Key Site 2: Salish Sea, Washington and British Columbia

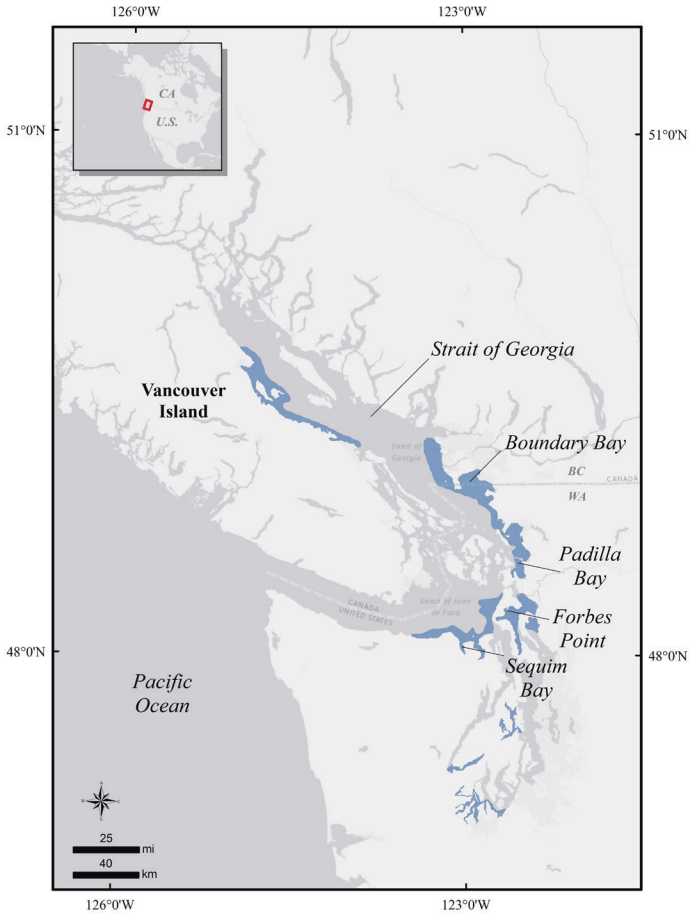
Location: 49°2'35"N, 123°4'22"W

Size: 18,000 km^2

Description: The Salish Sea is a fjord estuary network of coastal marine waters located in southwestern British Columbia (BC), Canada, and northwestern Washington, United States, that includes four major water bodies: the Strait of Georgia, Desolation Sound, Puget Sound, and the Strait of Juan de Fuca (Appendix 1). The name Salish Sea is a relatively new term for the region that unifies this ecosystem across its international border. The Salish Sea extends from Desolation Sound and Discovery Passage at the northern end of the Strait of Georgia along the eastern side of Vancouver Island, and south to Olympia, Washington in Puget Sound. The northern portion is comprised of more "typical" fjord characteristics of steep slopes with deep basins and the southern portion is comprised of less steep slopes with shallower basins. To the west, the Salish Sea opens to the Pacific Ocean via the Strait of Juan de Fuca. It is one of the largest estuarine ecosystems in North America. The Salish Sea key site does not include the entire watershed, but several areas within the Salish Sea watershed that are extremely important to sea ducks. Those areas include a portion of the Strait of Georgia on the east side of Vancouver Island, and Boundary Bay in British Columbia waters, and Padilla Bay, Sequim Bay, and the Forbes Point area in Washington waters.

The Strait of Georgia is roughly 200 km long and 40 km wide, with a maximum depth of 400 m. The Vancouver Island Range to the west and the Coast Range to the east border the Strait of Georgia. Archipelagos and narrow channels mark each end of the Strait of Georgia, the Discovery Islands within Desolation Sound in the north, including a narrow ocean influence, and the Gulf Islands and San Juan Islands in the South. The Fraser River Delta, in the southeast accounts for 80% of the fresh water entering the Strait of Georgia.

Puget Sound is characterized by five deep basins including Whidbey Basin, Central Puget Sound, South Puget Sound, Hood Canal, and Admiralty Inlet. The maximum depth of Puget Sound is 280 m (Freelan 2018). The Strait of Juan de Fuca is approximately 25 km wide and 150 km long, connecting



northern Puget Sound to the Pacific Ocean. The majority of ocean influence enters the Salish Sea through the Strait of Juan de Fuca. The Strait is bisected by the international boundary between the United States and Canada.

Precision and Correction of Abundance Estimates Presented: Data on the distribution and abundance of sea ducks have been collected for the inner marine waters of Washington State during a long-term annual aerial winter survey conducted by the Washington Department of Fish and Wildlife (WDFW) (WDFW 2020, Appendix 2). Canadian waters are surveyed periodically by Canadian Wildlife Service (CWS) in collaboration with the WDFW survey protocol and crew (Appendix 2). Winter bird abundance and density estimates presented for this key habitat do not account for incomplete detection by applying species-specific visibility correction factors, and do not include estimates of several known important areas for sea ducks in Canadian waters including Boundary Bay and the Fraser River estuary, therefore the winter abundance

figures (Appendix 3) provided should be considered minimum estimates.

Biological Value: The Salish Sea is a biologically rich and dynamic system comprised of a wide variety of habitats including intertidal zones, pelagic waters, rocky reefs, coastal wetlands, and freshwater river estuaries. It is especially important to sea ducks of the Pacific Flyway during wintering, staging, spring migration, and molting. The site is a major wintering location for 11 species of sea ducks, including Surf Scoter (*Melanitta perspicillita*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Barrow's Goldeneye (*Bucephala islandica*), all three mergansers (*Mergus* spp.), Long-tailed Duck (*Clangula hyemalis*), and Harlequin Duck (*Histrionicus histrionicus*) (Appendix 3). The total wintering population of sea ducks in surveyed areas of the Salish Sea (Appendix 2) was estimated to be a minimum abundance of about 247,000 birds in 2013 (Appendix 3; Evenson et al. 2013, WDFW 2020). This estimate is biased low because the survey area in British Columbia did not include Boundary Bay or the Fraser River estuary, both high density sea duck areas (Evenson et al 2013). The most abundant species or species group was scoters, followed by Bufflehead, goldeneyes, mergansers, Long-tailed Duck, and Harlequin Duck (Appendix 3). Nyeswander et al. (2005) and Evenson et al. (2013) summarized abundance estimates by species and species groups in near-shore versus offshore waters, and, in the case of Puget Sound, among basins. WDFW (2020) summarized sea duck trends in Washington marine waters of the Salish Sea from 1994 to 2019. Trends in BC areas of the Salish Sea are less understood.

While winter survey estimates clearly indicate the importance of the Salish Sea during winter, this site also hosts thousands of sea ducks, particularly scoters, during spring staging and during late summer molt. Several areas in the Salish Sea are particularly important to sea ducks at various times of the year. In British Columbia, Baynes Sound, in the northwest of the Strait of Georgia, hosts tens of thousands of sea ducks in winter and especially during herring spawning in spring, particularly around Hornby and Denman Islands (D. Esler, USGS pers. comm). Recent CWS surveys in coastal BC have identified sea duck use of estuaries and rivers where Eulachon (*Thaleichthys pacificus*) spawn. Mergansers are particularly abundant on estuaries and rivers where Eulachon spawn. Bufflehead is the most common sea duck species in BC coastal estuaries and large aggregations of goldeneyes have been observed in the estuaries at the head of some mainland coast inlets (Toba, Knight and Kingcome Inlets) in late March, suggesting that these estuaries are the last coastal stop prior to inland migration. Other areas in BC important to sea ducks in spring include Boundary Bay, Fraser River Delta, and Howe Sound (Evenson et al. 2007).

Herring spawning is important to several species of sea ducks during spring, but habitats lacking herring spawn and bivalves, like eelgrass beds where soft-bodied prey are found (e.g., polychaetes) are also important to sea ducks (Anderson et al. 2008). In Salish Sea waters in Washington, Padilla Bay supports one of the largest continuous native eelgrass (*Zostera marina*) beds on the Pacific Coast (Bulthuis 1995), and as such is important particularly for molting scoters that return in thousands during late-July and August. Areas of particular importance to sea ducks in Washington during spring included Padilla Bay north through Lummi Bay, and Boundary Bay dominated by Surf Scoter, White-winged Scoter, Harlequin Duck, and the only consistent concentrations of Long-tailed Duck found in Washington waters (Evenson et al. 2007).

Detailed information about abundance and site use for species or species groups is as follows.

Scoters. Surf, White-winged, and Black Scoters are common species in the Salish Sea, with Surf Scoter being the predominant species of the three (Evenson et al. 2013, 2020). Numbers of scoters wintering in inner marine waters of Washington have declined significantly since the late 1970s (Nysewander et al. 2005). Nysewander et al. (2005) reported higher densities of scoters in near-shore habitats (<20 m) than in deep waters (>20 m), and that scoters used most near-shore marine waters in the survey area. Highest winter densities of scoters occurred in southern and central Puget Sound. Hot spots for scoters also included the Washington portion of Boundary Bay, Bellingham Bay and Padilla-Samish Bay. Densities ranged annually from 55.0 to 70.4 scoters per km^2 in near-shore waters. In BC, the majority of Scoters are also found in near-shore waters. Hot spots in BC for scoters include Boundary Bay, the Fraser River Delta, Baynes Sound, and the east

Coast of Vancouver Island from Campbell River to Nanaimo. Numbers of scoters in Baynes Sound in the early 2000s were much higher than during a CWS survey in 1981 (D. Esler, CWS, pers. comm.).

In summer, Nysewander et al. (2005) found high densities of scoters in Padilla Bay, Crescent Harbor, Penn Cove, and in three locations in the Strait of Juan de Fuca: Dungeness Bay, Crescent Bay and Neah Bay and Boundary Bay, on the Washington border with British Columbia. Anderson et al. (2006) documented year-round use by Surf and White-winged Scoters among three sites in Puget Sound: Penn Cove, Birch Bay, and Padilla Bay. Penn Cove largely lacks vegetation and has extensive mussel beds over sand and gravel and harbors roughly 5000–7000 Surf Scoters during early winter. Scoter use of Birch Bay peaked during spring staging when herring spawn was available. Padilla Bay was used during both spring staging and molting in summer. Molt surveys in 2007–2009 revealed roughly 8000 scoters in Padilla Bay, 2500–3000 at Forbes Point (between Oak Harbor and Crescent Bay, Washington), approximately 6000–8000 in Boundary Bay, and 8000–10,000 in the Fraser River Delta (Joe Evenson, WDFW pers. comms.). Only Birch Bay held substantial numbers of White-winged Scoters. Telemetry revealed scoters that wintered from Mexico to British Columbia used the Salish Sea from mid-March to mid-May (Evenson et al. 2007). The southern Gulf Islands of British Columbia are important to Surf Scoters during spring migration including Gabriola Island, Porlier Pass, Active Pass and Saturna Island, as well as the northern entrance of Howe Sound (Evenson et al. 2007).

Bufflehead. Bufflehead occur in Washington waters in similar densities to scoters, but tend to favor shallower waters and heads of bays or inlets (Nysewander et al. 2005). The shoreline of southern Strait of Juan de Fuca is important to Bufflehead in some years. Densities of Bufflehead ranged from 34.1 to 64.3 birds per km^2 in near-shore waters. In British Columbia, Bufflehead were primarily associated with estuaries and near-shore waters, with less than 10% associated with offshore waters (Evenson et al. 2013). Wintering Bufflehead populations have been generally stable since the late 1970s (Nysewander et al. 2005).

Goldeneyes. Goldeneye species (Barrow's Goldeneye and Common Goldeneye) are widely distributed in Washington (Nysewander et al. 2005, WDFW 2020). Densities ranged from 17.3 to 38.3 birds per km^2, much lower than Bufflehead and scoters (Nysewander et al. 2005). Goldeneye densities were higher in southern and central regions than in northern areas of Puget Sound, and they were often found where no other sea duck species were present (Nysewander et al. 2005). Numbers of goldeneye have declined in Puget Sound (Nysewander et al. 2005, WDFW 2020). In British Columbia, goldeneyes were more abundant in fjords and less abundant along the exposed waters of the Strait of Georgia and Strait Juan de Fuca (Evenson et al. 2013). Hot spots for Barrow's Goldeneye in BC include Burrard Inlet, Desolation Sound, and Mainland Coast Inlets (particularly Toba, Kingcome, Knight, and Jervis Inlets).

Mergansers. Mergansers were common throughout Washington marine waters, but occurred in lower numbers compared to other sea duck species, except Long-tailed Duck and Harlequin Duck. Of the merganser species, Red-Breasted Mergansers (*M. serrator*) were most common during winter surveys, followed by Common (*M. merganser*) and Hooded Mergansers (*Lophodytes cucullatus*) in both Washington and British Columbia, but only Common and Hooded Mergansers also breed in this region (Nysewander et al. 2005, Evenson et al. 2013, WDFW 2020). In Washington, Hooded Merganser favored the San Juan Islands and selected portions of south and central Puget Sound (Nysewander et al. 2005). In British Columbia, Red-breasted Merganser were evenly distributed among coastal and fjord habitats, and Common and Hooded Mergansers were most common in near-shore habitats (Evenson et al. 2013). Mergansers in Puget Sound are considered stable to increasing (Nysewander et al. 2005), WDFW 2020).

Long-Tailed Duck. Nysewander et al. (2005) reported Long-tailed Duck distribution differed from other sea ducks in that they were found in eastern portions of Strait of Juan de Fuca and Georgia Strait in deeper near-shore waters. Similarly, in British Columbia, Evenson et al. (2013) found Long-tailed Duck exclusively near the coastline of the Strait of Georgia and Strait Juan de Fuca. Numbers of Long-tailed Duck have declined substantially over the past few decades (Nysewander et al. 2005, WDFW 2020).

Harlequin Duck. Harlequin Duck were associated with intertidal habitats as well as kelp beds along the southern shore of the Strait of Juan de

Fuca (Nysewander et al. 2005). Similarly, Evenson et al. (2013) found Harlequin Duck predominantly along coastlines of the Straits and were less commonly observed in the deeper fjords. WDFW (2020) reported relatively stable Harlequin Duck population in the Washington portions of the Salish Sea between 1999 through 2019. Harlequin Ducks are widespread throughout the BC portion of the key site. Of note, large numbers of Harlequin Ducks congregate around Hornby Island and nearby areas in BC during herring spawn. The shores of nearby Hornby Island are a major roost site for molting Harlequin Ducks (K'omoks IBA CANADA).

Sensitivities: Sea duck populations may be vulnerable to habitat loss, loss of prey due to climate change, ocean acidification, marine pollution, disease, harmful algal bloom events (Phillips et al. 2011), and disturbance from shipping and recreational boating (De La Cruz et al. 2014). These threats have the greatest potential impact during the flightless molt period in late summer and spring foraging events when energetic demands are high and birds are more vulnerable and sensitive to disturbance.

Potential Conflicts: This site is adjacent to major urban population centers with over 7 million people as of 2012 (Salish Sea Marine Sanctuary 2018) and projected to be over 9 million in 2025 (U.S. Environmental Protection Agency 2017). Major coastal cities include Victoria and Vancouver in British Columbia, and Seattle and Tacoma in Washington. These large port cities, as well as extensive coastline development of other urban centers, present many potential conflicts with sea ducks and the habitats they rely on, such as degraded water quality and habitats, as documented by the Puget Sound Partnership (2018). Specific sources of pollution include oil, gas, paint, fertilizer, flame-retardants, heavy metals, and sewage. Many of these pollutants enter the Salish Sea via storm-water runoff (Ecology and King County 2011). Additional potential impacts on sea ducks include marine boat traffic, mariculture, habitat loss, oil spills, and climate change. The Health of the Salish Sea Report, a joint initiative between the U.S. Environmental Protection Agency (2017) and Environment and Climate Change Canada, tracks ten environmental indicators such as air quality, water quality, species at risk, and toxins in the food web, and found 6 of the 10 indicators were either neutral or worsening in the Salish Sea. For instance, mussels have been used to study toxins in Puget Sound's nearshore biota, and Lanksbury et al. (2014) observed Poly-aromatic hydrocarbons (PAHs) from oil pollution were widespread with highest levels in urban areas. Willie et al. (2017) found that Barrow's Goldeneyes wintering in BC had higher exposure of PAHs in coastal areas with greater anthropogenic influence versus more pristine areas. Finally, expansion of the non-native eelgrass (*Zostera japonica*) threatens intertidal mudflats and bivalve beds, with uncertain implications for competition with the native eelgrass beds (*Z. marina*) and the invertebrate species found to provide food resources for several of the sea duck species in these zones (Ray 1997, Anderson et al. 2008).

Status: This key site includes 21 Important Bird Areas (IBAs) within the state of Washington and 14 IBAs in British Columbia. The IBAs in this key site include bays, inlets, marshes, bends, passes, harbors, coves, lagoons, and a brackish lake important for water birds (IBA Audubon 2018, and IBA Canada https://ibacanada.org/). Additionally, the Washington Department of Fish and Wildlife (WDFW) has designated Marine Protected Areas (MPAs) including Conservation Areas (no take allowed) and Marine Preserves (limited take allowed). The MPAs provide protection for important fisheries in Puget Sound that are often important to sea ducks as well (e.g., herring).

In Washington State, local governments must meet state requirements for development in near-shore waters (Shoreline Management Act (RCW 90.58) and the Growth Management Act (RCW 36.70A)). These regulations require collection of information about critical areas (MRSC website), including eelgrass beds, to characterize shoreline function and ecosystem wide processes. Adopted in 1971 as citizen's initiatives, local governments are tasked with identifying measures to protect and/or restore impacted ecosystems (Envirovision, Herrera Environmental, and Aquatic Habitat Guidelines Program 2010).

The Washington State constitution stipulated that all citizens, not individuals, own aquatic lands; however, until 1971, landowners could purchase tidelands or shore-lands from the state (Washington DNR https://www.dnr.wa.gov/). Tideland usually refers to ownership between the lower low water mark and the mean high water mark. Shore-lands

are submerged lands lying along the edge of rivers or lakes. In 1971 the legislature voted to stop sale of the state's aquatic lands. At present, 70% of tidelands remain privately owned. The state monitors jurisdiction over 75% of shore-lands, all navigable waters, and all bed-lands. Bed-lands are those aquatic lands that are submerged at all times.

Additional state legislation to restore the health of Puget Sound was enacted in 2007 through the Puget Sound Water Quality Protection program (RCW 90.71), designed to use science to develop and meet measurable goals for the recovery of the sound through the Puget Sound Partnership (2018).

In Canada, the jurisdiction of near shore waters lies with both local and provincial governments (Green Shores 2009). Local governments are responsible for land use planning and regulation and the Provincial government issues permits of all near-shore areas in inland seas such as the Strait of Georgia and Strait of Juan de Fuca.

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