities and document prior years' efforts. - The WLA manger and district biologist will work together to mana (both game and non-game species). - Consider specific climate sensitivity for individual SGCN before im
		B. Conduct Oregon spotted frog monitoring as prescribed by protocol.	South Puget Sound	1. Egg mass surveys conducted annually through 2021 and then every 3 years (y/n).	WL District Biologist	- Conduct annual egg mass surveys from 2019-2021 and then surve
		C. Conduct western pond turtle population monitoring annually.	South Puget Sound	1. Western pond turtle report completed (y/n)	WL District Biologist	- Implement annual population census. - Work with science division to evaluate annual census and improv - Attain population of 500 turtles. Support Head Start program and
		D. Improve nesting habitat for western pond turtles.	South Puget Sound	1. Develop plan (y/n); 2. # of grant applications; 4. # of projects implemented; 5. # of acres improved.	WL District Biologist Secondary WLA Manager	- Develop restoration plan to improve nesting habitat including: - Amend soil on nest hill to address increased soil compaction/sett - Plant native forbs and fescue to reduce the need to mow during t - Explore funding possibilities and apply for grants. - Implement plan. - Evaluate and report on progress.
		E. Maintain or improve pond health for western	South Puget Sound	1. Establish # of acres to maintain as open water;	WLA Manager	- Monitor the amount of open water area, depth and temperature - Implement reed canary and cattail control measures to maintain

		pond turtles, Oregon spotted frog and other species.		conduct weed control efforts as needed to maintain the amount of open water. 2. Establish minimum water depths and implement appropriate actions to maintain ponds at that depth when needed.	Secondary: WL District Biologist	- Evaluate options to maintain adequate water depths in all ponds - Explore funding possibilities and apply for grants.
		F. Limit public access to western pond turtle area.	South Puget Sound	1. Signs installed(y/n); 2. # feet of fencing replaced	WLA Manager Secondary: WL District Biologist	- Maintain signs advising of restricted access and dog leash requirements - Remove and replace current fencing with high quality human/pet friendly fencing - Coordinate with enforcement regarding trespassing issues. -Expand closure area if new pond area is developed (see H below)
		G. Create an additional western pond turtle pond by 2028.	South Puget Sound	1. Develop plan (y/n); 2. # of grants applied; 3. Annual progress report within WPT annual report.	WLA Manager Secondary: WL District Biologist	- District Biologists work with wildlife area manager to determine feasibility - Consult with hatchery staff and habitat division to develop a pond on upland habitat. Explore funding possibilities and apply for grant. - Implement plan. - Evaluate and report on progress.
		H. Conduct species surveys on McNeil Island and Lake Koeneman (e.g. amphibian, waterfowl, fish, mammals, butterflies, etc.) by 2022.	McNeil Island/Lake Koeneman	1. Species surveys conducted (y/n)	WL District Biologists/ Diversity Division	- The surveys will be tied into the objectives for the aquatic restoration project - Identify the locations, timing, and frequency of survey efforts.
		I. Develop a strategy to reintroduce streaked horn lark on McNeil Island by 2026.	McNeil Island	1. Survey for streak horn larks throughout the island (y/n); 2. Develop a plan to establish streak horn lark habitat (y/n); 3. # of grants applied; 4. # of acres transferred; 5. # of acres improved.	WL District Biologist	- Potential land transfers from DOC to WDFW for the protection of infrastructure objective. -Develop plan to establish and maintain lark habitat. - Work with USFWS & Federal Aviation Administration for potential land transfers.
		J. Collaborate with partners to establish protection measures for developing wildlife corridors adjacent to the	Big Beef Creek, Stavis Creek	# of projects implemented;	Habitat	- Identify intact and high-quality wildlife corridors and add them to the list of high-quality wildlife corridors - Use the high-resolution change detection (HRCD) tool to monitor changes in habitat - Create an inventory map of lands held in conservation by the state - Partners include: Great Peninsula Conservancy, Hood Canal Salmon Enhancement Council, Kitsap County, DNR, Forterra, Suquamish Tribe, Port Gamble

		wildlife area units in Kitsap County.				
		K. Investigate bat use of WDFW lands and monitor for white nose syndrome and surveillance, as needed.	McNeil Island	1. # of surveys conducted; 2. # colonies confirmed; 3. # samples collected and submitted.	WL District Biologist	- Investigate the abundant abandoned housing on the island outhouses that likely support bat roosts. - Conduct acoustic monitoring at sites when it conforms to co Acoustic Monitoring). - Conduct non-acoustic monitoring and sample collection for the Wildlife Program.
4.	Maintain waterfowl and migratory bird management.	A. Conduct an inventory of the wildlife area to identify the location of any band-tailed pigeon mineral sites and incorporate those sites into WDFWs band-tailed mineral site counts by 2026.	McNeil Island, Nisqually, Skokomish, Union River	1. Inventory conducted (y/n).	WL District Biologist	- Collaborate with district biologists and section manager to determine band-tailed pigeon mineral site counts. - Using identified techniques, implement a search for mineral sites. - Document the location of mineral sites found. - Where appropriate, add located mineral sites to the mineral count.
		B. Include WLA units in annual mid-winter waterfowl surveys.	Big Beef Creek, South Puget Sound, Lake Keonoman, McNeil Island	1. Annual surveys conducted (y/n)	WL District Biologist	- Initial surveys are needed for Buttersworth Reservoir (McNeil Island), Ponds and Morgan Marsh, Lake Koeneman in surveys.
		C. Conduct a wetland inventory on the wildlife area by 2025 and prioritize waterfowl management.	Big Beef Creek, Lake Koeneman, McNeil Island, South Puget Sound	Wetland inventory conducted (y/n)	Game Division	- Duck Stamp funding available – western US tool being developed
5.	Manage for wildlife conflict.	A. Reduce the number of reports of wildlife conflict incidents and concerns on McNeil Island.	McNeil Island	1. # of reports of wildlife conflict incidents/concerns annually.	Wildlife Conflict Specialist	- Develop a means of collecting information on the number of incidents on McNeil Island. - Provide education material on living with wildlife to partner agencies. - Continue to provide training and materials to DSHS staff to maintain the Wildlife Facility on McNeil Island.

						<ul style="list-style-type: none"> - Provide technical advice on the type, quantity and installation of bird strikes. - Provide technical advice on the installation and maintenance of b onto roadways.
6.	Protect and restore estuarine, nearshore, and riparian habitats on the wildlife area for salmonid recovery.	A. Collaborate with the Mason Conservation District on restoration activities at RM 6.5 on the Skokomish River by 2024.	Skokomish	<ol style="list-style-type: none"> 1. Designs documents reviewed (y/n); 2. Design documents approved or commented on by WDFW and edits made by MCD at 30%, 60%, 90%, and final designs (y/n); 3. Project implemented successfully (y/n). 	Habitat Program/WLA Manager	<ul style="list-style-type: none"> - Mason CD – approval – design 30 percent in 2020-22 Restoration - Water access site construction summer 2023-25 - - Change in water floodplain reconnection – Gated access to reduce dumping and sti vehicle access – remove vault toilet and parking lot fill material and roadway. - Project ongoing – Mason Conservation District developing 30% pl properties. Scope of work-Likely developed at 90% plans and right of entry? - Public access consistent with Deed, requirement was for access a with occasional vehicle access allowed.
		B. Complete habitat restoration projects along the marine shoreline at McNeil Island by 2031.	McNeil Island	<ol style="list-style-type: none"> 1. # of linear feet of shoreline restored; 2. # of grants received; 3. # of tidal exchange estuaries reconnected. 	Habitat Restoration Coordinator/WLA Manager	<ul style="list-style-type: none"> - Seek grant funding. - Partner with DNR as well as DOC and maintain regular communic implementation.
		C. Determine a strategy for weir future operation on the Big Beef Unit.	Big Beef Creek	<ol style="list-style-type: none"> 1. Strategy developed (y/n); 	Fish Program/Habitat Program/WLA Manager	<ul style="list-style-type: none"> - Evaluate how to collect the data if the weir is removed. - Determine to what extent the estuary and lower river restoration - Consider habitat impacts in conjunction with value of information management from the weir. - Weir placement concerns are coordinated with the wildlife area r
		D. Improve 7 acres of Union River Estuary interconnectivity by 2025.	Union River	<ol style="list-style-type: none"> 1. Lands acquired (y/n); 2. Trail project completed (y/n); 3. Dikes setback (y/n); 4. # of acres restored. 	WLA Manager/Lands Division/Habitat Program	<ul style="list-style-type: none"> - Complete NMSD land transfer. - Collaborate on seeking grant funding, Duck Stamp, SRFB, ESRP, and - Partner with HCSEG on restoration efforts. - Oversee construction efforts on WDFW lands.
		E. Monitor eelgrass on the wildlife area.	Nisqually, McNeil Island, Union River	<ol style="list-style-type: none"> 1. Develop monitoring program (y/n); 2. Funding obtained (y/n) 	Habitat Program/WLA Manager	<ul style="list-style-type: none"> - Partner with DNR - Apply for funding
		F. Identify traditional management techniques	McNeil Island	<ol style="list-style-type: none"> 1. Include summary of Traditional Ecological 	Wildlife Lands cultural	<ul style="list-style-type: none"> - Conduct research and meet with tribes to identify traditional pra used in restoration projects

		and knowledge that may be useful in estuarine and nearshore habitat restoration and management by 2026.		Knowledge in McNeil Island Cultural Resource Management Plan (w/in one year) 2. Assessment by cultural resource and habitat restoration staff about the feasibility of using traditional tribal management techniques and species of cultural value in restoration projects.	resource specialists	<ul style="list-style-type: none"> - Communication between WLA managers, habitat restoration staff and tribal cultural knowledge with WDFW restoration and management - Identify funding sources for restoration projects that include important knowledge applications (for example, intertidal clam or marsh garden) - Communicate species surveys to cultural resource staff to identify training of cultural resource staff to aid in data collection.
7.	Provide recreation opportunities in the wildlife area.	A. Increase waterfowl hunting opportunities on the Union River Unit by improving /adding additional blinds and evaluating access off HWY 106 by 2025.	Union River	<ol style="list-style-type: none"> 1. Maintain 2 floating blinds (y/n); 2. Maintain 2 stationary blinds (y/n); 3. # of walk in blind maintained; 4. Access off HWY 106 improved (y/n); 5. # of signs appropriately placed; 6. One new walk in site developed (y/n) 	WLA Manager/ WL District Biologist	<ul style="list-style-type: none"> - Partner with local waterfowl organizations, e.g., Washington Waterfowl Society - Signage should be consistent with current regulations. - Repair both stationary wire blinds. - Rebuild floating blinds. - Improve access and establish one new hunting blind where appropriate - User built blinds are problematic and should be removed. - Increase quality and quantity of waterfowl hunting related signage
		B. Evaluate recreational opportunities on the wildlife area by 2022; and establish unit rules to designate access by 2023.	Union River, Big Beef Creek, Skokomish, South Puget Sound	<ol style="list-style-type: none"> 1. Rules established (y/n); 2. Post signs and update kiosks (y/n). 	WLA Manager	<ul style="list-style-type: none"> - Consider seasonal restrictions. - Educate users. - Maintain and update adequate signage.
		C. Increase public awareness of wildlife viewing opportunities by 2025.	Union River, Nisqually, South Puget Sound	<ol style="list-style-type: none"> 1. Water access improvements completed (y/n); 2. # of trails improved 3. Kiosk signage improved at boat launch and Theler Trail (y/n); 4. Information added to website (y/n); 5. Brochure created (y/n); 	WLA Manager	<ul style="list-style-type: none"> - Create brochure explaining site use. - Post public information - Allowable activities on the wildlife area, - Collaborate with Salmon Center, Nisqually Reach Nature Center and

				6. Add information kiosk on HWY 3 added (y/n)		
		D. Participate in Belfair Chamber of Commerce's proposed Lower Hood River Canal Discovery Trail on Union River.	Union River	1. Review and submit comments on the proposal (y/n).	WLA Manager	<ul style="list-style-type: none"> - Review trail proposals and submit comments for consistency with wetlands may be counter to other goals. - Review concepts early, as the trail could have unintended impact opportunities on or near DFW lands, etc.
		E. Increase public outreach by implementing two projects by 2025.	All	<ol style="list-style-type: none"> 1. # of kiosks added, and signs updated; 2. Online information updated (y/n); 3. # of brochures completed; 4. # of and type of partnerships developed and/or utilized. 	WLA Manager	<ul style="list-style-type: none"> - Explore potential partnerships with other organizations. - South Puget Sound and Union River units are the priority sites for at the Nisqually Unit. - See 7C – for more performance measures.
		F. Develop a plan to manage public use on the Smith Access by 2022.	Skokomish	<ol style="list-style-type: none"> 1. Site management plan completed (y/n); 2. Signage placed (y/n). 	WLA Manager/ Access Manager	<ul style="list-style-type: none"> - Establish a plan regarding site use that benefits public and site management activities and annual flooding. - Address illegal dumping, camping, and campfires.
		G. Complete four projects to improve recreational access on the WLA within the life of the plan.	All, except for McNeil Island	<ol style="list-style-type: none"> 1. Funding received (y/n); 2. # of projects completed; 3. # of signs and kiosks placed. 	WLA Manager	<ul style="list-style-type: none"> - Apply for grants and capital funding. - Add additional parking. - Provide kiosks. - Install new access resources or improve existing access sites. - Consider Moving gate (BB)
		H. Develop a plan to manage access and establish recreation priorities on Lake Koeneman by 2022.	Lake Koeneman	<ol style="list-style-type: none"> 1. Access agreement finalized (y/n); 2. Recreation plan developed (y/n); 2. Plan implemented (y/n); 3. Reestablish public access pedestrian and equestrian trail (y/n). 	WLA Manager/ RES staff	<ul style="list-style-type: none"> - Lease landowner agreement drafted 2015 with RES - Alpine Evergreen - Purchased with DJ funding. - Recreational trail to the lake – agreement needed. - Administrative access to the lake – agreement needed. - Add additional access route, parking, and signage. - Annual trail maintenance conducted.
		I. Assess target shooting needs and opportunities, and implement site plan in accordance with new	Big Beef	<ol style="list-style-type: none"> 1. Assessment complete (y/n); 2. Plan implemented (y/n) 	WLA Manager	<ul style="list-style-type: none"> Morgan Marsh - New target rules may impact users may apply. - Compliance with new rule - Post signage. - Clean-up shooting debris.

		statewide target shooting standards by 2025.				
		J. Assess the need and feasibility for a new fishing/wildlife observation pier at Nisqually by 2026.	Nisqually	1. Needs assessment completed (y/n) 2. Feasibility assessment completed (y/n) 3. Determine source of funding and O&M	WLA Manager/	- Discuss with Regional Management Team and coordinate with NI from stakeholders. Under representative communities - Donations may be needed - Assess fishing, wildlife viewing community need, Recreation Strategy?
		K. Resolve issues related to the McAllister Creek Road Access/Eagle Cliff Road Easement by 2024.	Nisqually	1. Alternatives assessment conducted (y/n); 2. Resolution determined (y/n); 3. Corrective action taken (y/n).	WLA Manager/Real Estate	- Address access easement encroachment with lands agent. - Evaluate access to McAllister Creek for public and management p - Create and implement solutions. - Properly sign and conduct outreach to the community about access
		L. Develop a plan to address access and enhance parking for Big Beef Creek Unit - Morgan Marsh and Union River by 2024.	Big Beef Creek, Union River	1. Plan developed (y/n); 2. Parking area developed (y/n); 3. # of signs and kiosks placed; 4. # agreements developed.	WLA Manager/Real Estate	- Determine what parcels need to be accessed. - Create and install signs, kiosks, parking area, and boundary signa - Long-term access agreement needed with Rayonier Inc. - Trail designation and maintenance. - Assessment of existing roads and trails and other infrastructure.
		M. Develop a strategy to address conflict between pets and wildlife by 2023.	South Puget Sound, Union River	1. Plan developed and implemented (y/n); 2. Monitoring conducted (y/n); 3. Enforcement strategy developed (y/n).	WLA Manager	- Provide education and outreach materials to the public to reduce
		N. Maintain fishing opportunities in the South Puget Sound Wildlife Area.	Lake Koeneman, Union River, Skokomish, Big Beef Creek, Nisqually	1. Up to 200 catchable rainbow trout stocked annually (y/n); 2. 150 broodstock rainbow and cutthroat trout stocked per year (y/n); 3. Access sites maintained annually (saltwater and freshwater) (y/n).	Fish Program/WLA Manager/Acceptance Area staff	- Support the catch and release program. - Maintenance of vehicle access. - Formalize and secure long-term trail access agreement for Lake K - Provide signage for fishing opportunity and regulations at trailhea - Support Lakewood Hatchery operations.
		O. Partner with Pierce County and City of Lakewood to develop a trail connection between	South Puget Sound	1. Trailhead designation (y/n); 2. Signage and kiosk placed (y/n);	WLA Manager	- Collaborate with Clover Park Rotary Club, Pierce County and City WLA and the existing trail. - Support the county and city on the operations and maintenance - Update WDFW website accordingly.

		Chambers Creek Trail System and the South Puget Sound Unit by 2024.		3. Trail improvements/connections (y/n).		- Coordinate with Public Affairs Office.
8.	Offer multiple and varied opportunities for stakeholder participation and engagement.	A. Coordinate and maintain a Wildlife Area Advisory Committee that meets at least annually.	--	# of meeting(s) per year.	WLA Manager	- Setup meeting time and place based on group members' availability. - Draft agenda with attention to group interest and time constraints. - Hold meeting and collect group comments and recommendations for actions (proposed or ongoing). - Include meeting notes in wildlife area management plan updates.
		B. Provide information to community groups related to current wildlife area management activities.	-	# of group/constituents contacted	WLA Manager	- Key user groups include: waterfowl hunters, anglers, bird watchers, Salmon center, etc. - Provide WLA information to local organizations, through email, text, and presentations, and written notices and newsletters. - Factor in diversity and equity values.
		C. Work with local community business and tourism associations to communicate opportunities on and benefits of the wildlife area.	All	1. # of stories or events promoted on the wildlife area annually; 2. # of local entities contacted.	WLA Manager/ <i>Lands Messaging Team</i>	- Work with internal Lands Messaging Team to develop messages, - Develop 1-2 stories each biennium or as opportunities arise.
		D. Develop a volunteer program to monitor, maintain and install nest boxes for Species of Greatest Conservation Need on the wildlife area by 2023.	Nisqually, Union River, South Puget Sound	1. Volunteer program developed (y/n); 2. # of nest boxes installed and maintained annually; 3. Monitoring conducted (y/n); 4. # of boxes utilized annually; 5. # of snags created.	WLA Manager	- Coordinate with Audubon and other volunteers. - Maintain purple martin boxes.
9.	Maintain productive	A. Determine and evaluate the need, feasibility and	McNeil Island	1. Deed modification complete (y/n).;	WLA manager/RES	- Identify items that need modified in the existing deed. - Discuss with DOC existing deed language, and proposed changes.

	and positive working relationships with neighbors, partners, and permittees.	potential conflicts with land use and formalize working relationships with DOC, and other agencies regarding McNeil Island by 2025.		2. Management agreement developed (y/n).		<ul style="list-style-type: none"> - In collaboration with DOC, reach out to GSA to request a process - Clarify land use restrictions and formalize working relationships v - Develop a WDFW/ DOC cooperative management agreement. - Develop a deed modification (see pg. 94 of the plan) agreement. - Explore land transfer opportunities to better reach goals and resp - Implement facilities or species restoration. - Conduct forest health treatments on McNeil Island, which is curre modified through an MOU or deed language updated with GSA.
		B. Develop a plan to create an urban wildlife center using other successful models and case studies by 2023.	South Puget Sound, Union River	<ol style="list-style-type: none"> 1. Plan developed (y/n); 2. Apply for funding (y/n); 3. Plan implementation (y/n). 	WLA Manager/ Diversity Staff	<ul style="list-style-type: none"> - Develop a stakeholder group to develop a strategy to move forward - Factor in diversity and equity values.
		C. Continue to support the Nisqually Reach Nature Center.	Nisqually	<ol style="list-style-type: none"> 1. # of board meetings and events attended; 2. Unit webpage updated with link to NRNCs information (y/n); 3. # of WDFW staff presentations; 4. # of facility improvement projects. 	WLA Manager	<ul style="list-style-type: none"> - Conduct monthly communications with NRNC staff/board leaders - Maintain and monitor long-term land use agreement renewed ev - Conduct annual inspections. - Address and/or seek funds for facility issues. - Review NRNCs annual reporting. - Support diversity and equity values.
		D. Maintain strong working relationships with current volunteer groups.	South Puget Sound, Union River, Nisqually	<ol style="list-style-type: none"> 1. # of events participated in annually; 2. # of volunteers recruited; 3. # of groups supported 	WLA Manager	<ul style="list-style-type: none"> - Consider citizen science projects. - Foster relationships through the Adopt a Wildlife Program, e.g. S - Work with Nisqually Reach Nature Center and The Salmon Center
		E. In collaboration with DNR and DOC, develop a strategy for addressing whale disposal at McNeil Island.	McNeil Island	<ol style="list-style-type: none"> 1. Recommendations developed (y/n) 2. # of meetings with partners; 3. Surveys for sensitive species conducted (y/n); 4. Alternative disposal sites identified (y/n); 5. Whale disposal strategy implemented (y/n). 	WLA Manager/WLP Science	<ul style="list-style-type: none"> - Locations include Hogan and Hyde Point. Hyde Point is the officia - Develop a cap set on whales disposed of on McNeil Island each y - Spreading the whales across two locations reduces any potential - Consider alternative sites if sensitive fish, wildlife and/or plant co - Consider whether there is planned restoration in the current loca - Address concerns from DOC/DSHS on the attraction of coyote an

10.	Properly train, equip, and license WLA staff to meet operational and management needs of the WLA.	A. Increase staff capacity to meet operational and management needs on the wildlife area.	All	1. Needs assessment conducted (y/n); 2. Additional staffing hired (y/n).	WRPM	- Hire staff to meet demands around ongoing maintenance and res - Identify needs, partnerships, and issues that are not sufficiently c
11.	Maintain safe, highly functional, and cost-effective administrative facilities and equipment.	A. Reduce illegal and unauthorized activities within 2 years and continue to reduce violations over the term of the plan.	South Puget Sound, Big Beef Creek, Union River	1. # of site cleanups conducted; 2. Establish a relationship with Rayonier Timber Co and DNR (Big Beef Creek) (y/n); 3. # of gates/barriers improved; 4. # of on-site meetings with enforcement (Big Beef Creek).	WLA Manager/ Enforcement	- Reduce hours of use – add signage and gate. - Add new security gate on SPS unit. - Add security cameras and improve lighting. - Engage neighbors, stakeholders to help. Utilization of Master Hur Rotary and others to cleanup site, improve signage. - Work with neighboring large landowners to reduce illegal and un - Alter vegetation management practices near problem areas to in trespassing, and vandalism activities. - Provide additional enforcement.
		B. Improve operational efficiency by considering land transfers for either the Big Beef Creek and/or Stavis Creek parcels by 2028.	Big Beef Creek, Stavis Creek	1. Transfer(s) complete (y/n).	WLA Manager/ RES	- Consider transferring to DNR NAP Program or a conservation org
		C. Monitor project success of the re-development at Lühr's Landing by 2023.	Nisqually	1. Post project monitoring conducted (y/n).	WLA Manager	- Coordinate with access site management future upkeep. - Ensure all project components have been implemented – perform - Monitor public use.
		D. Develop feasibility and design analysis to redesign or replace Nisqually Nature Reach Center by 2027.	Nisqually	1. Sea level analysis conducted (y/n); 2. Funding for feasibility study secured (y/n); 3. Funding for design and build secured (y/n).	WLA Manager /CAMP Climate Change coordinator	- Conduct a sea level analysis. https://cig.uw.edu/our-work/applie - Coordinate with CAMP. - Project added to the capital budget. - Key point – the building is a learning center for shoreline and near
		E. Develop a landowner agreement for the	South Puget Sound	Agreement finalized (y/n)	WLA Manager/ RES	- Meet with landowner and discuss cemetery site access and mana

		cemetery inholding on SPS Unit by 2023.				<ul style="list-style-type: none"> - Evaluate and address county platted roads within wildlife area lea County. - Work with both the private family and Real Estate to establish ac
		F. Remove or replace perimeter fencing on the South Puget Sound Unit by 2026.	South Puget Sound	<ol style="list-style-type: none"> 1. # of linear feet of perimeter fencing replaced/removed; 2. # of volunteer hours and funding donated. 	WLA manager	<ul style="list-style-type: none"> - Scope project. - Seek and secure funding. - Acquire necessary permits and survey work. - Utilize partnerships and volunteers were possible. - Implement projects.
		G. Develop a plan to assess the removal of the Buttersworth dam and associated reservoir – and Ellen Creek Dam by 2023.	McNeil Island	<ol style="list-style-type: none"> 1. Assessment conducted (y/n); 2. # of cultural resource surveys conducted; 3. Feasibility and design study complete (y/n); 4. Grants received (y/n). 	WLA Manager/Land s Division Manager/RPM /CAMP/RES/ Wildlife Lands cultural resource specialists	<ul style="list-style-type: none"> - Conduct earthen dam assessment – addressing removal and re-v - Address road management, shoreline restoration and restore Elle - Evaluate 33 buildings, reservoir, docks, and residences for cultura
		H. Develop a strategy to resolve water supply issues on the South Puget Sound Wildlife Area by 2028.	South Puget Sound	<ol style="list-style-type: none"> 1. Assessment conducted (y/n); 2. Strategy developed (y/n); 3. Strategy implemented (y/n). 	Hatchery Division/WLA Manager/RES	<ul style="list-style-type: none"> - Assess issue and develop solutions. - Seek and secure funding. - Ensure no impacts to WPT recovery.
		I. Conduct annual shoreline cleanup of tidelands.	Union River	<ol style="list-style-type: none"> 1. Annual Clean-up conducted (y/n); 2. # of tons/yards of material removed. 	WLA Manager	<ul style="list-style-type: none"> - Coordinate with Salmon Center, WDOE work crews, and volunte
		J. Update wildlife area facility information in the centralized database quarterly	All	<ol style="list-style-type: none"> 1. Central facilities databased updated quarterly (y/n). 	WLA Manager	<ul style="list-style-type: none"> - Work with Wildlife Program GIS to update facilities information.
		K. Review and update information on the wildlife area webpages annually.	All	<ol style="list-style-type: none"> 1. Webpages reviewed and updated annually. 	WLA Manager	<ul style="list-style-type: none"> - Keep public information on the website current.
		L. Assess hazard trees on the wildlife area annually.	South Puget Sound, Nisqually, McNeil	<ol style="list-style-type: none"> 1. Assessment conducted (y/n); 2. # of hazard trees removed annually 	WLA Manager	<ul style="list-style-type: none"> - Conduct an assessment of hazard trees addressing buildings and

			Island, Union River			
12.	Maintain productive and positive relationships with local tribes.	A. Assess potential tribal shellfish opportunities on McNeil Island by 2024.	McNeil Island	1. Assessment conducted (y/n);	WLA Manager/ Shellfish Program/ Wildlife Lands cultural resource specialists	<ul style="list-style-type: none"> - Assess (DOC) potential of Tribal shell fishing harvest where suitable - Avoid sensitive seal haul out and pupping areas. - Review existing agreements between State Parks and tribes. - Evaluate whether this is consistent with the DOC Deed. - Coordinate with DNR – tidelands. - Evaluate restoration of shellfish populations - Seeding of Olympia

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Species and Habitat Management

Physical characteristics

Geology and soils

Puget Sound was formed by repeated advance and retreat of glaciers carving deep troughs and filling the lowland with glacial deposits, along with shaping due to tectonic forces. Although the last glacial retreat was between 13-16,000 years ago, Puget Sound beaches are relatively recently formed. As sea level stabilized approximately 5-6,000 years ago, the tides, winds, waves, and gravity worked the weak glacial sediments and shoreline bluffs to form the shoreline landforms and beaches seen today. The shorelines of Puget Sound continue to be subject to erosion due to the geologic history of the region and the high tidal range, despite low wave energy due to limited fetch in many locations (Finlayson 2006).

The receding Vashon glaciations deposited the sand, gravel, boulders and clay that make up the current Spanaway gravelly sandy loam soils. The terminal moraine of the Vashon glacier, just south of Olympia, slopes gently toward Puget Sound and contains many lakes and poorly drained depressions underlain by glacial drift. Franklin and Dyrness (1973) describe the soils and geology as follows: Glacial deposits range from very porous gravels and sands to a hard till in which substantial clay and silt are mixed with coarser particle. Soil texture is commonly gravelly sandy loam, and profile depth averages about one meter. Many of the units include steep topography with unstable slopes identified as geologically hazardous areas on county maps.

Underlying materials are either loose gravels and sands or hard, cemented till. In the prairie communities, soils are extremely well drained and contain very little organic matter. In estuary and wetland habitats soils are poorly drained and contain considerable amounts of organic matter (WDFW 2006).

The geology underlying the McAllister sub-basin is dominated by glacial deposits, glacial outwash, and alluvium that comprise a complex configuration of aquifers and aquitards. These sediments, and the aquifers within them extend beneath portions of the watershed to the north and south of the Nisqually Watershed (Nisqually Indian Tribe 2003).

Hydrology

The wildlife areas outlined in this management plan occur throughout Kitsap, Mason, Thurston, and Pierce counties in areas effected by major rivers and tributaries that flow into Puget Sound and Hood Canal. These units are maintained within the following Water Resource Inventory Areas (WRIA): Nisqually (WRIA 11), Chambers-Clover (WRIA 12), Kennedy-Goldsborough (WRIA 14), Kitsap (WRIA 15), and Skokomish-Dosewallips (WRIA 16) (WDFW 2006).

The Skokomish-Dosewallips Watershed, WRIA 16, is located on the eastern slope of the Olympic Peninsula, while the South Shore Sub-basin of the Kennedy Goldsborough Watershed, WRIA 14, is located just south of Hood Canal. Together, these areas make up the WRIA 16 Planning Area. On the western shore of Hood Canal, major rivers, including the Skokomish, Dosewallips, Hamma Hamma, and Duckabush, as well as many small and intermittent streams, flow from headwaters in the snow-capped Olympic Mountains down to the glacier-carved fjord of Hood Canal and the floodplains of the Skokomish River Valley.

A significant quantity of groundwater flow in the Qva (Vashon advance outwash) and Qc (pre-Vashon glacial unit) aquifers appears to converge toward McAllister/Abbott Springs and McAllister Creek in the northern portion of the McAllister Sub-basin. This aquifer is referred to as the “Nisqually Aquifer” (Nisqually Indian Tribe 2003).

The South Puget Sound - Chambers-Clover Creek Watershed (WRIA 12) extends from Commencement Bay to DuPont and includes Chambers, Clover, Spanaway, Morey, Murray, Flett, Leach, Puget, and Peach streams. Major lakes include American, Spanaway, Steilacoom, Gravelly, and Tule.

The Kitsap Watershed (WRIA 15) uplands are predominantly recharge areas in which water percolates downward to water bearing strata and eventually migrates to discharge areas. Numerous surface water drainage features, such as Gorst and Big Beef Creeks, provide internal drainage for the shallow ground water systems that occur within the uplands. The larger drainage features within or adjoining the county such as Liberty Bay, Sinclair and Dyes Inlets, Hood Canal, and Puget Sound, are predominantly regional discharge areas for the deep ground water that originates within the uplands. Much of the discharge is submerged in Hood Canal, Puget Sound, and their inlets. The Kitsap Peninsula contains a multitude of creeks, only a few of which drain extensive land areas. The largest drainages in the Water Resources Inventory Area (WRIA) include the Tahuya River, Union River, and Dewatto Creek. The Kitsap WRIA in total includes approximately 521 identified rivers and creeks providing over 665 linear miles of drainage. In general, drainages on the western side of the Peninsula are larger than those on the eastern side (Kitsap Public Utility District 1997).

Climate

The Pacific Ocean, westerly winds and the Olympic Mountains largely influence the regions climate. The region generally experiences a maritime climate characterized by mild temperatures with prolonged cloudy periods; wet, mild winters, cool, relatively dry summers; and heavy precipitation. The Kitsap Peninsula has a marine climate which is typified by short, cool, dry summers and prolonged, mild, wet winters. This seasonal variation results from the position of the Pacific High, a high-pressure air mass that varies in position seasonally along the Pacific Coast. The Pacific High reaches its northernmost position during the summer months and brings with it typically clear and sunny days. During the winter months, the Pacific High recedes to the south and is replaced by a low-pressure system associated with rainstorms which cover paths several hundred miles in width. Transitions between the wet and dry seasons occur in early fall

and late spring. Average monthly high and low temperature, and precipitation are illustrated in Figure 10 (US Climate Data 2020) (Kitsap Public Utility District 1997).

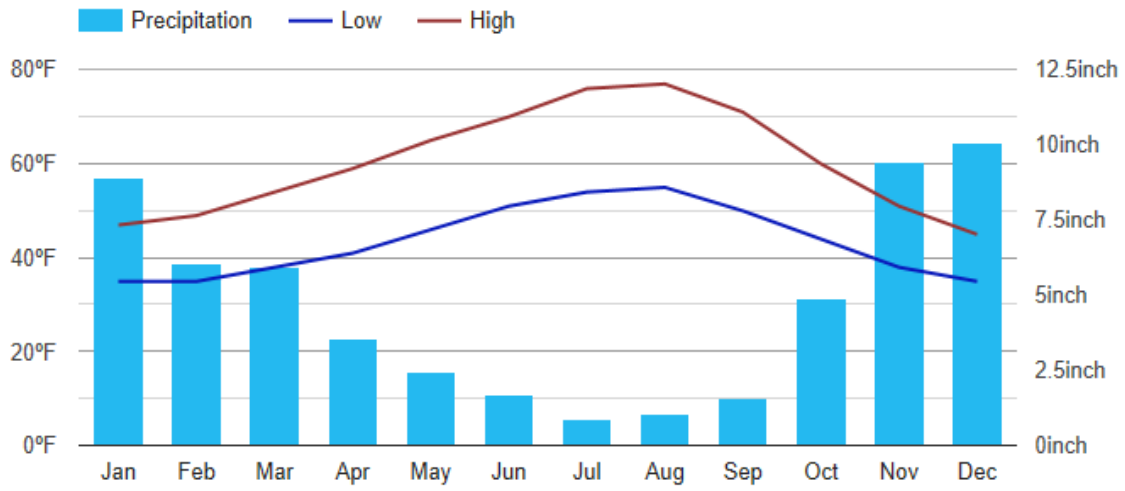


Figure 10. Bremerton, Washington average monthly high and low temperatures and precipitation (Source: U.S. Climate Data).

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Ecological Values

Ecological systems and ecological integrity

WDFW uses Ecological Integrity Assessments (EIA) and Ecological Integrity Monitoring (EIM) to track management progress on the wildlife area. Ecological integrity is defined as the ability of a system to support and maintain a community of organisms that has species composition, diversity, and functional organization comparable to those of natural habitats. EIM is a tool to evaluate ecological integrity and changes to integrity over time within priority systems and sites on the wildlife areas. The complete classification system, including descriptions of all ecological systems, can be found online at http://file.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf and summarized in the framework.

The South Puget Sound Wildlife Area includes six Ecological Systems of Concern defined by the State Wildlife Action Plan as those most imperiled in the state (Table 7).

Appendix A contains the list of Species of Greatest Conservation Need (SGCN) believed to be present on the wildlife area and their relationships with ecological systems of concern. Actions associated with maintaining and improving ecological integrity are included in the goals and objectives section (page __). These include actions to establish an ecological integrity baseline to create a monitoring plan to evaluate progress toward ecological integrity objectives over time for each of these systems.

Table 7. Ecological systems of concern on the South Puget Sound Wildlife Area

Ecological System of Concern	Units	Acres	Description
North Pacific Dry Douglas-fir Forest and Woodland	McNeil Island	1,240	Most of this system’s range is within the Puget lowlands, west slope of the Cascades and the lee side of the Olympic Mountains. The system occurs on dry soils within relatively dry to mesic climate areas west of the Cascades. They also occur on some sites that formerly supported prairies or tall shrublands with scattered trees.
North Pacific Hardwood-Conifer Swamp	Big Beef Creek, McNeil Island	124	Coniferous or hardwood tree-dominated swamps that occur in poorly drained environments with slowly moving or stagnant surface water. They are primarily found in the lowlands up to 1,500 feet elevation but also occur in montane environments west of the Cascades.
North Pacific Lowland Riparian Forest and Shrubland	Big Beef Creek, South Puget Sound, Stavis Creek, Lake	222	Riparian forests and shrublands found throughout low elevations west of the Cascades. These forests and tall shrublands are linear in character, occurring on low-elevation, alluvial

Ecological System of Concern	Units	Acres	Description
	Koeneman, Skokomish		floodplains that are confined by valleys and inlets or lower terraces of rivers and streams. Annual flooding is a key ecological process which results in a diversity of patch types such as woodlands, shrublands, wet meadows, and marshes.
Temperate Pacific Freshwater Emergent Marsh	South Puget Sound, Lake Koeneman, Big Beef, Skokomish	20	This small patch ecological system is found at all elevations below timberline throughout the temperate Pacific Coast. However, the dynamic hydrological regimes, high nutrient status, and relatively warm growing season of lowlands in western Washington make this system more abundant at lower than at higher elevations. These semi-permanently to permanently flooded wetlands are dominated by emergent herbaceous species, mostly tall graminoids with some forbs.
Temperate Pacific Tidal Salt and Brackish Marsh	McNeil Island, Union River	170	Coastal salt and brackish marshes found in large bays on the outer coast and around the waters of the Puget Sound. Occurrences are confined primarily to intertidal portions of estuaries, coastal lagoons, and bays, and behind sand spits or other locations protected from wave action. Vegetation usually occurs as a zonal mosaics of multiple communities due to variation in daily and seasonal dynamics of freshwater input balanced against evaporation and tidal flooding of saltwater.
North Pacific Oak Woodland	South Puget Sound	11	This is a large and small patch system which occurs primarily in the Puget Trough and Willamette Valley. In Washington, this oak woodland is most abundant on gravelly outwash plains in Thurston and Pierce counties but is found on dry sites that experienced frequent pre-settlement fires in other parts of the Puget Trough, especially within the rain shadow of the Olympic Mountains.

Wetlands

The South Puget Sound Wildlife Area contains a unique diversity of intertidal and fresh-water wetlands. Collectively, the wildlife area units provide important examples of the variety of

wetlands found in western Washington, including the Puget Sound nearshore, intertidal mudflats and marshes, estuary deltas, seasonal freshwater wetlands, riparian creeks, beaver ponds, and small lakes. Wetlands serve as the transition between aquatic and terrestrial systems. The combination of physical, biological, chemical processes, and conditions interact to provide important, and often critical habitat function supporting life history requirements for a variety of plants, invertebrates, fish, and wildlife.

Wetlands provide many critical functions, including providing water storage, aquifer recharge, food resources, protection from the elements and predators, and contributing to a network of sites relied upon every year. The dynamic nature of intertidal areas that experience two cycles of wetting and drying every day creates an opportunity for certain plants to establish, invertebrates to colonize, and places for other fish and animals to find food, some at critical moments of their annual life cycle. The network of channels and sloughs that wind through mudflat and vegetated marsh provide critical navigation pathways for fish, but also serve a protective function for birds to take shelter from high winds or to evade predators seeking their meal. Freshwater wetlands types provide critical food resources to migratory birds and anadromous fish during critical growth and development stages of their annual life cycle. For example, wood duck and hooded merganser use nutrients derived from invertebrates in spring for development of their eggs, reductions in the amount or quality of this seasonally available food would lead to lower clutch sizes (fewer eggs) or abandonment of nesting attempts (fewer nesting females).

While intertidal wetlands have the ability to maintain themselves, with development, freshwater wetland types have become fragmented and isolated, and the natural processes that provide a critical “reset” of wetland succession more limited. Several species such as Oregon spotted frog and western pond turtle, that rely on more inland freshwater wetland types, have been heavily impacted by development and loss of seemingly small wetland acreage, specifically because those processes to maintain and reset wetlands are interrupted. Wetlands also provide over-wintering and rearing habitat for juvenile salmonids, especially coho, cutthroat, and steelhead.

As wetland types become impacted or influenced by human activities, concerns over habitat degradation, fragmentation, and loss rise. Concerns include contamination, disruption of food webs, loss of seasonally critical functions, invasive species, all increasing the need for active management and restoration or enhancement activities to keep these systems productive.

The South Puget Sound Wildlife Area would benefit from a full inventory and delineation of wetland types. Species lists should be made in associations with these types found on the different units of the wildlife area. This would not only assist conservation planning efforts but provide an informative outreach tool for recreational users.

Habitat connectivity

The South Puget Sound Wildlife Area is comprised of relatively small, dispersed, and distinct units. Most Species of Greatest Conservation Need verified to occur in these units are small and have low mobility. These include a few wetland obligate vertebrates (e.g., Oregon spotted frog and western

pond turtle). Though these species do not move far, they nonetheless require connected habitat for dispersal (e.g., between breeding areas and permanent water) and for genetic interchange with neighboring populations. The lack of enough connected habitat, even at fine a scale, reduces the chance that a population of species on the wildlife area will persist. WDFW has published recovery plans (Hallock 2013 and Hays et. Al 1999) for a few of the sensitive species verified on the wildlife area, some of which includes information useful for managing habitat connectivity.

One of the primary challenges to maintaining connectivity in this landscape is development, as well as conversions of habitat for new development. This is particularly true for the Nisqually and South Puget Sound units in the highly fragmented urban and suburban landscapes of Pierce and Thurston County. This fragmentation inhibits the movements of sensitive, low mobility species, and increases conflicts between people and larger more mobile species, such as bear. Future development will only exacerbate this problem.

To address habitat fragmentation, the department should work with local conservation partners, and local governments to identify and map potential habitat linkages on and around the wildlife area as well as areas with potential for improving connectivity through habitat enhancements and restoration. In some instances, maintaining connectivity for sensitive species on the wildlife area will require considerations of adjacent lands. This includes building and maintaining relationships to gain support for work that can help sustain or enhance connectivity across ownerships. It also requires collaboration with our conservation partners to identify lands to pursue for acquisitions or conservation easements due to their habitat connectivity value.

A local group is developing a finer scale connectivity analysis of western Washington that will cover the entire wildlife area. Once complete, this [Coastal Washington Connectivity Analyses](#) will be at a fine enough scale to guide many activities in western Washington, including projects in and around the South Puget Sound Wildlife Area. Once complete, the Coastal Washington Connectivity Analyses will serve as a useful resource to identify areas in and around the wildlife area that have high connectivity value.

Species management

Overview

The Wildlife Area Management Planning Framework describes how species are classified – including species listed at the state or federal level as threatened or endangered, state sensitive and candidates, and other species of conservation concern, including WDFW’s Species of Greatest Conservation Need (SGCN). SGCN species are described in the 2015 State Wildlife Action Plan (<https://wdfw.wa.gov/species-habitats/at-risk/swap>). Table 9 describes the state and federal conservation status for species that may occur on the South Puget Sound Wildlife Area.

The South Puget Sound Wildlife Area supports a broad range of game and diversity or non-game species. The wildlife area supports various wintering waterfowl concentrations (Nisqually, Union River, Skokomish, and Lake Koeneman units), a population of western pond turtles (South Puget Sound), and one of the largest harbor seal haul-out sites in Puget Sound (McNeil Island). The wildlife area is also home to the federally threatened Oregon spotted frog, Chinook salmon, chum, steelhead, bull trout, and marbled murrelet.

The wildlife area is within the historic or potential range of other species of birds, reptiles, amphibians, and invertebrates listed in the Table 8.

Table 8. State and federal conservation status, SGCN inclusion, WDFW Priority Habitats and Species (PHS) criteria and priority areas for species that may occur on the South Puget Sound Wildlife Area

Common Name	Scientific Name	Federal/State Status/SGCN/PHS	Wildlife Area Unit
Birds			
American white pelican	<i>Pelecanus erythrorhynchos</i>	SGCN	Nisqually, Skokomish
Bald eagle	<i>Haliaeetus leucocephalus</i>	SGCN	All
Band-tailed pigeon	<i>Columba fasciata</i>	SGCN, PHS	All
Barrow's goldeneye	<i>Bucephala islandica</i>	SGCN, PHS	Nisqually, South Puget Sound, Union River, Skokomish, McNeil Island, Big Beef Creek, Lake Koeneman
Black scoter	<i>Melanitta nigra</i>	SGCN	Nisqually, McNeil Island, Union River, Skokomish
Brown pelican	<i>Pelecanus occidentalis</i>	SGCN, PHS	Nisqually, McNeil Island,
Caspian tern	<i>Sterna caspia</i>	PHS	Nisqually

Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead, Hooded Merganser		PHS	Nisqually, South Puget Sound, Big Beef, and Lake Koeneman
Cinnamon teal	<i>Spatula cyanoptera</i>	SGCN	Nisqually, Skokomish, Union River
Clark's grebe	<i>Aechmophorus clarkii</i>	SGCN	Nisqually, McNeil Island, Skokomish
Common loon	<i>Gavia immer</i>	SS, SGCN, PHS	Nisqually, Big Beef Creek, McNeil Island, Skokomish, South Puget Sound, Lake Koeneman, Union River
Golden eagle	<i>Aquila chrysaetos</i>	SGCN, PHS	Nisqually, Union River
Green heron	<i>Butorides virescens</i>	PHS	Nisqually, South Puget Sound
Great blue heron	<i>Ardea herodias</i>	PHS	Nisqually, South Puget Sound, McNeil Island, Skokomish, Big Beef Creek, Lake Koeneman, Stavis Creek
Great egret	<i>Andea alba</i>	PHS	Nisqually
Harlequin duck	<i>Histrionicus Histroinicus</i>	SC, SGCN	Nisqually, Skokomish, McNeil Island, South Puget Island
Lewis's woodpecker	<i>Melanerpes lewis</i>	SGCN	Nisqually
Loggerhead shrike	<i>Lanius ludovicianus</i>	SGCN, PHS	Nisqually
Long-tailed duck	<i>Clangula hyemalis</i>	SGCN	Nisqually, Skokomish, McNeil Island, South Puget Sound
Marbled godwit	<i>Limosa fedoa</i>	SGCN	Nisqually, Skokomish, South Puget Sound, Union River
Marbled murrelet	<i>Brachyramphus marmoratus</i>	FT, SE, SGCN, PHS	Nisqually, Big Beef Creek, McNeil Island, Skokomish, South Puget Sound
Mountain quail	<i>Oreortyx pictus</i>	PHS	Nisqually, Big Beef Creek, Skokomish, Stavis Creek, Union River
Northern spotted owl	<i>Strix occidentalis</i>	FT, SE, SGCN, PHS	Historic - Skokomish, Big Beef Creek, Stavis Creek
Oregon vesper sparrow	<i>Poocetes gramineus affinis</i>	SC, SGCN, PHS	Nisqually, McNeil Island, South Puget Sound
Peregrine falcon	<i>Falco peregrinus</i>	SGCN	Union, Skokomish, Big Beef,
Pileated woodpecker	<i>Dryocopus pileatus</i>	SC, PHS	Nisqually, Big Beef, Lake Koeneman
Purple martin	<i>Progne subis</i>	SGCN	All
Red knot	<i>Calidris canutus</i>	SGCN	Nisqually, Union River

Red-necked grebe	<i>Podiceps grisegena</i>	SGCN	Nisqually, McNeil Island, Skokomish, South Puget Sound, Union River, Lake Koeneman
Sandhill crane	<i>Antigone canadensis</i>	SGCN, PHS	Nisqually, Union River
Shorebird concentrations		PHS	Nisqually, Skokomish, South Puget Sound
Short-eared owl	<i>Asio flammeus</i>	SGCN	Nisqually, Skokomish, South Puget Sound, Union River
Slender-billed white-breasted nuthatch	<i>Sitta carolinensis aculeata</i>	SC, SGCN, PHS	Nisqually, South Puget Sound
Snowy owl	<i>Nyctea scandiaca</i>	PHS	Nisqually
Streaked horned lark	<i>Eremophila alpestris strigata</i>	FT, SE, SGCN, PHS	Nisqually, South Puget Sound, Union River
Surf scoter	<i>Melanitta perspicillata</i>	SGCN	Nisqually, Skokomish, South Puget Sound, McNeil Island, Union River
Waterfowl concentrations		PHS	Nisqually, South Puget Sound, McNeil Island, Big Beef Creek, Skokomish, Union, Lake Koeneman, Stavis Creek
Western bluebird	<i>Sialia mexicana</i>	SGCN	All
Western grebe	<i>Aechmophorus occidentalis</i>	SGCN, PHS	Nisqually, Big Beef Creek, Skokomish, South Puget Sound, McNeil Island, Union River, Lake Koeneman
Western high Arctic brant	<i>Branta bernicla</i>	SGCN, PHS	Nisqually, McNeil Island
Western screech owl	<i>Megascops kennicottii</i>	SGCN	Nisqually, Big Beef Creek, South Puget Sound
White-winged scoter	<i>Melanitta fusca</i>	SGCN	Nisqually, Skokomish, South Puget Sound, McNeil Island, Union River,
Wood duck	<i>Aix sponsa</i>	PHS	Nisqually, Big Beef Creek, Lake Koeneman
Nonbreeding concentrations of: Loons, Grebes, Cormorants, Fulmar, Shearwaters, Storm-petrels, Alcids		PHS	Nisqually, McNeil Island
Nonbreeding concentrations of: Barrow's Goldeneye, Common Goldeneye, Bufflehead		PHS	Nisqually

Nonbreeding concentrations of: Charadriidae, Scolopacidae, Phalaropodidae		PHS	Nisqually
Mammals			
Dall's porpoise	<i>Phocoenoides dalli</i>	PHS	Nisqually, McNeil Island
California sea lion	<i>Zalophus californianus</i>	PHS	Nisqually, McNeil Island, Skokomish, Union River
Cascade red fox	<i>Vulpes vulpes cascadenis</i>	SGCN, PHS	Nisqually?
Columbian black-tailed deer	<i>Odocoileus hemionus columbianus</i>	PHS	All
Elk	<i>Cervus elaphus</i>	PHS	Skokomish
Fisher	<i>Pekania pennanti</i>	SGCN	Skokomish
Harbor seal	<i>Phoca vitulina</i>	PHS	Nisqually, McNeil Island, Skokomish, Union River
Hoary bat	<i>Lasiurus cinereus</i>	SGCN	All
Keen's myotis	<i>Myotis keenii</i>	SGCN, PHS	All
Killer whale (southern residents only)	<i>Orcinus orca</i>	FE, SE	Nisqually, McNeil Island, Skokomish, Union River
Pacific harbor porpoise	<i>Phocoena phocoena</i>	SC	Nisqually, McNeil Island, Skokomish, Union River
Pacific marten	<i>Martes caurina caurina</i>	SGCN	
Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		PHS	South Puget Sound, Big Beef Creek
Sea otter	<i>Enhydra lutris</i>	FT, SE	McNeil Island, Nisqually
Silver haired bat	<i>Lasionycteris noctivagans</i>	SGCN	Nisqually, Big Beef Creek, McNeil Island, Skokomish, South Puget Sound, Stavis Creek, Union River, Lake Koeneman
Steller's sea lion	<i>Eumetopias jubatus</i>	PHS	Nisqually, McNeil, Skokomish, and Union River
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SC, SGCN, PHS	All
Western gray squirrel	<i>Sciurus griseus</i>	ST, SGCN, PHS	Nisqually, South Puget Sound

Western spotted skunk	<i>Spilogale gracilis</i>	SGCN	All
Reptiles			
Northern alligator lizard	<i>Elgaria coerulea</i>	PHS	McNeil Island
Western fence lizard	<i>Sceloporus occidentalis</i>	PHS	McNeil Island
Western pond turtle	<i>Actinemys marmorata</i>	SE, SGCN, PHS	South Puget Sound
Western terrestrial garter	<i>Thamnophis elegans</i>	PHS	Nisqually
Western toad	<i>Anaxyrus boreas</i>	PHS	All
Amphibians			
Cope's giant salamander	<i>Diacamptodon copei</i>	SGCN	Skokomish
Long-toed salamander	<i>Ambystoma macrodactylum</i>	PHS	Nisqually
Northwestern salamander	<i>Ambystoma gracile</i>	PHS	Nisqually
Olympic torrent salamander	<i>Rhyacotriton olympicus</i>	SGCN	Skokomish
Oregon spotted frog	<i>Rana pretiosa</i>	FT, SE, SGCN, PHS	South Puget Sound
Pacific treefrog	<i>Pseudacris regilla</i>	PHS	McNeil Island
Red-legged frog	<i>Rana aurora</i>	PHS	McNeil Island
Roughskin newt	<i>Taricha granulosa</i>	PHS	South Puget Sound, McNeil Island
Van Dyke's salamander	<i>Plethodon vandykei</i>	SGCN, PHS	Skokomish
Fishes			
Bull Trout/Dolly varden	<i>Salvelinus confluentus/S. malma</i>	FT, SC, SGCN, PHS	Nisqually, Skokomish, South Puget Sound
Chinook	<i>Oncorhynchus tshawytscha</i>	FT, SC, SGCN, PHS	Nisqually, South Puget Sound, Skokomish, Union River, Big Beef Creek, Lake Koeneman
Chum	<i>Oncorhynchus keta</i>	FT, SC, PHS	All
Coastal resident searun cutthroat	<i>Oncorhynchus clarki clarki</i>	PHS	Nisqually, South Puget Sound, Skokomish, Union, Big Beef, Lake Koeneman, Stavis

Coho salmon	<i>Oncorhynchus kisutch</i>	PHS	Nisqually, South Puget Sound, Skokomish, Union, Big Beef, Lake Koeneman, Stavis
Kokanee	<i>Oncorhynchus nerka</i>	PHS	South Puget Sound
Olympic mudminnow	<i>Novumbra hubbsi</i>	SS, SGCN, PHS	South Puget Sound
Pacific herring	<i>Clupea pallasii</i>	SGCN, PHS	McNeil Island, Big Beef Creek, Stavis Creek, Union River
Pacific lamprey	<i>Entosphenus tridentatus</i>	PHS	Lake Koeneman
Pacific sand lance	<i>Ammodytes personatus</i>	SGCN, PHS	Nisqually, McNeil Island
Pink salmon	<i>Oncorhynchus gorbuscha</i>	PHS	Nisqually, Skokomish, South Puget Sound, Union River
Rainbow trout	<i>Oncorhynchus mykiss</i>	PHS	Nisqually, South Puget Sound, Skokomish, Union River, Big Beef Creek
Sea-run coastal cutthroat	<i>Oncorhynchus clarki clarki</i>	PHS	Lake Koeneman
Sockeye salmon	<i>Oncorhynchus nerka</i>	SC, PHS	Nisqually, Skokomish, South Puget Sound
Surf smelt	<i>Hypomesus pretiosus</i>	SGCN, PHS	Nisqually, McNeil Island, Union
Steelhead	<i>Oncorhynchus mykiss</i>	FT, SC, SGCN, PHS	Nisqually, South Puget Sound, Skokomish, Union River, Big Beef Creek, Lake Koeneman, Stavis Creek
White sturgeon	<i>Acipenser transmontanus</i>	PHS	Union
Invertebrates			
Beller's ground beetle	<i>Agonum belleri</i>	SC, SGCN, PHS	Big Beef
Butter clam	<i>Saxidomus giganteus</i>	PHS	Nisqually, McNeil Island
Dungeness crab	<i>Metacarcinus magister</i>	PHS	Nisqually, Skokomish, Union, McNeil Island, Big Beef
Hardshell clam	<i>Mercenaria mercenaria</i>	PHS	Skokomish, McNeil Island, Union, Big Beef
Manila littleneck clam	<i>Venerupis philippinarum</i>	PHS	Nisqually, McNeil Island
Mardon skipper	<i>Polites mardon</i>	SGCN, PHS	Nisqually
Native littleneck clam	<i>Leukoma staminea</i>	PHS	Nisqually, McNeil Island

Oyster beds		PHS	Skokomish, Union
Pacific geoduck	<i>Panopea generosa</i>	PHS	Nisqually, McNeil Island
Pandalid shrimp	<i>Pandalus spp.</i>	PHS	Nisqually, Skokomish
Puget blue	<i>Icaricia icarioides blackmorei</i>	SC, SGCN, PHS	South Puget Sound?
Slider	<i>Trachemys scripta</i>	PHS	Nisqually
Taylor's checkerspot	<i>Euphydryas editha taylori</i>	FE, SE, SGCN, PHS	South Puget Sound historic
Valley silverspot	<i>Speyeria zerene bremnerii</i>	SC, SGCN, PHS	Nisqually, South Puget Sound, Union River, Lake Koeneman
Western pearlshell	<i>Margaritifera falcata</i>	SGCN	Big Beef
Plants			
Bog Clubmoss	<i>Lycopodiella inundata</i>	WHNP SSC	Big Beef Creek
Giant chain fern	<i>Woodwardia fimbriata</i>	WHNP	Skokomish
Oregon white oak	<i>Quercus garryana</i>	PHS	South Puget Sound
White top aster	<i>Sericocarpus rigidus</i>	WHNP	South Puget Sound

Abbreviations:

State endangered (SE), State threatened (ST), State Sensitive (SS), State Candidate for listing (SC), Federal endangered (FE), Federal Threatened (FT), Federal candidate (FC), Species of Greatest Conservation Need (SGCN); Washington Natural Heritage Program - DNR Natural Heritage – Species of Special Concern (SSC).

Game species overview and management

The South Puget Sound Wildlife Area supports several game species, including black-tailed deer, black bear, cougar, bobcat, coyote, eastern cottontail, snowshoe hare, and multiple waterfowl species. Furbearers including river otter and beaver, mink, weasel, and bobcat are also present. Management guidance for these species is provided by the WDFW's 2015-2021 Game Management Plan (<https://wdfw.wa.gov/publications/01676>) with the primary goals of supporting sustainable populations and recreational opportunities. Although the wildlife area provides important habitat for many of these species, management guidance is generally at a larger scale, whether Game Management Unit, statewide, or flyway, of which the wildlife area represents only a small part.

Band-tailed Pigeon

The Pacific Coast subspecies of band-tailed pigeon (*Patagioenas fasciata monilis*) breeds in Washington and winters in California. They inhabit coniferous forests, traveling long distances based on food availability. Their diet includes buds, flowers, and fruits of deciduous trees and shrubs, especially oak, madrone, elderberry, dogwood, cherry, cascara, and huckleberry, varying seasonally and by location. They typically nest within closed-canopy conifer or mixed hardwood-

conifer stands. In the summer, adults frequently visit natural springs, creek beds, water bodies, or shorelines high in sodium where they drink and peck at the soil between long periods of roosting in nearby trees.

In Washington, mineral sites are found in estuarine and inland environments, but WDFW knowledge of specific sites is limited. The Nisqually Unit is adjacent to a known estuarine mineral site currently used by band-tailed pigeons. A mineral site survey is conducted annually by WDFW staff members on the Nisqually Unit in cooperation with the USFWS National Wildlife Refuge. Mineral site surveys are used as the official index for the Pacific Coast population of band-tailed pigeons. They determine management thresholds and hunting season closure thresholds. These data are included in Game Status and Trend reports which are published annually by the Department located here: <https://wdfw.wa.gov/hunting/management/plans>.

Black-tailed deer

Black-tailed deer (*Odocoileus hemionus columbianus*) range throughout western Washington, including the South Puget Sound Wildlife Area. Black-tailed deer in Washington are non-migratory, often occupying a core area less than ½ square mile throughout the year; however, larger movements have been documented for some deer associated with seasonal migrations, weather, the breeding season, and dispersal (Rice 2012; Brown 1961; McCorquodale 1999). Although estimates of abundance are not available, black-tailed deer are present on all units of the wildlife area where suitable habitat exists.



Black-tail deer doe and fawns. Photo by Dyanna Lambourn.

Black-tailed deer are habitat generalists, occupying a diverse range of habitat types from alpine meadows to coastal forests, marine estuaries, and even urban environments. As long as food, shelter and cover needs are met black-tailed deer may be present. They consume a variety of browse including coniferous and deciduous trees, woody shrubs, forbs, lichens, and some grasses.

Additional foods include mushrooms, acorns, berries, fruit, and various non-native agricultural crops, and decorative plants.

Black-tailed deer management goals are to maintain productive populations, while providing for multiple uses, including recreational, educational, aesthetic, and a sustainable annual harvest (WDFW 2015). Hunting regulations are set for Game Management Units (GMUs) or Deer Areas, which are smaller sub-sets of one or more GMUs. The South Puget Sound Wildlife Area contains several small parcels distributed in five GMUs, which lie in the Olympic (GMUs 627, 633, and 636) and South Cascades black-tailed deer management zones (GMUs 652 and 666). Although deer hunting opportunities at the GMU level may not be representative of the wildlife area, hunting seasons in these GMUs generally provide liberal buck hunting and a conservative antlerless harvest.

Annually, the Department publishes Game Status and Trend reports for each black-tailed deer management zone, which can be found at (<https://wdfw.wa.gov/hunting/management/plans>). Additional information about deer harvest can be found in game harvest reports located at (<https://wdfw.wa.gov/hunting/management/game-harvest>). For a description of hunting regulations, see the annual Big Game Hunting Seasons and Regulations Pamphlet (<https://wdfw.wa.gov/hunting/regulations/big-game>).

Waterfowl

Waterfowl are most abundant in Puget Sound during the fall and winter, with important concentration areas during the spring. Common dabbling ducks include northern pintail, American wigeon, gadwall, mallard, green-wing teal, and northern shoveler. Cinnamon teal and blue-wing teal may be present on Nisqually, Skokomish, and Union units, but in very low numbers during migration periods. Wood ducks are common on freshwater lakes and ponds, and nest locally in cavities (natural or man-made) associated with more permanent water (e.g. beaver ponds). Species of diving ducks, including greater and lesser scaup, and ring-necked ducks, being the most common, make use of submerged aquatic vegetation, benthic invertebrates and bivalve beds for forage either in nearshore habitats of the Puget Sound or forested ponds such as those found on Big Beef Creek Unit. Canvasback and redhead ducks are few and rarely encountered on the wildlife area except near the Skokomish Unit. Ruddy ducks are consistently seen each winter in the south end of Hood Canal not far from the Union River Unit; although we expect use of the wildlife area to be minimal, they may occasionally be seen. Sea ducks, including surf-, white-winged and black scoters, Barrow's and common goldeneye are commonly found along marine shorelines foraging on benthic invertebrates and bivalves. Regions that provide protection from intense winds and waves during the winter and areas providing low disturbance minimizing flight provide valuable refugia to sea ducks. Long-tailed and harlequin ducks are both present, but depend on specific habitat characteristics, with long-tailed duck preferring deeper waters relative to the other sea duck species, and harlequin duck dependent upon rocky shoreline for roosting out of the water around such as areas found near Nisqually and McNeil Island units. Common and hooded mergansers can be found on both fresh and saltwater, while red breasted mergansers are the most numerous of the merganser species and would be seen in winter on saltwater, often associated with freshwater inflows (mixing zones) such as around the Skokomish, McNeil Island, and Union River units.

Two subspecies of Canada geese are most likely to be found on the wildlife area, western and lesser, with possible occurrence of the dusky Canada goose during migration periods. Two subspecies of cackling geese, Taverner's and "cacklers" (or small cackling goose) may also be encountered, particularly in areas adjacent to grazed fields or managed wetlands, such as near the Nisqually Unit. White-fronted and lesser snow geese can also occasionally be encountered, but not in any significant number and are likely in transit during migration periods. Although their presence on the wildlife area will be infrequent, black brant are present in Puget Sound and Hood Canal in winter and build in numbers during the spring, particularly near the Nisqually and McNeil Island Units, as they are highly associated with and dependent upon eelgrass (*Zostera marina*) beds, shorelines with sea lettuce (*Ulva sp.*), and sandbars for preening and the acquisition of grit necessary for digesting plant material. Trumpeter swans may be seen in the winter at Nisqually, Union, and Skokomish, and in the summer at Big Beef. Tundra swans may also be seen, but only as fall migrants.

The Department conducts surveys of wintering waterfowl throughout Puget Sound and Hood Canal, as well as, surveys for breeding waterfowl in the spring across the state. Periodically, operational banding of certain waterfowl species occurs on or closely associated with the wildlife area. These data are included in Game Status and Trend reports which are published annually by the Department found at: (<https://wdfw.wa.gov/hunting/management/plans>). Distribution and density maps of several waterfowl species are also provided on-line at: (<https://wdfw.wa.gov/species-habitats/at-risk/species-recovery/seabirds/surveys-winter-aerial>). Additional information about waterfowl harvest can be found in annual game harvest reports under the small game section located at (<https://wdfw.wa.gov/hunting/management/game-harvest>). For a description of hunting regulations, see the annual Waterfowl Hunting Seasons and Regulations Pamphlet (<https://wdfw.wa.gov/hunting/regulations/>).

Wildlife Diversity Species Overview and Management

The South Puget Sound Wildlife Area supports a broad range of diversity or non-game species. Marine mammals, including harbor seals, California sea lions, and Steller sea-lions use the Nisqually, McNeil Island, Skokomish, and Union River units. Marine birds can be locally and seasonally abundant, as the greater Puget Sound Region provides one of the largest bodies of inland marine environments in the Pacific Flyway important for these migratory species. Some of the more common marine birds that can be seen on the wildlife area include double-crested, pelagic, and Brandt's cormorants, common loon, red-throated loon, pigeon guillemot, red-necked, horned, and eared grebes. Shorebirds would be locally abundant in some locations of the wildlife area with the most common species being western sandpiper, least sandpiper, dunlin, and killdeer. The Nisqually, McNeil Island, Skokomish, Lake Koeneman, and Union River units likely support the greatest number of shorebirds. Other bird species include great blue herons, bald eagles, osprey, red-tailed hawks, northern harrier, barred owl, great-horned owl, and a great variety of neo-tropical migratory songbirds.

The Department conducts surveys for wintering marine birds throughout Puget Sound and Hood Canal annually. Species accounts survey data is available on the Department's website at: (<https://wdfw.wa.gov/species-habitats/at-risk/species-recovery/seabirds/surveys-winter-aerial>).

Most notably, this Wildlife Area supports the largest harbor seal haul-out site in Puget Sound, a population of Oregon spotted frogs, western pond turtles, and purple martins.

Harbor Seals

Harbor seals (*Phoca vitulina*) are the most abundant marine mammal in Washington State. They are year-round residents typically use shoreline habitat to haul out to rest, thermoregulate and give birth. Seal numbers typically increase at haul outs/rookery sites during annual pupping, breeding, and molt cycles. The Washington Department of Fish and Wildlife's Atlas of Seal and Sea Lion Haulout Sites in Washington (Jeffries et al. 2000) lists the locations of haul out sites throughout Washington state (<https://wdfw.wa.gov/sites/default/files/publications/00427/wdfw00427.pdf>).

Located on the north side of McNeil Island, Gertrude Island is home to the largest harbor seal rookery in south Puget Sound. The highest numbers of seals are recorded during moderate low afternoon tides when disturbance is low at Gertrude Island with fewer deer, coyotes, and eagles present. Additionally, during summer months, human disturbance increases at publicly accessible locations near Marine State Parks - Eagle Island and Cutts Island. Still Harbor is closed to public access and Gertrude Island is the only rookery in south Puget Sound where the harbor seal population is relatively free from human disturbance. Seals also utilize the dock and floats in Still Harbor, beaches from Hyde point to Baldwin Point, various coves and rocks around McNeil Island, the barge landing area, and the main dock during higher tides especially during the summer when peak pupping occurs.



Harbor seal with pup on Gertrude Island – McNeil Island Unit. Photo by Dyanna

Harbor seals were first recorded using Gertrude Island in 1948. Historically, the first newborn harbor seal pup births were reported the first week in August at Gertrude Island and pups were reportedly weaned by mid-October. Historic pupping at other locations in South Puget Sound was

reported to start around the first week in July. In recent years, peak pupping has shifted almost a month earlier with the first live healthy harbor seal pups at Gertrude Island reportedly born during the first week of July, with pupping continuing until the last births in mid-August. This phenology is consistent with the other haulouts in south Puget Sound. The number of pups observed on Gertrude Island increased from 27 in 1976, to over 100 pups in recent years. Harbor seal pups generally nurse at four to six weeks with most pups at Gertrude Island weaned by mid-September. Following pupping season, their annual molt cycle begins and continues into December.

Harbor seals at Gertrude Island have been studied as part of numerous research projects since the 1960's. Gertrude Island was chosen as the primary haulout for studies because of its accessibility; it is the largest haulout in south Puget Sound; and public access is restricted. For a complete list of research projects see Appendix F.

Harbor seals also utilize shoreline, docks, and floats at Nisqually, Skokomish, and Union rivers to haul out and as rookery areas. Unlike south Puget Sound, in Hood Canal the greatest number of seals can be seen hauled out during high tide. The start of pupping is slightly later with pups starting in mid-July.

Oregon Spotted Frog

The Oregon spotted frog is a medium-sized aquatic frog endemic (native or restricted to a certain area) to the Pacific Northwest. They are communal breeders that return to the same breeding areas each year. They require breeding sites in shallow water with short vegetation and full sun exposure with aquatic connectivity to permanent water (Hallock 2013). The Oregon spotted frog was listed as state endangered in 1997 and USFWS listed it as threatened under the Endangered Species Act in 2014.



Oregon spotted frog. Photo by Alan L. Bauer.

Population declines are attributed to multiple factors including wetland loss and alteration, loss of disturbance processes, hydrological changes, and the introduction of non-native species (e.g. reed canary grass, bullfrogs, game fish). The specific life history traits and habitat requirements of the Oregon spotted frog limits their distribution and makes them vulnerable to changes in habitat. Their breeding habitat is rapidly lost to invasive grasses without active management to reduce cover and maintain sun exposure, such as grazing, haying, mowing, or restoration to native flora and their dispersal is limited to aquatic corridors restricting their dispersal (Hallock 2013).

Oregon spotted frogs in Washington are not expected to recover without active conservation. Habitat management is essential to the recovery of this species. In addition, searching for new breeding sites throughout their range needs to continue. Surveys of all known breeding areas in 2012 found a total of 3,684 egg masses, which corresponds to a total population estimate of 7,368 breeding adults for Washington (Hallock 2013). Since then, additional breeding areas have been located; this species was confirmed on the South Puget Sound Unit in 2018. Egg mass surveys conducted in 2019 found a total of 73 egg masses corresponding to a total of 146 breeding adults at the South Puget Sound Unit.

Purple Martin

Purple martins are insectivores that nest in cavities throughout eastern North America and along the Pacific Coast, including within the Puget Sound. In Washington, purple martins are reported to nest primarily in artificial structures, historically, they likely bred in old woodpecker cavities in large dead trees. The population is estimated at about 600 within Washington, including 400 in the Puget Trough, but comprehensive monitoring is lacking to verify (WDFW 2015). Threats to purple

martins include habitat loss, competition for nesting cavities from European starlings and house sparrows, and the broad use of pesticides.

To promote and protect purple martin populations, snags, especially ones near water, and old pilings should be retained. In addition, installing and maintaining artificial nesting structures is another tool where natural nesting structures are not available (Hays and Milner 2003). Currently, there are approximately four purple martin boxes located on McNeil Island, and a dozen located on the Nisqually units.

Purple martins were removed from the Priority Habitat and Species list in 2018. However, their dependence on humans by having to provide nest structures requires ongoing intervention. Conducting proper nest box maintenance and adding additional nesting structures, both natural and artificial, where feasible will provide continued support to purple martin populations.

Western Pond Turtle

In the 1990s, only two populations of western pond turtle remained in Washington State and the Puget Sound population was effectively extirpated. In 1994, the first western pond turtle recovery site was established at the South Puget Sound Unit as part of a Pierce County Public Works wetland mitigation project. The turtle recovery site consists of a 12-acre compound within the wildlife area



Western pond turtles. South Puget Sound Unit. Photo by Alan L. Bauer

including a 3-acre wetland with adjacent grass uplands. Three ponds were dug from an existing spring seep. Native trees and shrubs were planted along the pond margins and the entire area was fenced. A nesting hill was created from fill and project debris at the southwest corner of the pond complex.

WDFW, with conservation partners from the Woodland Park Zoo, established a captive breeding and head-start program to establish and grow this population. In 1996, an initial release of 16 turtles from the breeding program at Woodland Park Zoo occurred consisting of 15 offspring of captive breeding stock (14 females, one male) and one wild adult male. In 2010, the captive breeding program was suspended in order to focus efforts on the head-start program, which involved collecting eggs or hatchlings to be reared at the zoo for one to two years until they are roughly the size of a 3-year old. From 1996 – 2019, WDFW released a total of 629 turtles through these programs. The population census peaked in 2015 with 245 individual turtles trapped at the South Puget Sound Unit. Only 185 individual turtles were trapped in 2020, but a high of 226 individual turtles were counted during basking surveys in June of 2020 (Butler and Tirhi 2020).

This population met the recovery objective of having a population of more than 200 turtles in 2015. Changes within the census methods from 2015 and 2019 will be evaluated to address the drop in the number of turtles captured in 2019. Natural recruitment does occur at the site, but it cannot yet sustain the population without population augmentation. This site is also the main source of hatchlings used to establish the Mason County population and is a potential main source of hatchlings for the establishment of a needed third site within the Puget Sound.

Many issues remain for the recovery of this species. Habitat loss and degradation due to invasive plant species and pond succession are ongoing concerns at the South Puget Sound Unit. The habitat is actively managed to control invasive plant species in both the aquatic and upland habitats. The ponds and nesting hill were created specifically for western pond turtle recovery and both require maintenance to maintain quality habitat. Mammalian predation on nests prevents natural recruitment of hatchlings. Disease has also emerged as a major concern in recent years with the discovery of shell disease affecting a substantial number of turtles. The cause of the disease is under investigation but is not yet known (WDFW 2017).

Fish Management

The South Puget Sound Wildlife Area's eight units are located geographically to the east of the Olympic Mountains near the Olympic Peninsula, adjacent to the shorelines of the Puget Sound and near the confluences of the Nisqually, Skokomish, Union rivers. Federally listed threatened or endangered fish species include summer chum, steelhead, Chinook salmon, steelhead, and bull trout (Figures 11 & 12).

Big Beef Creek and Stavis Creek

Big Beef Creek harbors several populations of native fish including summer chum, fall chum, and coho salmon, steelhead, and cutthroat trout. Of these, summer chum and steelhead are currently



WDFW Fish weir – Big Beef Creek Unit. Photo by Darric Lowery.

listed as threatened under the Endangered Species Act (ESA). Though abundant historically, summer chum had been extirpated from Big Beef Creek and were re-introduced in 2005. Since then, numbers had declined to less than 50 spawners by 2015, and as of 2018, summer chum appear again to have become extirpated with no returns observed since 2017. The steelhead population in Big Beef Creek, although

very small, numbering fewer than 30 spawners annually, is one of very few locations in Puget Sound with a comprehensive estimate of smolt abundance. Under ESA, it is considered a local population, which, with the Dewatto River, forms the East Hood Canal Demographically Independent Population (DIP).

Fall chum and coho salmon are more abundant, with annual fall chum returns numbering between 290 and 1,300 spawners and coho numbering between 180 and 3,000 spawners over the last twenty years. Big Beef Creek is part of the Intensively Monitored Watershed program (IMW) and is rigorously surveyed by WDFW. Coho salmon population monitoring in Big Beef Creek is considered essential by state and tribal co-managers for forecasting returns to Hood Canal for the purposes of responsible fisheries management.

The WDFW research station and weir on Big Beef Creek provide critical data for recovery and management of native salmon in Hood Canal, and the Pacific Northwest. The IMW study is a watershed scale experiment intended to measure the habitat and fish response to restoration. Big Beef is one of four streams in the study. Along with nearby Little Anderson and Seabeck creeks, Big Beef is a treatment streams receiving restoration actions, while Stavis Creek is a reference stream without targeted restoration, intended to control for natural environmental variation. The study will aid our understanding of restoration effectiveness throughout the region, especially in the small lowland streams inhabited by coho salmon facing ongoing rural residential development that are common in Western Washington. An IMW study plan and multiple reports are available upon request (<https://wdfw.wa.gov/sites/default/files/publications/00783/wdfw00783.pdf>).

Furthermore, this facility played a critical role in the summer chum reintroduction and could be used again in the future should the co-managers decide on a more appropriate stock. Currently, steelhead and coho smolt outmigration data continues to be collected in the spring, while numbers of adult summer chum, coho, and fall chum salmon are counted in the summer and fall. Approximately 10,000 – 40,000 coho smolts are coded wire tagged annually, and their subsequent returns (jacks) and adults are counted at the weir and sampled in fisheries. As one of the few wild coho index tag groups in Puget Sound, these fish are used to estimate ocean survival and harvest rates, critical information for forecasting and managing wild coho stocks returning to Hood Canal, a program that has been ongoing for 40 years.

There are no salmon fisheries, sport or tribal, in Big Beef Creek, commercial fisheries operate in Hood Canal.

Lake Koeneman

Lake Koeneman, also known as Fern Lake, was previously owned by the University of Washington, in which a fisheries research station was located. The lake drains to Case Inlet via Rocky Creek. WDFW stocks low numbers of larger rainbow and cutthroat trout to provide a quality fishery in a more natural setting than what is available in local lowland lakes. In addition to stocked trout the lake also harbors populations of bass and sunfish. The gamefish are all managed under catch-and-release rules.

McNeil Island

The McNeil Island Unit, which includes Gertrude and Pitt Islands, provides habitat for a variety of species. Small tributaries on the island are used for spawning and rearing by fall chum salmon, coho salmon, and coastal cutthroat trout. These are small populations that are limited by the size of the tributaries and the amount of available habitat.

Nisqually

The Nisqually River originates from the Nisqually Glacier on the slopes of Mt. Rainier and flows west-northwest before draining into South Puget Sound northeast of Olympia. Rainfall, snowmelt, and glacial melt all contribute flow to the Nisqually River. Flood control at LaGrande and Alder hydroelectric projects both influence the flow regime and LaGrande Dam represents the upper limit for anadromous salmonids. Downstream of LaGrande Dam, the Nisqually River flows through a mix of forested, rural, and agricultural land before bordering the Joint Base Lewis and McCord and the Nisqually Indian Reservation.

The Nisqually River is home to a diverse community of fish species which includes Chinook salmon, coho salmon, winter chum salmon, pink salmon, steelhead, rainbow trout, and cutthroat trout. Both Chinook salmon and steelhead are listed as threatened under the Endangered Species Act and represent the Nisqually River Chinook and steelhead DIPs.

Skokomish

The Skokomish River harbors the most diverse community of fish species in Hood Canal, which includes summer and fall chum salmon, spring and fall Chinook salmon, sockeye salmon, pink salmon, coho salmon, steelhead and cutthroat trout, and bull trout. It is also the largest, most complex river system in Hood Canal with anadromous habitat in the mainstem, South Fork, and North Fork consisting of approximately 9 miles, 17 miles, and 7 miles, respectively. Collectively, these areas support average spawning populations of approximately 1,500 summer/fall Chinook, 1,200 summer chum, 8,000 fall chum, 5,000 coho, and 900 steelhead. Of these, Chinook salmon, steelhead, trout, and bull trout are listed as threatened under the ESA. Under ESA, Skokomish Chinook and steelhead constitute the Skokomish Chinook and steelhead DIP's, forming the cornerstone of recovery for the Hood Canal region, while two small local bull trout populations, one in the South Fork, and another in the upper North Fork, the only designated core area recovery unit in Hood Canal. Programs to introduce spring Chinook and sockeye, begun in 2016, have not been operating long enough to assess natural spawning in the Skokomish River. Should re-introduction of spring Chinook prove successful, this program will also contribute to recovery of Chinook salmon.

The Skokomish River includes the only major hydroelectric project in Hood Canal, comprising two dams on its North Fork. These dams, operated by Tacoma Power Utility, have resulted in two reservoirs, Lake Cushman (4,010 acres) and Lake Kokanee (150 acres). Lake Cushman harbors a diverse fish community. Several salmonids, including small populations of landlocked Chinook salmon and bull trout as well as more abundant cutthroat trout, rainbow trout, and kokanee inhabit the lake. Native nongame fish populations of whitefish, Salish sucker, and sculpin provide a broad prey base for Chinook, bull trout, and cutthroat trout. Non-native, illegally introduced, largemouth bass have also been found at low abundance, presumably due to cold water temperatures and lack of ideal habitat. No anadromous access to the reservoirs has existed since the installation of the dams, and only a couple of miles of spawning habitat exists in the upper North Fork above Lake Cushman. However, plans for restoring anadromy for salmon and steelhead are in development by signatories to the Cushman re-licensing Agreement, approved by FERC in 2010 (<https://www.federalregister.gov/documents/2010/11/29/2010-29936/record-of-decision-and-floodplain-statement-of-findings-for-the-cushman-hydroelectric-project-mason>).

Several hatchery programs exist in the Skokomish Basin, including George Adams and McKernan salmon hatcheries, operated by WDFW, Eells Springs trout hatchery, also operated by WDFW, and the North Fork salmon hatchery, operated by Tacoma Power. George Adams produces approximately 3 million fall Chinook salmon annually, and McKernan produces approximately 7 million fall chum. Collectively, these hatchery programs support international, national, state, and tribal agreements by providing fish for fisheries along the west coast of North America as well as in the Strait of Juan de Fuca, Puget Sound, and Hood Canal. Eells Springs produces approximately 400,000 rainbow trout, which are stocked in lowland lakes throughout Jefferson, Kitsap, Mason, Pierce, and Thurston counties. The North Fork hatchery produces 300,000 spring Chinook, along with small conservation programs of coho and steelhead. Saltwater Park, another Tacoma Power

facility, located on Hood Canal at Potlatch, rears approximately 600,000 hatchery sockeye salmon which are released into lake Cushman and the Skokomish North Fork each year.

Several non-treaty sport, tribal ceremonial and subsistence, and tribal commercial fisheries occur in the lower river. Prior to 2016, the river opened in the lower five miles for salmon sport fishing from August through September for Chinook, and September through December for coho and fall chum. However, a reservation boundary dispute has forced the closure of these fisheries.

The Skokomish Tribe continues to fish in-river for Chinook salmon in August, closing in September, then re-opening for coho and fall chum in October through November. A small subsistence fishery for steelhead also opens in March and April. These commercial and ceremonial and subsistence fisheries are critically important to the tribal culture and economy.

South Puget Sound Wildlife Unit

The South Puget Sound Unit is within the Chambers Creek Watershed. The Chambers Creek watershed flows through diverse habitat types including Joint Base Lewis and McChord and Kobayashi Park before entering Puget Sound just south of Tacoma. The watershed harbors a natural population of coho salmon, winter chum salmon, and coastal cutthroat trout along with hatchery origin Chinook salmon which are raised at the Chambers Creek Hatchery. The Chambers Creek basin historically supported winter run steelhead, but that population is thought to be extirpated from the basin.

Union River

The Union River is the southernmost river system in southeast Hood Canal, and harbors one of the most important local populations of ESA-listed summer chum in the summer chum evolutionarily significant unit (ESU). This summer chum population is the earliest returning summer chum population in Hood Canal and the most abundant in south Hood Canal since a conservation supplementation program restored it to current levels nearly 20 years ago. Despite degraded habitat conditions in the river, the population has benefitted from improving estuary conditions in the recent years, with adult returns numbering more than 1,000 fish annually. These conditions also likely benefit the other salmon species in the Union, namely coho and fall chum. In addition to salmon, a small steelhead population and more abundant sea-run cutthroat trout population also inhabit the Union River. Under ESA, The Union River steelhead population, together with the Tahuya River, forms the South Hood Canal DIP. A few Chinook enter the river each summer as well, and though listed under ESA, do not belong to a designated DIP.

There are no salmon fisheries, either sport or tribal, in the Union River.

Eelgrass

All submerged aquatic vegetation, including eelgrass, provides essential nearshore fish habitat as well as many other ecosystem functions such as carbon fixation. The relationship between eelgrass and juvenile salmon is well-documented; predator protection and food production from the large number of invertebrates that live in eelgrass meadows (Mumford 2007). Eelgrass provides general

habitat for adult Dungeness and red crab and is critical for the development of crab larvae. Eelgrass is also one of the primary substrates for the attachment of Pacific herring eggs after spawning. Herring is another species in decline due, in part, to the loss of eelgrass and kelp. Monitoring nearshore restoration efforts in general and eelgrass restoration and natural extent in particular is a very important to our understanding of ecosystem health and the health of the many species that depend on it for survival and sustainability. Without monitoring, there is no gauge to evaluate and adjust restoration and recovery efforts.

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Figure 11. Fish distribution for the north half South Puget Sound Wildlife Area

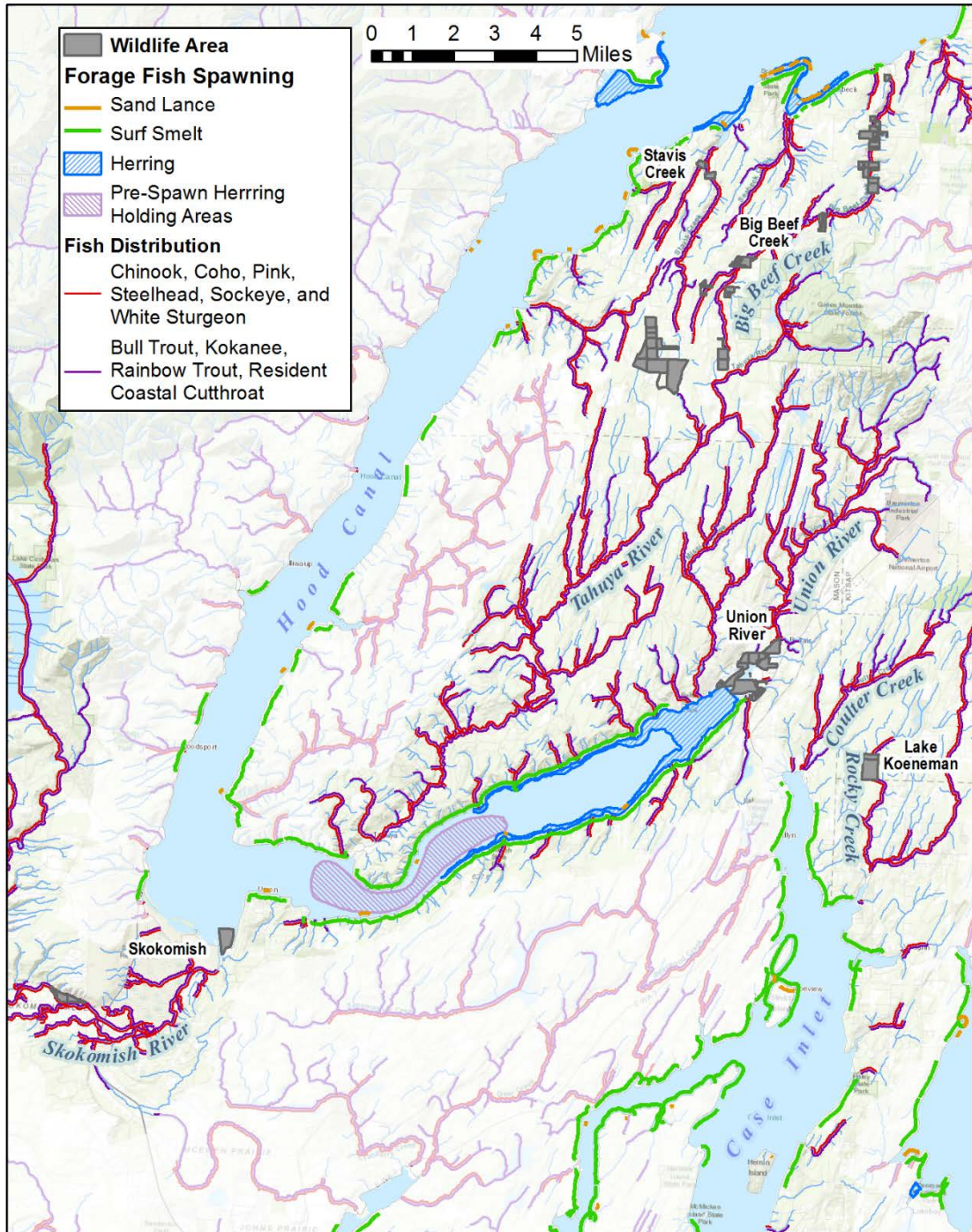
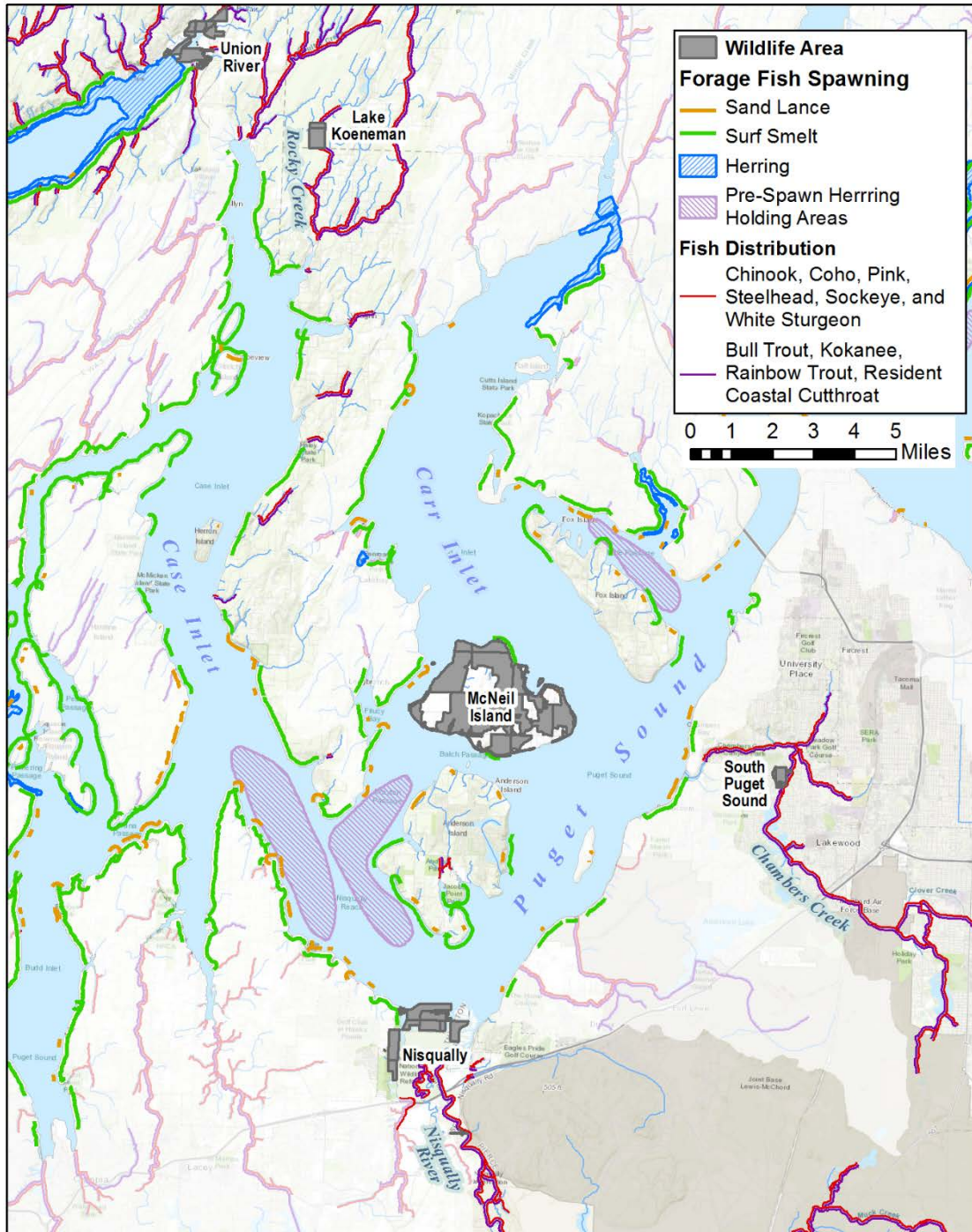


Figure 12. Fish distribution for the south half South Puget Sound Wildlife Area



Habitat Management

This section provides a description of habitat management activities that occur on the South Puget Sound Wildlife Area, including forest management, weed management, and estuary and riparian habitat restoration.

Forest Management Overview

There are approximately 3,064 acres of forest on the South Puget Sound Wildlife Area. The majority of forest habitat on the South Puget Sound Wildlife Area was harvested at least once prior to WDFW ownership. Most forests are recovering naturally and progressing towards climax conditions with the exception of forests in the Big Beef Creek Unit where in 2020, WDFW completed a 266-acre pre-commercial thinning project to increase stand diversity and accelerate succession on lands previously managed as forest plantations.

Management approach

WDFW balances management for forest health, fire risk, and wildlife species management. Timber harvest, prescribed fire, and tree planting in suitable areas enhance species composition, accelerate stem growth, and recreate historic forest conditions (e.g. diverse, patchy forests). This increases ecological integrity by improving habitat quality for priority species. Forest management tools, including prescribed fire, will help reduce wildfire risk on WDFW lands and adjacent lands, reducing the risk of fire on WDFW lands will lessen the potential impact to adjacent private lands.

Sites on the South Puget Sound, McNeil Island, and Lake Koeneman units are identified for active forest management in this plan. For each unit, custom prescriptions will be developed by the WDFW forester in collaboration with WDFW staff. Table 9 describes forest management and the estimated forest acres for each unit.

Table 9. Estimated Forest Acres and Management Needs by Unit

Unit	Acres	Forest Management needs
Big Beef - Morgan Marsh	--	No anticipated forest management needed. Young plantations were recently thinned to accelerate succession and improve species composition.
Lake Koeneman	28	Active forest management would be beneficial on about 28 acres
McNeil Island	2,368	Active forest management would be beneficial on about 1,000 acres.
Nisqually	114	No active management.
Stavis Creek	23	No active management.
Skokomish	21	No active management.
Union River	7	No active management.
South Puget Sound	4	No anticipated forest management needed other than the occasional removal of individual trees to protect oak habitat.

The McNeil Island Unit is the only unit where a large amount of active forest management is necessary. About half of the forests on the island have been converted to monotypic, stunted Douglas fir plantations. A single commercial thinning could accelerate the development of climax conditions which are currently under-represented on the island. Forest thinning can only be done,

however, if there is a new MOU with the DOC and U. S. General Services Administration (GSA) allowing active forest management. A detailed forest management plan will be developed once an MOU is in place. In addition to thinning, trees would be planted in previously deforested areas to restore forest connectivity. Lake Koeneman would also benefit from active forest management.

Weed Management

WDFW manages weeds to establish and maintain diverse native plant communities that support native fish and wildlife. Invasive plants and noxious weeds can infest high quality native plant communities and convert them to low quality monocultures that reduce wildlife value and increase wildfire risk. The weed management plan (Appendix B) identifies weed species and management practices to control those species of primary concern on the wildlife area (Table 10). The goal of the weed control plan is to meet legal obligations, reduce spread to adjacent private lands, and maintain or improve habitat for fish and wildlife.

Table 10. Weeds of primary concern on the South Puget Sound Wildlife Area

State designation	Weed Species
Class A	None known
Class B	Poison hemlock, tansy ragwort, Japanese knotweed, phragmites
Class C	Canada thistle, English ivy, Himalayan blackberry, Scotch broom, English holly

Habitat Restoration

A large part of the restoration efforts on the South Puget Sound Wildlife Area focus on estuary and salmon recovery which is a reflection on the purpose for which some of the units were acquired. The next section highlights restoration efforts that have occurred or are in process for the wildlife area including upland restoration for the streaked horn lark on McNeil Island.

Big Beef Creek

In partnership with the Hood Canal Salmon Enhancement Group (HCSEG) and Hood Canal Coordinating Council, an extensive floodplain reconnection and large woody debris placement project occurred in lower Big Beef Creek in 2015-2017, as part of the Intensively Monitored Watersheds (IMW) study, to monitor life-stage changes in coho salmon abundance, survival, and growth.

Restoration efforts in the Big Beef Creek watershed have primarily been focused on the lower reaches of the watershed on land owned by the Washington Department of Natural Resources (DNR) and the University of Washington (UW). The IMW study evaluates salmonid response to restoration treatments in four stream complexes in western Washington. Restoration activities in Big Beef Creek included removal of a derelict road and other fill within the stream and floodplain, decommissioning two wells, and installing 30 large log jams. The majority of restoration activities

were located on the UW property in the lower watershed, but log jams also extend upstream onto DNR state lands.

In the upper watershed of Big Beef Creek, WDFW owns land in the headwaters at Morgan's Marsh. This land is generally in a natural condition, with high functioning habitat, but there is a network of logging roads throughout the property. A culvert removal occurred in 2018 that restored a wetland and tributary stream. There may be additional opportunities for restoration on this property if there are undersized culverts on logging roads that have not been identified.

There is extensive infrastructure remaining on the property currently owned by HCSEG that offers opportunities for future restoration. The property will ultimately be transferred to WDFW for long-term stewardship. This infrastructure includes an old hatchery complex, roadway, and dike. There is also a weir and fish trap on the property that is used to collect data to support fish management in Hood Canal, as well as the IMW study.

McNeil Island

WDFW and DNR are collaborating on shoreline habitat restoration in partnership with other land owners on the island such as Department of Corrections (DOC). Much of the 12 miles of marine shoreline of the island are in a natural state, retaining high quality habitat due to limited access by the public. However, development related to the historic use of the island for a federal penitentiary resulted in some areas being highly impacted by the presence of relict structures and debris along shorelines. The agencies have worked together to identify potential beach cleanup and habitat restoration sites. Restoring habitat complexity along the shorelines of McNeil Island will promote utilization of nearshore habitat by juvenile salmonids, including Chinook salmon. Additional rearing would take place in restored pocket estuaries for salmonids and other estuarine fish, as well as benefits for waterfowl and shorebirds. Both Pacific sand lance and surf smelt are documented to spawn along McNeil Island shorelines.

Two marine shoreline habitat restoration projects were completed in 2018 along Still Harbor and in 2019 at the vehicle barge landing. Additional marine shoreline habitat restoration efforts are in planning and design stages at Milewa Creek estuary, Bodley Creek, and Floyds Cove. The project proposal at Milewa Creek Estuary is a full estuarine restoration project. This project will not only restore estuarine function in three locations currently disconnected from tidal influence, but also relocate the roadway landward at Milewa and possibly at Floyds Cove. Funding has been provided by RCO (Estuary Salmon Restoration Program) and mitigation funding from the Asarco Tacoma Smelter Superfund site (<https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-sites/Tacoma-Smelter/History-studies>).

Bodley Creek is located on the northern shore of McNeil Island approximately $\frac{3}{4}$ mile east of Samego Point, the Northwesterly corner of the island. The existing embankment that forms the upstream freshwater pond was constructed to impound freshwater that would be piped into Butterworth Reservoir. Butterworth Reservoir is the primary source of freshwater on the island, and water from it was used for irrigation, cattle, and domestic supply throughout the penitentiary. Restoration at Bodley Creek involves removing the undersize culvert and replacing with either a

larger culvert or bridge. The pump house, pump diversion, pilings, and abandoned road will be removed. The project will restore full tidal influence to the salt marsh and provide freshwater wetlands.

Floyds Cove is located on the westerly coast of McNeil Island along Pitt Passage. Pre-development Floyds Cove was an open estuary with a barrier beach extending to the south from the northern shoreline. The embankment that impounds the existing pond was constructed to help provide freshwater to Butterworth Reservoir, similar to the Bodley Creek site. There is an existing pump house and diversion that are inoperable currently. Additionally, the shoreline is heavily armored with a combination of riprap, piling, and submarine cable bulkheads. The road embankment and perched culvert along Floyds Cove has blocked the tidal inundation of approximately 0.5 acres at mean higher high water (MHHW). The restoration project will restore full tidal influence through removal of the culvert and replace with either a larger culvert, bridge, or bypass road. The pump house, shoreline armor, and debris will be removed, and the shoreline will be planted with native vegetation.



Floyd's Cove – McNeil Island Unit. Photo by Alan L. Bauer.

The barge landing site is located adjacent to the vehicle barge landing, on the southernmost tip of McNeil Island. The project was completed in 2018 and restoration work included removing concrete shoreline armoring, creosote-treated piles, a wood bulkhead, concrete and metal debris, a derelict boat and submarine torpedo nets.



Barge Landing – McNeil Island Unit – Before project above and after project below photos. Photo by WDFW staff.



The road crossing at the mouth of the Milewa Creek acts as a dam, impounding 2.5 acres of former tidal marsh and impeding fish passage. Within the impounded pond there are remnants of two barges and other debris. The existing roadway is armored along the shoreline with WWII era torpedo netting, concrete slabs and other debris. The restoration proposal includes removal of failing culverts, shoreline armor, and re-connection of the marine waters to the stream through a restored open at the estuary mouth.

WDFW and USFWS are discussing creating habitat on the island for federally and state listed streaked horned larks which nest near Gig Harbor and Joint Base Lewis McChord. With some structural enhancement, the grasslands on the island may provide adequate nesting habitat to birds that either naturally migrate to the site or are relocated. Streaked horn lark occupancy surveys and habitat assessments are currently underway.

Nisqually

The Nisqually River estuary historically contained a total area of approximately 15 square Kilometers. Habitat of the Nisqually River estuary has changed substantially compared to historic conditions, primarily by the dikes installed in the early 1900s to convert saltmarsh into pasture. Starting in November 2009 until 2011, the Billy Frank Jr. Nisqually National Wildlife Refuge along with the Nisqually Tribe and Ducks Unlimited and its partners removed five miles of dike surrounding portions of the Nisqually River estuary. This significant project restored tidal influence to 760 acres of tidelands and estuary habitat, and over 21 miles of tidal slough systems, and re-connected historic floodplains to Puget Sound, increasing potential salt marsh habitat in the southern reach of Puget Sound by 50% (<http://nisquallydeltarestoration.org/about.php>).

WDFW was a project cooperater and provided Estuary and Salmon Restoration Program (ESRP) funding to assist with amphibian monitoring. These recovery efforts are expected to substantially increase the ecological health of the Nisqually River Estuary and South Puget Sound. The Nisqually River Estuary provides critical habitat to juvenile salmonids, forage fish, and a host of marine fish species.

Skokomish

While restoration projects have not been conducted within the Skokomish Unit boundary, the greater estuary area has been the focus of three restoration projects conducted by the Skokomish Tribe and the Mason Conservation District in recent years. In the mid-twentieth century, the Skokomish River delta estuary was converted to agricultural through the construction of dikes, levees, and roads, which effectively removed, or severely limited the critical ecological functions provided by estuarian habitats. Further, the addition of roads, improperly sized culverts and bridges eliminated miles of freshwater salmon habitats in the watershed. Between 2007 and 2011 the Skokomish Tribe and Mason Conservation District restored tidal and river hydrology to a 214-acre island by removing 2.4 miles of dikes and levees, roads, and borrow ditches. From 2011 to 2018, an additional 9.8 acres of estuary was restored by filling soil borrow ditches, re-grading historic estuary channels, and restoring 2.6 miles of shoreline. The projects also re-opened 369 acres of freshwater habitats by permanently removing 10 culverts and replacing 17 with fish passable designs. These and future restoration actions, along with the Skokomish Unit's permanent conservation status are invaluable components of the long-term goals to recover imperiled salmonid in the Hood Canal and Skokomish River.

Union River

Lynch Cove (Lower Hood Canal) has long been the site of conservation efforts through acquisition of estuarine lands and habitat restoration efforts. In 2013, full tidal exchange was returned to 32 acres of former salt marsh and tidelands at the mouth of the Union River, completing a joint habitat-restoration project by WDFW and Hood Canal Salmon Enhancement Group. The project was funded by a \$1.6 million USFWS Coastal Wetlands Grant and a \$300,000 matching grant from the Washington State Recreation and Conservation Office's Salmon Recovery Funding Board. This project complements estuarine habitat restoration at Belfair State Park, Klingel Wetlands, and Beards Cove.

The early 20th century dike was breached in two locations with pedestrian bridges spanning the newly created estuary habitat. The excavation within the restored area included restoration to promote salt marsh vegetation and tidal channel networks. As a result of this effort, the Theler Wetland trail system was formed and includes the dike trail and the new setback dike.

The Union River tidelands are important rearing grounds for juvenile salmon as well as a diversity of other fish and wildlife species. Juvenile chum and Chinook salmon depend on estuaries during early marine life for food resources, refuge from predation, and a gradual transition from freshwater to saltwater habitat.

WDFW received a USFWS National Coastal Wetland Conservation pass-through grant (to Hood Canal Salmon Enhancement Group) for acquisition adjacent to the Union River Unit and restoration work at Theler Wetlands. The restoration work is on the Theler Wetlands trails currently owned by the North Mason School District. WDFW is working with NMSD on a transfer of lands to WDFW future stewardship. Once the land is transferred, the planned restoration work would take place on WDFW managed land. The conceptual design restoration work is to remove a breached dike/trail

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and replace with a setback dike/trail landward of existing in order to restore tidal exchange. The HCSEG will be lead for the restoration work, in partnership with WDFW.



Union River Restoration before (above) and after (below) photos 2013. Photo by WDFW staff.



Climate Change Approach

Purpose

The primary purpose of this section is to evaluate the potential impacts of projected changes in climate on the South Puget Sound Wildlife Area and highlight opportunities to mitigate or prepare for those impacts. This section also summarizes work by the wildlife area planning team to review the management objectives (see Goals and Objectives section) and make changes as appropriate to ensure that objectives are robust to future changes.

This work is consistent with the directives of a 2017 WDFW policy titled “Addressing the Risks of Climate Change,” which states that WDFW will “manage its operations and assets to better understand, mitigate, and adapt to impacts of climate change.”

Projected climate change impacts

Continued increases in average annual and seasonal Pacific Northwest temperatures are projected as a result of global warming, as well as increases in extreme heat. Warming is projected to continue throughout the 21st century. For the 2050s relative to 1950-1999, temperature is projected to rise +5.8°F (range: +3.1 to +8.5°F) for a high greenhouse gas scenario (RCP8.5). Much higher warming is possible after mid-century. Lower emissions of greenhouse gases will result in less warming. Warming is projected for all seasons. The warming projected for summer is slightly larger than for other seasons (CIG 2013). Table 11 describes the projected climate summary report for 2010-2039 for Water Resource Inventory 16.

Table 11. Climate Summary Report (2010-2039) for Water Resource Inventory 16

Climate Attribute	Value	Change
Average annual temperature	49.7 +/- 0.6 degrees F	+2.2 degrees F
Freeze free days	309.9 +/-8.8 days	+27.3 days
Annual precipitation	119.4 +/- 3.9 in	+2.1 inches
Growing season length	219.5 +/- 12.1 days	+30.4 days

Source: Climate Impacts Group Tribal Projection Tool 2020 data.

Sea level rise

Sea level is rising along much of Washington’s coast and is projected to rise at an accelerating rate as the climate continues to warm. Local variations in vertical land movement causes different rates of relative sea level change along the coast and in Puget Sound. Sea level rise can impact the South Sound Wildlife Area by inundation and coastal flooding, wave impacts, saltwater intrusion, and changes in groundwater. Information is now available from the Washington Coastal Resilience Program which will provide additional analysis and estimates of water levels associated with tides, storm surge, and wave run-up and are found at this link:

(<http://wacoastalnetwork.com/chrn/research/sea-level-rise/>)

Species of concern with high vulnerability to climate change

Table 12 shows the Species of Greatest Conservation Need (SGCN) on the South Puget Sound Wildlife Area that were assessed in the WDFW Climate Change Vulnerability Assessment (WDFW 2015) as having a moderate-high vulnerability to climate change, and with high confidence in the data. Note that only SGCN were considered in this assessment and it does not include climate sensitivities for other species that may be associated with the wildlife area.

Table 12. Species on South Puget Sound Wildlife Area with moderate-high overall vulnerability* and high confidence (WDFW 2015)

Species of Greatest Conservation Need	Vulnerability Rank	Comments	Climatic factors of concern
Surf scoter	Moderate-high	Duckling surf scoters may exhibit some physiological sensitivity to climate change as local weather conditions can affect survival. However, the overall sensitivity of surf scoters is primarily due to dependencies on specific breeding and foraging habitats that could be affected by climate change. Increases in temperature or sea level as well as changes in water chemistry may alter prey species composition and herring spawn as well as alter subtidal foraging habitats.	<ul style="list-style-type: none"> - Increased ocean temperature - Sea level rise - Declines in dissolved oxygen and pH
Hood Canal summer chum	Moderate-high	Chum salmon may be sensitive to lower summer flows during adult migration to spawning areas. Altered freshwater thermal regimes could affect chum salmon by altering their phenology and potentially creating mismatch between arrival in estuaries and the timing of ideal ecological conditions in estuarine habitats. Chum salmon embryos are vulnerable to flood events that can scour redds or bury them in silt. Chum may be vulnerable to altered flow regimes that include increased flood severity.	<ul style="list-style-type: none"> - Increased water temperatures (freshwater and sea surface) - Increased winter/spring flood events - Lower summer flows
Puget Sound Chinook	Moderate-high	<p>In general, Chinook salmon appear sensitive to warmer water temperatures, low flows, and high flows.</p> <p>Puget Sound Chinook salmon may be more sensitive to warmer summer temperatures and lower flows, as their spawning migration encounters the warmest part of the watershed later summer and early fall. Because Puget Sound Chinook salmon rear in streams for up to one year, they may be vulnerable to heat stress during low flow periods of late summer and fall.</p>	<ul style="list-style-type: none"> - Increased freshwater temperatures - Lower summer flows - Increased winter/spring flood events

Species of Greatest Conservation Need	Vulnerability Rank	Comments	Climatic factors of concern
Puget Sound steelhead	Moderate-high	<p>In general, steelhead appear sensitive to warmer water temperatures, low flows, and high flows. Warmer water temperatures can affect physiological performance and energy budgets, as well as developmental rates and the timing of key life-cycle transitions (i.e., phenology). Lower stream flows (particularly summer and early fall) can reduce the probability of survival in rearing juveniles. Extreme high flows can reduce the likelihood of egg survival during incubation, and both low and high flows can affect adult migration.</p> <p>Winter-run steelhead migrate during winter or early spring and spawn immediately. Because they spend more time in freshwater, summer-run populations of steelhead may be more sensitive to changes in flow and temperature regimes across river networks.</p> <p>The survival of steelhead embryos or recently emerged fry may be sensitive to the timing and magnitude of spring runoff rather than the fall and winter aspects of flow regimes.</p>	<ul style="list-style-type: none"> - Altered spring runoff timing and amount/magnitude - Increased water temperatures - Increased flood events and associated sedimentation and/or scour - Lower summer flows
Pacific herring	Moderate-high	<p>Pacific herring will be sensitive to climate change through change in their prey availability and the distribution of appropriate spawning habitat. In Washington, herring populations have already shown northward movement for spawning, and these patterns could increase with predicted increases in sea surface temperature. Herring will also be sensitive to potential changes in nearshore and estuarine spawning habitat, such as increased salinity due to sea level rise and saltwater intrusion in estuaries, which could create suboptimal conditions for spawning and larval growth. Additionally, vegetation used by herring as spawning substrate could change with long-term variation in water temperature and acidity.</p>	<ul style="list-style-type: none"> - Increased ocean temperatures - Altered upwelling patterns - Changes in salinity - Saltwater intrusion in estuarine habitat

Species of Greatest Conservation Need	Vulnerability Rank	Comments	Climatic factors of concern
Pacific sand lance	Moderate-high	<p>Though there is limited information regarding the sensitivity of Pacific sand lance to climate change, their sensitivity likely stems from climate-induced changes in their intertidal spawning habitat and changes in prey distribution and abundance. Increasing air and sea surface temperatures could lead to suboptimal sediment temperature and lower oxygen conditions in sediments where sand lance prefer to burrow, forcing sand lance to emerge from the sediment and making them more susceptible to predation. Sand lance tend to return to the same burrowing sediment habitat interannually, so changes in nearshore habitat could limit burrowing and spawning habitat availability. Increasing sea surface temperature could also lead to declines and changes in distribution in zooplankton, limited prey availability for sand lance, and decreased recruitment.</p>	<ul style="list-style-type: none"> - Increased air and ocean temperatures - Decreased oxygen - Sea level rise - Increased coastal erosion
Surf smelt		<p>The primary presumed threat to surf smelt as a result of climate change is a reduction in spawning habitat due to sea level and shoreline armoring. Surf smelt may also experience some physiological sensitivity to climate change since warmer and drier beach conditions have been shown to lead to higher levels of smelt egg mortality. Surf smelt sensitivity will be increased by potential changes in zooplankton prey availability. Additionally, changes in beach habitat due to sea level rise and stronger and increased storms could lead to declines in available spawning area.</p>	<ul style="list-style-type: none"> - Increased air temperatures - Altered upwelling patterns - Sea level rise - Increased storminess
Cope's giant salamander	Moderate - high	<p>Cope's giant salamanders appear sensitive to temperature and precipitation factors that cause microhabitat desiccation as well as high flow events that degrade aquatic habitat. Elevated temperatures (although one study has shown these salamanders may tolerate a wider temperature range), increased solar radiation, and moisture loss, as well as declines in stream flow that reduce aquatic habitats, will likely negatively affect this species.</p>	<ul style="list-style-type: none"> - Increased temperatures - Changes in precipitation - Shifts from snow to rain - Range contractions are projected for the southern Cascades ecoregion, with possible expansions in the northern Cascades and/or low-mid elevation southern coastal streams.
Oregon spotted frog	Moderate – high	<p>Very limited information is available regarding the sensitivity of the Oregon spotted frog to climate change. Its main sensitivity is likely to be due to changes in pond and wetland habitat.</p>	<ul style="list-style-type: none"> - Increased temperatures - Changes in precipitation - Altered hydrology

Species of Greatest Conservation Need	Vulnerability Rank	Comments	Climatic factors of concern
Western toad	Moderate - high	Sensitivity of the western toad to climate change is primarily driven by its dependence on intermittent and permanent aquatic habitats that may be lost or degraded due to changes in precipitation and altered hydrology. A significant portion of western toad breeding in western Washington occurs in low-gradient portions of rivers, after the hydrographs have dropped to a level that is unlikely to risk scouring their unattached eggs. Greater, more variable, and episodic rainfall are likely to put these river-breeding populations at risk.	<ul style="list-style-type: none"> - Changes in precipitation (rain and snow) - Altered hydrology

*Vulnerability to climate change was determined by an evaluation of inherent sensitivity to climatic variables, as well as an assessment of the likelihood of change in key climate variables important for each species. Confidence in each ranking was also assessed, based on the extent and quality of reference material and information.

Making the goals and objectives of the wildlife area plan climate resilient

South Puget Sound Wildlife Area goals and objectives potentially affected by climate change, or those with a “climate nexus,” are listed below (Table 13). Opportunities to build resilience to climate change are summarized for each objective and are also integrated into the final list of objectives available [on page __](#).

Table 13. South Puget Sound Wildlife Area objectives with climate nexus

Objectives with a climate nexus	Opportunities to build resilience
Goal 1: Maintain or improve the ecological integrity of priority sites.	
Establish an ecological integrity baseline and associated goals for ecological systems of concern/priority systems by 2026.	<ul style="list-style-type: none"> • Consider adding a metric for climate change, e.g. soil moisture, and compare different habitat types. • Continue collecting plant phenology data. Start a volunteer emergence scheme (monitor changes over time).
Consistent with guidance from the weed management plan, conduct weed control activities annually.	<ul style="list-style-type: none"> • Consider monitoring for invasive species expected to increase under climate change. Plan for a possibility of new weeds.
Restore natural function and processes of aquatic systems on the wildlife area that benefit focal species, including maintaining, and encouraging beaver presence where appropriate.	<ul style="list-style-type: none"> • Restore natural stream hydrology to reduce vulnerability to projected climate changes • Identify and restore degraded riparian habitat to shade streams and provide floodwater storage. • Restore floodplain connections to improve lateral connectivity with streams.
Goal 2: Improve ecological integrity of forests while maintaining and/or improving habitat for wildlife.	
Identify and implement forest health treatments for the wildlife area over the next 10 years.	<ul style="list-style-type: none"> • Thin dense stands to increase tree vigor and reduce vulnerability to drought and disturbance events.

Objectives with a climate nexus	Opportunities to build resilience
	<ul style="list-style-type: none"> • Protect areas with high habitat heterogeneity, including structural diversity and stand-level species and genetic diversity.
Goal 3: Achieve species diversity at levels consistent with healthy ecosystems	
Improve nesting habitat for western pond turtles.	<ul style="list-style-type: none"> • Consider creating more habitat for native plants and consider water availability.
Maintain or improve pond health for western pond turtles, Oregon spotted frog and other species.	<ul style="list-style-type: none"> • Restore natural stream hydrology to reduce vulnerability to protected climate changes (Oregon spotted frog). • Restore floodplain connections to improve lateral connectivity with streams (Oregon spotted frog). • Maintain/improve hydrology to increase connectivity and duration of water on the landscape. • Identify and track appropriate metrics, e.g. water temperature, to monitor changes in pond conditions over time. • Monitor and manage for aquatic invasive species.
Create an additional western pond turtle pond by 2028.	Develop additional western pond turtle ponds with water control structures to manage varying water levels due to climate change.
Develop a strategy to reintroduce streaked horn lark on McNeil Island by 2026.	Consider creating streaked horn lark nesting habitat within areas on McNeil Island.
Collaborate with partners to establish protection measures for developing wildlife corridors adjacent to the wildlife area units in Kitsap County.	Collaborate with local governments and stakeholders to seek new opportunities for increased habitat and open space protection.
Goal 6: Protect and restore estuarine, nearshore, and riparian habitat on the wildlife area for salmonid recovery.	
Collaborate with the Mason Conservation District on restoration activities at RM 6.5 on the Skokomish River by 2024.	Consider future climate in restoration design and implementation – include changes in streamflow, sea level rise, wetlands, and riparian vegetation (Raymond et al. 2018).
Improve 7 acres of Union River Estuary interconnectivity by 2025.	Consider future climate in restoration design and implementation – include changes in streamflow, sea level rise, wetlands, and riparian vegetation (Raymond et al. 2018).
Goal 11: Maintain safe, highly functional, and cost-effective administrative facilities and equipment.	
Develop feasibility and design analysis to redesign or replace Nisqually Nature Reach Center by 2027.	A sea level rise analysis should be done in advance of a feasibility study. The building is a learning center for shoreline and nearshore resilience.

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Appendices

- A. Species and habitat information
- B. Weed management plan
- C. Fire response information
- E. Public response summary
- F. Research and other studies

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Appendix A. Species and habitat information

Table 14. Species of Greatest Conservation need relationship with Ecological Systems of Concern for South Puget Sound Wildlife Area

Species of Greatest Conservation Need Relationship with Ecological Systems of Concern for the South Puget Sound WLA	North Pacific Dry Douglas-fir Forest and Woodland	North Pacific Hardwood-conifer Swamp	North Pacific Lowland Riparian Forest and Shrubland	North Pacific Oak Woodland	Temperate Pacific Freshwater Emergent Marsh	Temperate Pacific Tidal Salt and Brackish Marsh
Bald eagle	X	X	X	X	X	X
Barrow's goldeneye		X			X	X
Brown pelican						X
Cinnamon teal					X	
Common loon						X
Harlequin duck		X			X	X
Marbled godwit						X
Marbled murrelet	X	X	X			
Peregrine falcon	X		X		X	X
Purple martin					X	X
Red-necked grebe						X
Sandhill crane					X	
Short-eared owl					X	
Slender-billed white breasted nuthatch	X		X	X		
Western bluebird	X		X	X		
Western high Arctic brant						X
Western screech owl	X	X		X		
Fisher	X	X	X			
Hoary bat	X	X	X	X	X	
Keen's myotis	X	X	X	X	X	
Silver haired bat	X	X	X	X	X	
Townsend's big-eared bat	X	X	X	X	X	
Western gray squirrel	X		X	X		
Western spotted skunk	X	X	X			
Western pond turtle				X	X	
Cope's giant salamander			X			
Olympic torrent salamander			X			

Oregon spotted frog	X	X	x	X
Van Dyke's salamander			x	
Hoary elfin	X			
Mardon skipper			x	
Propertius duskywing			X	
Puget Sound fritillary	X		X	
Taylor's checkerspot butterfly	X		x	X
Valley silverspot butterfly	X		x	X

X **Bold** indicates SGCN species that are closely associated with the ecological system. Small "x" for SGCN generally associated with the ecological system.

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Appendix B. Weed management plan

Weed Control Goals at the South Puget Sound Wildlife Area

The goals of weed control on Department lands within the South Puget Sound Wildlife Area, which is composed of the Big Beef Creek, Nisqually, Skokomish, South Puget Sound, Stavis Creek, Lake Koeneman, Union River, and McNeil Island units, are to maintain or improve the habitat for fish and wildlife, meet legal obligations, and protect adjacent private lands. High quality habitats are vital for the many aquatic and terrestrial species. A great deal of Federally and State listed species can be found on the South Puget Sound Wildlife Area Units utilizing the varied habitats.

To these ends, WDFW uses integrated pest (i.e. weed) management (IPM), which is defined in RCW 17.15.010 as “a coordinated decision-making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet agency programmatic pest management objectives.”

In the South Puget Sound Wildlife Area, WDFW’s weed management objectives are:

- a) **Shoreline, riparian, and aquatic:** Riparian and freshwater aquatic habitat is present on all South Puget Sound Wildlife Area units. Shoreline and saltwater aquatic habitat can be found at Nisqually, Skokomish, Union River, and McNeil Island units. Complete noxious weed inventories and annual surveys of the aquatic, riparian, and wetland habitats are needed at all units. Aquatic and riparian weed species are present and require treatment, but the extent of the infestations is truly unknown. Each of the lakes, wetlands, and streams need detailed inventories and surveys conducted. Similarly, is the case for the tidelands, mudflats, and estuaries where saltwater is present. South Puget Sound, McNeil Island, and Union River units should be a primary area of focus. One known infestation of Phragmites is located on McNeil Island Unit and requires control promptly. Poison hemlock, Scotch broom, English ivy, Reed canary grass, Himalayan blackberry, and Japanese knotweed are present at these units.

Maintaining breeding habitat at the South Puget Sound Unit for Western pond turtle and Oregon spotted frog by annually mowing and brush cutting 4-acre area to increase sunlight to ponds and maintain access to both nesting and breeding locations. If necessary, aquatic control herbicides can possibly be utilized. Before any weed treatment activity, surveys for listed species should be conducted to determine occupancy of the treatment site. If noxious weeds are outside of occupied Oregon spotted frog locations, herbicides can be used. If within occupied Oregon spotted frog areas, approvals will need to be obtained before any aquatic herbicides are sprayed.

The less accessible islands and deltas on wildlife area units need regular, but slightly less frequent weed inventories and surveys. It is critical to identify and control invasive species before they consume the unique and often limited habitat. These less visited sites receive reduced attention and could become easier for an invasive weed situation to get out of control. Special focus in this regard needs to be directed to McNeil Island (Gertrude and Pit Islands), Big Beef Creek- Morgan’s Marsh Tract, Skokomish, Union River, and Nisqually units.

- b) **Forests:** Hardwood forest that contain Oregon ash, alder, madrone, and many other species are prevalent within the South Puget Sound Wildlife Area. Similar is the case for conifer forest and mix conifer/hardwood forests. In each forest type reed canary grass, blue bindweed, English ivy, Himalayan blackberry, and English holly are invasive species that compete with and exclude native understory vegetation. These weeds displace native species and shade out a

wide variety of native canopy and understory species. Reed canary grass is the dominant understory species in many areas. Blue bindweed contributes to the toppling of riparian deciduous trees due to added weight during storms. Currently these species are generally minor components of the understory with the exceptions of the McNeil Island unit where there are larger individual colonies throughout the island. They all should be controlled as soon as possible to avoid greater challenges later. Control of these species would be a good activity for volunteers on some of the units.

- c) Puget Prairies and oak woodlands- Remnant high quality prairie and oak woodlands are essential for several pollinators and birds. Presently 5-acres, on the 80 acre unit, of exotic grasses and Scotch broom are either mowed or sprayed each year to protect and enhance habitat in order to maintain the low-growing prairie structure as well as reduce fuel loads in the oak understory. South Puget Sound Unit has remnant prairie soils and should receive increased treatments to enhance prairie vegetation in the future. Scotch broom is the most prevalent and problematic broadleaf weed to control on this upland site. Up to five additional acres should be treated per year with broadleaf applications of herbicide where prudent. Other broadleaf weeds of concern include hairy cats-ear, ox-eye daisy, tansy ragwort, common tansy, common groundsel, sulfur cinquefoil. Hairy cats-ear and ox-eye daisy are widespread on this prairie site and containment needs to be tied into a suite of restoration practices. Tansy ragwort and common groundsel should be monitored annually and hand-pulled where they occur sparsely.

Several legacy oaks and young oak seedlings are found throughout this unit. Himalayan Blackberry, Scotch broom, common hawthorn, English ivy, and spurge laurel are significant threats to oak regeneration within the present oak savannah habitat. All these invasive species compete with and exclude young, slow-growing oaks within the understory. Conifer encroachment also outcompetes oaks and should be monitored or removed where feasible. Efforts need to be made to cut back and spray where oaks occur, while also avoiding damage to seedling and saplings. An attainable goal for management on this unit would be to treat 1-2 acres per year treated for oak management.

Furthermore, spurge laurel and tansy that occur on the South Puget Sound Unit, more monitoring is needed to understand the extent of its coverage in addition to continuing annual treatments. With more information about the extent of the infestation, IPM can be put into place more readily. Mechanical control measures should be the first to be explored in most cases.

- d) Parking areas, roads, and trails- Survey all unit parking areas and roads a minimum of twice per year and treat weeds located when prudent. Besides general weeds, problematic species such as tansy ragwort, Scotch broom, and Canada thistle pose a risk of spreading to new areas if not treated and controlled. It is estimated that 3-5 acres require annual maintenance at most units and will be necessary to address these invasive species around parking areas and along both roads and trails. Japanese knotweed has been known to occur occasionally near the parking areas at Union River Unit and will be treated or removed on sight. Himalayan blackberry is an issue at several sites and is most prevalent at the South Puget Sound Unit and McNeil Island Unit along roadways. Those units with Himalayan blackberry should be cut back on a biannual basis and is estimated that 1-5 acres require annual maintenance.

Weed Species of Concern on South Puget Sound Wildlife Area

Weed species of concern on the South Puget Sound Wildlife Area include but are not limited to:

Himalayan blackberry (*Rubus armeniacus*), English Ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), Canada thistle (*Cirsium arvense*), English Holly (*Ilex aquifolium*), common groundsel (*Senecio vulgaris*), ox-eye daisy (*Leucanthemum vulgare*), Scotch broom (*Cytisus scoparius*), reed canary grass (*Phalaris arundinacea*), sulfur cinquefoil (*Potentilla recta*), tall oatgrass (*Arrhenatherum elatius*), tansy ragwort (*Jacobaea vulgaris*), rat-tail fescue (*Vulpia myuros*), bull thistle (*Cirsium vulgare*), common St. John's wort (*Hypericum perforatum*), common tansy (*Tanacetum Vulgare*), English hawthorn (*Crataegus Monogyna*), English ivy (*Hedera Hibernica*), field bindweed (*Convolvulus arvensis*), Japanese knotweed (*Reynoutria japonica*), Herb Robert (*Geranium robertianum*), and phragmites (*Phragmites australis*).

Weeds occurring in the wildlife area and on associated units are listed in Table 15. The table also describes the weed's classification, an estimate of the acreage affected by the weed, how many acres were treated, the relative density of infestation, the general trend the weed infestation has been exhibiting, the control objective and/or strategy for the weed and finally, which wildlife units have the weed present.

Detailed descriptions and natural history information for each of the above state-listed weed species listed above can be found at the Washington State Noxious Weed Control Board web site <http://www.nwcb.wa.gov/search.asp>. Information on other species contained in the list can be found at the University of California's IPM Online web site: http://www.ipm.ucdavis.edu/PMG/weeds_intro.html.

Weed management information for individual weed species can be found at the PNW Weed Management Handbook link at: <http://pnwhandbooks.org/weed/control-problem-weeds>

Table 15. South Puget Sound Wildlife Area weed table including the weed class and unit location within the wildlife area

Weed Species	Noxious Weed Region 2 Class	2020 Estimated Affected Acres	2020 Treated Acres	Annual Trend	Control Objective/Strategy	Wildlife Area Unit Weed Distribution
Himalayan Blackberry	C	unknown	1	increasing	control	All
Canada thistle	C	unknown	0	increasing	control	South Puget Sound, Big Beef Creek, McNeil Island
English ivy	C	unknown	1	increasing	control	South Puget Sound, Nisqually, McNeil Island, Union River
Poison hemlock	B-Designate	unknown	1	decreasing	control	South Puget Sound
Scotch broom	C	unknown	30	decreasing	control	South Puget Sound, McNeil Island, Big Beef Creek
Tansy ragwort	B	unknown	3	decreasing	control	South Puget Sound, McNeil Island, Big Beef Creek
Japanese knotweed	B	unknown	0	increasing	control	South Puget Sound, McNeil Island, Skokomish
Phragmites	B	<1	0	increasing	control	McNeil Island
English Holly	C	unknown	0	increasing	control	All

B-Designates area required to be controlled

Appendix C. Fire response information

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Appendix D. Public response summary

Table 16. WDFW Response to public comments received during public review of the South Puget Sound Management Plan draft under the State Environmental Policy Act (SEPA) - DNS

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Appendix E. Research and other studies

Table 17. Summary of research activities conducted on the South Puget Sound Wildlife Area

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Researcher	Year	Title	Description
Research – Big Beef Creek			
Clayton Kinsel and Joseph Anderson, WDFW	2004-present	Hood Canal Intensively Monitored Watershed (IMW) project- fish population monitoring	Assess fish population response to habitat restoration activities. Fish monitoring activities include adult and juvenile salmon trapping at the weir, spawning ground surveys and summer parr population surveys throughout Big Beef and adjacent watersheds.
Clayton Kinsel and Joseph Anderson, WDFW	1978 - present	Big Beef Creek coho monitoring	Estimate Coho smolt abundance and apply coded wire tags to Big Beef Creek wild Coho smolts. Tagged fish are then harvested in fisheries and detected upon return to the Big Beef weir as adults. Tag recaptures enable estimation of marine survival and harvest rates, metrics that are important for fishery management, forecasting adult returns and monitoring long-term trends in the population.
Barry Berejikian, NOAA Fisheries and Clayton Kinsel, WDFW	2006 - present	Hood Canal steelhead project	Assess population response to conservation steelhead hatchery; Big Beef is a reference stream in which no hatchery-origin steelhead were released.
Various external collaborators, including NOAA Fisheries, Simon Fraser University, and the University of Washington Clayton Kinsel and Joseph Anderson, WDFW	Ongoing	Various	Over the years, the long-term monitoring project and facilities at Big Beef Creek have permitted collaborations with researchers investigating juvenile coho ecology, climate change impacts, steelhead early marine survival, cutthroat marine movement patterns, cutthroat/rainbow trout hybridization, and spawning behavior, among other topics.
Marine Mammal Research on McNeil Island			

<p>WDFW, NOAA Marine Mammal Laboratory</p>	<p>Ongoing</p>	<p>Population assessment of California and Steller sea lions, Pacific harbor seals, Northern elephant seals and Guadalupe fur seals along the U.S. West Coast.</p>	<ul style="list-style-type: none"> • Estimate annual and seasonal population abundance and trends. • Determine if pinniped population trends are different among populations or regions. • Document shifts in breeding or migratory range distributions of all pinnipeds. • Identify environmental or anthropogenic drivers of changes in abundance or distribution of all pinnipeds.
<p>WDFW, NOAA Marine Mammal Laboratory</p>	<p>Ongoing</p>	<p>Population health assessment of California and Steller sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals along the U.S. West Coast</p>	<ul style="list-style-type: none"> • Identify and monitor natural sources of mortality or health impairment including diseases, predation, biotoxins, and malnutrition. • Identify and monitor anthropogenic sources of mortality or health impairment such as entanglement in debris (gillnet, packing bands, etc.), exposure to contaminants, and antimicrobial resistance. • Determine if exposure and response to health threats differs among populations or regions. • Examine relationships between environmental variability and exposure and susceptibility to natural and anthropogenic sources of health threats. • These data are used to provide baseline and long-term time series of health measures on wild populations as well as identify emerging diseases that could be a threat to marine mammal or human health.

WDFW, NOAA Marine Mammal Laboratory	Ongoing , decreased since 2011 due to funding	Demographic assessment of Pacific harbor seals at U.S. West Coast breeding colonies	<ul style="list-style-type: none"> • Estimate survival and natality of the South Puget Sound stock of Pacific harbor seals. • Examine the relationships among environmental, anthropogenic, and disease factors and survival and natality rates of harbor seals.
WDFW, NOAA Marine Mammal Laboratory	Ongoing	Foraging ecology of California and Steller sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals along the U.S. West Coast	<ul style="list-style-type: none"> • Describe spatial and temporal patterns in marine habitat use by harbor seals and overlap in habitat with ESA listed prey taxa or other prey species of concern. • Examine seasonal and annual diet patterns and trophic relationships of both species in general and in relation to ESA listed prey taxa. • Examine relationships between habitat use, foraging behavior, diet, and environmental variability in relation to habitat and prey availability and ESA listed prey ecology.
West Coast Marine Mammal Stranding Network, WDFW	Ongoing	Marine mammal stranding response, large whale necropsy and land based natural decomposition site	<ul style="list-style-type: none"> • Investigate causes of mortality for all dead marine mammals. • Respond to live stranded marine mammals. • Allows for WCMMSN to conduct necropsies on large whales. • Area for natural decomposition with limited access. • Allows for the ability for skeletal parts to be collected for educational display and outreach.

WDFW, DOC/DSHS, Cascadia Research	Past currentl y offline, pending upgradi ng	Watchable wildlife camera- Harbor seal camera	<ul style="list-style-type: none"> • Allows researcher to remotely monitor long term haul out/ rookery site of harbor seals. • Allows public viewing of life at a harbor seal rookery. • Security camera for Still Harbor area.
Western Pond Turtle Research at South Puget Sound Unit			
Melissa M. Reitz Central Washington University Dr. Alison Scoville Central Washington University	2010	Maternal and environmental effects on hatchling quality in Washington Western pond turtles, <i>Actinemys marmorat</i>	This study investigates the maternal and environmental influences on WPT reproductive output to improve hatching success and hatchling quality at introduced sites.
Tammy Schmidt, WDFW Michelle Tirhi, WDFW	2010-2014	Over-winter survival and causes of mortality of head-started yearling Western pond turtles in Pierce County, Washington	This project documented the over-winter survival of head-start yearling turtles from release to the following spring and determined the causes of mortality when possible.
Tammy Schmidt, WDFW	2015	Comparing radiographic imaging and retrospective photography to physical field assessment as methods to detect ulcerative shell disease infection in Western pond turtles (<i>Actinemys marmorata</i>)	This project investigated if radiographic imaging and reviewing retrospective photographs of individual western pond turtles could be an effective method to identify USD prior to the onset of clinical signs of the disease.
Tammy Schmidt, WDFW	2015	Field detection & assessment of ulcerative shell disease in Western pond turtles (<i>Actinemys marmorata</i>) in Washington	This study developed a field assessment tool establishing a standardized scoring system that could be used to compare ulcerative shell disease prevalence between sites, through time, and across age classes.
Washington State University College of Veterinary Medicine: Marley Iredale, Class of 2017	2015	Determining the cause of shell disease in the Western Pond Turtle in Washington	This study examined the relationship between “head-starting” and bone quality when compared with normal “wild” turtles through bone densitometry (DEXA), high

Dr. Gretchen Kaufman Dr. Kevin Snekvik Dr. Tom Wilkinson			resolution radiographs, and computed tomography (CT).
Monique S. Hazemi, University of Illinois at Urbana-Champaign Professor Angela D. Kent, University of Illinois at Urbana-Champaign	2017-2020	Environmental differences in the microbiome and exposure to the emerging fungal pathogen, <i>Emydomyces testavorans</i> , in conservation rearing and release programs for the Western pond turtle (<i>Actinemys marmorata</i>)	This study investigated the effect of the microbial rearing environment on shaping the microbiome structure, hematology, and shell health of free-ranging and managed-care Western Pond Turtle (<i>Actinemys marmorata</i>) populations.
Washington Dept. of Fish and Wildlife, Oregon Dept. of Fish and Wildlife, California Dept. of Fish and Wildlife, Center for Natural Lands Management, University of California Los Angeles and Greenbelt Land Trust	2017-2021	Advancing Western Pond Turtle Conservation in Washington, Oregon and California	This project will advance priority conservation actions aimed at understanding and improving the population status of Western pond turtles (<i>Actinemys marmorata</i> ; WPT) in WA, OR, and CA.
Katie Haman, DVM, WDFW Jennifer Pramuk, Woodland Park Zoo	2019-2021	Head-starting Washington's Western Pond Turtles in the Face of Shell Disease	Given the importance of head-starting and captive rearing for recovery of WPT, this study works to understand how time in captivity may be associated with a potential fungal pathogen and the development of shell disease.
Tim Storms, DVM, Woodland Park Zoo Kelly Flaminio, DVM, Oregon Zoo Karen Terio, DVM, PhD, DACVP, University of Illinois Shedd Aquarium WDFW	2021-2022	Investigating Shell Disease and Its Associated Pathobiome in Western Pond Turtles	As conservation rearing is critical for the recovery of WPT, this study sets out to understand how managed care environments and rearing practices affect <i>Emydomyces testavorans</i> infections in WPT.

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