## Species Status Summary and Information Needs

**Sea Duck Joint Venture, March 2015**

# Surf Scoter *(Melanitta perspicillata)*

**Population Size and Trends**: The 2012 North American Waterfowl Management Plan estimate for the continental population of Surf Scoters is 700,000, but there is little quantitative information available to assess actual population size. Data from the Waterfowl Breeding Population and Habitat Survey indicate that scoters (all spp.) experienced an overall decline since the 1950s in North America. This survey estimates the total scoter breeding population at 1,106,761 (2012-14 average), which is -17% below the 1955-2013 average. Unfortunately, in this survey all scoter species are lumped because they are difficult to distinguish from the air. Also, the survey is not optimally timed to monitor Surf Scoters, which generally breed later than other duck species. Consequently, annual estimates fluctuate widely depending on annual timing of migration and how many birds occur on surveyed areas.

Recent satellite telemetry studies suggest that Surf Scoters wintering on each coast are largely segregated on the breeding grounds, but there is a region of overlap near Great Slave Lake in the Northwest Territories as well as southwest continental Nunavut and northern Manitoba. Regardless, because the two wintering areas have distinct ecological characteristics with different harvest pressures, separate management of the eastern and western populations of Surf Scoters is warranted.

On the Pacific Coast, the wintering population is estimated at approximately 225,000 Surf Scoters, based on compilation of results from a variety of independent surveys (J. Hodges, unpublished). Wintering numbers were stable for Kodiak Island (1991-2005) and southern coastal British Columbia (1999-2011), but decreasing in Puget Sound (1999-2013) and San Francisco Bay (1981-2012) (Crewe et al. 2012; Richmond et al. 2014; Bowman et al. 2015). The number of Surf Scoters detected on Alaska breeding surveys appears to have declined from 1993-2012 (Bowman et al. 2015).

In the east, breeding Surf Scoters are counted in the Waterfowl Breeding Population and Habitat Survey in Canada, but the eastern survey area only covers the southern edge of the breeding range. In this part of the range, the Surf Scoter breeding population is estimated at 125,000 (average 2004-2013) and has increased since surveys were initiated in 1990 (Canadian Wildlife Service Waterfowl Committee 2014). Spring migration counts at Point Lepreau, New Brunswick have declined during 2000-2012, while fall migration counts at Point Avalon, New Jersey have been stable during 1995-2007 (Bowman et al. 2015). The Atlantic Coast Wintering Sea Duck Survey estimated an average of 149,200 Surf Scoters and 429,400 scoter spp., based on surveys conducted from 2008-2011 from the US-Canada border south to Florida (Silverman et al. 2012).

**Priority Information Needs:**

1. Inventory and monitor eastern and western breeding populations of Surf Scoters on an annual basis considering optimal survey timing, and increase coverage to significant unsurveyed areas.
2. Develop or refine aerial survey techniques to separate scoter species and estimate detection rates.
3. Periodically inventory and monitor eastern and western wintering populations of Surf Scoters, and increase coverage to significant unsurveyed areas.

**Population Delineation**: Surf Scoters breed throughout the boreal forest, but appear to have the highest densities in Alaska, Northwest Territories, Ontario, Québec, and Labrador. Recent satellite telemetry studies have provided information on connectivity among breeding, molting, and wintering areas.

Surf Scoters wintering on the Atlantic Coast utilize spring stopover and staging areas including Nantucket Shoals, Northumberland Strait, Chaleur Bay, and the St. Lawrence Estuary and Gulf. Atlantic Coast Surf Scoters breed primarily in the boreal forest of Quebec and Labrador, but some occur west of Hudson Bay; including the James Bay lowlands of Ontario, northern Manitoba, southwest continental Nunavut, and Northwest Territories. Molting areas used by males include the east coast of Hudson Bay, James Bay, coastal Labrador, St. Lawrence Estuary, and Ungava Bay. A large proportion of males and females migrate through the St. Lawrence Estuary and Gulf when returning to wintering areas. Fall staging areas include the St. Lawrence Estuary, Northumberland Strait, and Nantucket Shoals. (SDJV 2014)

Surf Scoters wintering on the Pacific Coast south of Alaska (i.e., from Baja California through San Francisco Bay, Puget Sound, Strait of Georgia, and Kitimat, BC) breed over a large geographic area, including the Northwest Territories and to a lesser extent southwest continental Nunavut, and the northern portions of Alberta, Saskatchewan, and Manitoba. These birds use one of two spring migration routes - a southern inland route involving staging in Puget Sound-Strait of Georgia before migrating inland, or a northern coastal route with inland migration beginning in the area around Lynn Canal near Juneau, Alaska. Individuals using the northern coastal route tended to breed further north within the boreal forest than those using the southern inland route. Less is known about breeding areas for Surf Scoters wintering in Alaska, but limited data from satellite telemetry suggest they breed as far east as the Northwest Territories. Surf Scoters captured during spring in Prince William Sound migrated to breeding areas in interior Alaska and northern Canada, molted at Kuskokwim Shoals, Prince William Sound, Norton Sound, and Kotzebue Sound; and wintered in Prince William Sound and the Strait of Georgia (Rosenberg et al. 2006).

Recent satellite telemetry studies have documented high return rates of individuals to breeding, molting, and wintering areas. However, sample sizes of individuals tracked for multiple years remain small, and focused on adult birds. For 12 Surf Scoters marked on the Atlantic Coast, mean distance between wintering areas used in consecutive years was 84 km (SDJV 2014). Eight females marked on the Pacific Coast were tracked to nest locations that averaged 1.2 km apart in successive years (Takekawa et al. 2011). Six females followed very similar spring migration routes in the two years of tracking (De La Cruz et al. 2009).

**Priority Information Needs:**

1. Using satellite telemetry, complete descriptions of linkages among key wintering areas and breeding, molting, and staging areas for both populations.
2. Determine relative densities of breeding populations to delineate key breeding areas.
3. Determine the level of annual fidelity to breeding, molting, and wintering habitats.
4. Using satellite telemetry, document movement patterns of hatch year and first year birds.
5. Conduct genetic and stable isotope analyses to refine understanding of breeding-wintering associations.
6. Evaluate veterinary practices to increase survival of scoters with implanted transmitters.

**Population Dynamics**: There are few data on population dynamics of this species. In eastern Canada, adult males had an annual survival rate of 0.91 (95% CI: 0.73-0.97) and a recovery rate of 0.01 (95% CI: 0.01 – 0.02) (Reed and Gilliland unpublished data). The winter daily survival rate in southeast Alaska, British Columbia, Washington and Baja California was 0.9985 (95% CI: 0.9979-0.9989), resulting in a cumulative survival rate of 0.82 (0.76-0.87) over the winter period (129 days) (Uher-Koch 2013). Daily and seasonal survival during remigial molt in southeast Alaska and the Salish Sea (Puget Sound-Strait of Georgia) was found to be 1.00 (Uher-Koch et al. 2014).

Limited data on productivity and recruitment are available for Surf Scoters. At Lake Malbaie, Québec, 67-75% of nests produced ducklings, 35-45% of ducklings survived to fledge (0.9-– 2.1 ducklings/pair), daily survival rate of broods (modified Mayfield estimate) was 0.91 - 0.93 and the brood:pair ratio was 0.34 - 0.63 (Morrier et al. 1997, 2008; Lesage et al. 2008). In another study in Québec, the brood:pair ratio ranged from 0.4 - 0.7, except for one year in which no broods were observed (Bergeron et al. 1996). In Puget Sound the average percentage of juveniles (i.e. first-year birds) was 8.3% in February of 2008-10 (WDFW 2013). In the Strait of Georgia during January-February 2000-2002, the average ratio of juveniles to adults was 0.11 for males and 0.23 for females, and the sex ratio was 0.35 females:total birds (Iverson et al. 2004). These surveys were repeated in three years between 2003 and 2014, resulting in an average juvenile percentage of 7% for males and 16% for females, and a sex ratio of 0.40 females:total birds. The only measures of recruitment available for the Atlantic population are from ratios of sub-adult (1 and 2-year-olds) to adult (>2 years old) males from molt sites in Labrador from 2004 to 2007. There were significant differences in the age composition among years, with about 10% immature males in 2004 and 2007, and 4% immature males in 2005 and 2006 (Gilliland et al 2007; SDJV#49). The reasons for this variability are unknown, but suggest that productivity and/or juvenile survival vary annually.

**Priority Information Needs:**

1. Determine survival rates for Surf Scoters wintering in specific areas on the Pacific and Atlantic coasts, with emphasis on adult birds.
2. Monitor age and sex ratios for key wintering and staging areas.

**Population Ecology**: Population ecology of breeding, molting, migrating, and wintering Surf Scoters needs additional study for all age classes. The relationship between foraging interactions of Surf Scoters occurring with other sea duck species is generally unknown. Studies suggest that the wintering behavior of Surf Scoters differs between clam and mussel habitats (Kirk et al. 2008) but studies are needed at molting and staging sites. In a study of Surf Scoters marked with VHF radio transmitters during remigial molt and during winter on the Pacific Coast, about 10% were either predated or scavenged, mainly by Bald Eagles and mustelids; predation rates were much higher during winter than during molt (Anderson et al. 2012). Based on marking studies, there is some indication that large scale spatial segregation and differential survival occurs according to age and sex in wintering habitats (VanStratt 2011; Uher-Koch 2013; D. Esler, unpubl. data).

**Priority Information Needs:**

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) during the breeding, molting, and wintering periods.

**Habitat Requirements**: Habitat characteristics at key breeding, molting, and winter areas have not been well documented. The Atlantic Coast Wintering Sea Duck survey was flown from 2008-2011 to determine winter distribution of sea ducks and to identify relationships between sea duck occurrence and habitat variables such as distance from land, bottom slope, and water depth. The Maryland and Delaware coasts were found to be areas of particularly high density for Surf Scoters; in general scoters used lower slope areas further offshore when compared to Common Eiders or Long-tailed Ducks, and Surf coters tended to move closer to shore during low tide (Silverman et al. 2013). Across a variety of transect types, mean distance to land was 5.3 – 7.6 km, water depth was 8.5 – 12.0 m and bottom slope was 0.1 – 0.2° (Silverman et al. 2013). Zipkin et al. (2010) found that more scoters on the Atlantic Coast tend to use nearshore areas during years of negative North Atlantic Oscillation index (i.e. cold snowy winters). In Narragansett Bay, Rhode Island, the highest densities of scoters were found in areas with sand substrates and homogeneous assemblages of infaunal prey (Loring et al. 2013). Locations of Surf Scoters in San Francisco Bay during December to March were strongly influenced by presence of herring roe (herring spawn in the bay November to March, peaking in January) and seagrass beds, but scoters were positively associated with seagrass beds even in the absence of herring roe (De La Cruz et al. 2014). Presence of herring roe is known to be a strong influence of Surf Scoter distribution in the Strait of Georgia and outer coast of BC during late winter and spring, as well as along the coast of BC and Alaska during spring migration (Zydelis et al. 2005; Lok et al. 2008, 2012; Sean Boyd, pers. comm.). When compared to random sites, stopover sites used by Surf Scoters during spring migration in southeast Alaska were farther from the mainland coast and closer to herring spawn locations, but physical shoreline habitat characteristics were not useful predictors of Surf Scoter presence (Lok et al. 2011). In early winter, Surf Scoters in San Francisco Bay were observed more in the shallow, freshwater-influenced San Pablo Bay, where they may feed on the abundant and accessible overbite clam (*Corbula amurensis*). Later in winter they were more common in the Central Bay in deeper, more saline water, where they were more likely to feed on Pacific littleneck clams (*Venerupis philipinarium*) and herring roe (De La

Cruz et al. 2014). In Puget Sound and BC, scoter distribution is also influenced by shellfish aquaculture activities (producing mussels and clams), although some commercial shellfish farms exclude sea ducks with netting (Don Kraege, pers comm.). In Malaspina Inlet, BC, a strong positive relationship was found between aquaculture facilities (mostly oyster longlines) and Surf Scoter density; intertidal width also positively affected density, but other environmental variables (rocky shore, reef presence, mussel density) had poor explanatory power (Zydelis et al. 2008). Conversely, in Baynes Sound, BC, Surf Scoter density was not related to aquaculture facilities but was predicted by environmental variables, particularly intertidal area (Zydelis et al. 2006). A study of sea duck habitat selection in southeast Alaska found that scoters (all species combined) tended to be less common in areas of more exposed shoreline and presence was positively related to the numbers of islets in an area (Gunn 2009). A similar analysis, but using BC Coastal Waterbird Survey data, is being undertaken by Ducks Unlimited Canada and the Canadian Wildlife Service. Surf Scoters were one of the species included in the preliminary analysis and modeling results suggest that their abundance may be related to habitat variables including substrate type, presence of mussels, clambeds, barnacles, urchins, shellfish farms, wave exposure, and number of islets (Cooper 2014, unpubl. report).

Locations of Surf Scoters marked with satellite transmitters have been used to identify some of the features of preferred nesting habitat. However, very few nest sites have been located, so it is difficult to make inferences about fine-scale habitat associations and correlations between habitat features and reproductive success. In some areas, Surf Scoters breed at relatively high densities on islands in large lakes and also may occur in high numbers at other localized breeding areas. Female Surf Scoters marked with satellite transmitters on the Pacific coast were tracked to breeding areas in the northern boreal forest. Nests of three individual females marked with VHF or satellite transmitters were located in this region; surrounding vegetation was sparse black spruce trees (*Picea mariana*) >4 m in height, with Labrador tea (*Ledum groenlandica*), cloudberry (*Rubus chamaemorus*), mountain cranberry (*Vaccinium vitis-idaea*) and lichen (Takekawa et al. 2011). Ground cover and above nest vegetation cover were 90% and the nests were near shallow oligotrophic lakes, with two nests located in granitic or metamorphic outcroppings having sparse (0-5%) soil cover (Takekawa et al. 2011). In the Mackenzie River Delta and surrounding upland areas, Surf Scoter pairs were observed more often on larger wetlands and on wetlands where White-winged Scoters were also present (Hazard 2004). Surf Scoter pairs and broods were found in wetlands in both the delta and upland areas, but a higher proportion of the upland wetlands had pairs and broods (Hazard 2004). Most observed broods were in open water or close to floating vegetation, with very few broods in shoreline emergent vegetation (may be partially due to detection bias) (Hazard 2004). In this region, habitat selection may not occur at the level of individual wetlands – wetlands are close together and scoters nest in upland areas, so they may use several wetlands over the course laying, incubation, and brood-rearing (Hazard 2004). At Lake Malbaie, Québec, the 19 nests discovered in 1994 and 1995 were all spotted on islands and most were built under a shelter, usually a fallen snag. Nests were situated in either mature boreal forest or in windfall, at a distance to the water from 6 to 27 m (Morrier et al. 2008). The distance travelled by the broods to feeding areas varied from 281 m to 1652 m. In the boreal forest of Quebec, breeding Surf Scoters selected nearshore areas of lakes and connected ponds and avoided offshore areas of lakes and flooded swamps (Lemelin et al. 2010).

**Priority Information Needs:**

1. Describe associations among bird densities, movement patterns, and foraging rates with specific marine habitat features and diets.
2. Determine specific habitat features and conditions necessary for successful recruitment.

**Harvest Assessment**: Fall harvest is poorly documented in existing surveys. During 1999-2008, the U.S. harvest averaged 25,552, based on Harvest Information Program (HIP) estimates. The Canadian harvest averaged 4,205 during the same period. In the U.S., 82% of the harvest occurs in the Atlantic Flyway and the majority of the Canadian harvest is in Québec, Nova Scotia and Newfoundland (Baldassare 2014). Limited data on harvest, age ratios, and band recovery rates from eastern Canada indicate that harvest rates of male Surf Scoters are generally low (0.016-0.034; Gilliland et al. 2011), and likely sustainable at current levels (Rothe et al. 2015). The Canadian harvest was significantly higher in the 1970s, when 20,000-40,000 birds were taken each year (Baldassare 2014). The level and composition of subsistence harvest is poorly documented, both in Alaska and northern Canada. Rothe et al. (2015) estimated Alaska subsistence harvest at 2,765 with about half of that occurring on the Yukon-Kuskokwim Delta. Subsistence harvest in Canada mostly occurs on the Atlantic Coast and about 1,000 birds are taken on the Pacific Coast (SDJV 2007). Available data for Quebec estimated Cree subsistence harvest at 3,300 in 2006, and Innu subsistence harvest at 2,350 in 2012.

**Priority Information Needs:**

1. Assess and improve fall harvest surveys, including enhanced parts collection surveys to monitor age and sex ratios.
2. Quantify subsistence harvest levels in Alaska and Canada.

**Parasites, Disease, and Contaminants**: Little is known about the effects of parasites, disease, and contaminants on Surf Scoters. A large number of parasites have been recorded from Surf Scoters (Bourgeois and Threlfall 1982). Infections varied between males and females, with a greater prevalence of marine parasites in males and a greater prevalence of freshwater parasites in females. Some parasitic infections are asymptomatic, whereas others may cause chronic to severe pathological symptoms, sometimes leading to death (Friend and Franson 1999). A parasitological survey of Surf Scoters from Nain, Labrador found 329 individual parasites and nematodes in 36 molting Surf Scoters, representing 17 taxa (Gilliland et. al 2007 [SDJV #49]). Thirteen of the 36 Surf Scoters collected were immatures, and these individuals had a greater abundance of parasites. All the adult individuals had a much higher intensity, range and prevalence of the abundant taxa of parasites.

In a review of sea duck disease factors identified from necropsies, the acanthocephalan *Polymorphus* spp. (associated with peritonitis) was the only biotic factor found to have caused mortality in Surf Scoters (Skerratt et al. 2005) Avian cholera has been reported to kill Surf Scoters, but prevalence and population-level effects of this disease and others are unknown.

Concentrations of organic contaminants, butyltins and trace metals were measured in Surf Scoters collected from wintering areas in the Strait of Georgia, British Columbia and some associations were found between contaminant levels and body condition, as well as location (Elliott et al. 2007). Molting scoters collected in Nain Labrador showed low concentrations of contaminants in samples that were screened for heavy metals and organic contaminants (Burgess and Gilliland, unpublished data [SDJV#49]). The only contaminant that approached levels know to be toxic to birds was selenium, and the only contaminant that varied between immature and adults was cadmium.

**Priority Information Needs:**

1. Screen Surf Scoters for diseases and parasites on breeding and wintering areas.
2. Determine levels of contaminants in birds on breeding and wintering areas.

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