Sea Duck Joint Venture
Strategic Plan 2022 - 2031

Plan Conjoint des Canards de Mer
Plan Stratégique 2022 – 2031

May 2022

A North American Waterfowl Management Plan
Conservation Partnership

Acknowledgements:

The Sea Duck Joint Venture respectfully acknowledges the Indigenous peoples of North America as the first stewards of North American sea duck populations and habitats and for their continued role in conservation and stewardship of sea ducks.

The Sea Duck Joint Venture will work to develop and maintain an inclusive climate, in which people from all cultures and backgrounds are welcome to collaborate to advance the conservation of sea ducks.

The following Sea Duck Joint Venture Coordinators and members of the Continental Technical Team and Management Board contributed to writing and review of this plan: Margaret Campbell, Kate Martin, Eric Anderson, Shannon Badzinski, Sean Boyd, Gary Donaldson, Dan Esler, Grant Gilchrist, Scott Gilliland, Al Hanson, Christine Lepage, Tyler Lewis, Pam Loring, Frances Mann, Nic McClellan, Eric Reed, Tony Roberts, Myra Robertson, Megan Ross, David Safine, Emily Silverman, Kyle Spragens, Greg Soulliere, and Kelsey Sullivan, and Eric Taylor.

We thank the following reviewers for their thoughtful comments on the preliminary draft: Melissa Burns (U.S. Fish and Wildlife Service), Bob Clark (Canadian Wildlife Service, retired), Susan De La Cruz (U.S. Geological Survey), Justyn Foth (U.S. Fish and Wildlife Service), Al Hanson (Eastern Habitat Joint Venture), Kristina Hick (Eastern Habitat Joint Venture), Monica Iglecia (Pacific Birds Habitat Joint Venture – US), Andrew Huang (Pacific Birds Habitat Joint Venture – Canada), Crystal Leonetti (U.S. Fish and Wildlife Service), Randy Milton (Nova Scotia Department of Natural Resources, retired), Chris Nicolai (Delta Waterfowl), Martin Robards (Wildlife Conservation Society), Tom Rothe (Alaska Department of Fish and Game, retired), Jean-Pierre Savard (Canadian Wildlife Service, retired), Graham Sorenson (Bird Studies Canada), and Sarah Wong (Canadian Wildlife Service).

Tim Bowman (retired, U.S. Fish and Wildlife Service) contributed all photographs in this document.

Suggested Citation:

Sea Duck Joint Venture. 2022. Sea Duck Joint Venture Strategic Plan 2022 – 2031. U.S. Fish and Wildlife Service, Anchorage, Alaska, USA; Canadian Wildlife Service, Whitehorse, Yukon, Canada.

Inquiries about this plan may be directed to member organizations of the Sea Duck Joint Venture or to the Coordination Offices:

U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99503 (kate_martin@fws.gov)

Canadian Wildlife Service, 91780 Alaska Highway Whitehorse, Yukon Y1A 5X7 (margaret.campbell@ec.gc.ca)

Copies of this plan and other joint venture documents may be obtained from these offices or downloaded from the SDJV website: http://seaduckjv.org

White-winged Scoter.

Executive Summary

The vision of the Sea Duck Joint Venture (SDJV) is that sustainable populations of North American sea ducks are maintained throughout their ranges. The SDJV promotes conservation of all North American sea ducks through partnerships that provide greater knowledge and understanding for effective population and habitat conservation and management. Its goals are to (1) work with partners to generate and disseminate knowledge that will inform management decisions, habitat protection initiatives, and sea duck conservation in North America; and (2) increase awareness of sea ducks and encourage engagement of management and scientific communities, industry, and the public in sea duck conservation through effective communications and outreach.

The 2022-2031 Strategic Plan (Plan) defines the general, comprehensive direction of the SDJV over the next 10 years, and outlines strategies for achieving the SDJV partnership's vision. The Plan will serve as an over-arching communication tool used to increase knowledge and awareness of key conservation issues that require action from entities within and outside the SDJV partnership. It identifies priorities for sea duck research and conservation action, including: (1) focus on species of management concern, (2) assess population status and distribution, (3) improve harvest management, (4) conserve important habitats, (5) understand consequences of environmental change, and (6) understand and mitigate effects of industrial development. Broad actions related to each priority are identified and will be expanded upon in a subsequent work plan that includes milestones, measurable outcomes, and a timeline.

Actions to achieve SDJV goals include: (1) continuing to support research that informs critical aspects of sea duck management, especially related to harvest and recreational enjoyment, habitat protection, and identification and response to threats; (2) improving management of existing data sets; and, (3) increase partnerships, awareness, and engagement in sea duck conservation through strategic communication, support for early career scientists, and increased focus on human dimensions and new partnerships. The SDJV will continue to be flexible and adaptive by taking advantage of opportunities presented by partners and maximize the application of knowledge gained through SDJV activities.

1 TABLE OF CONTENTS

2 INTRODUCTION 6

2.1 Vision *8*

2.2 Mission *8*

2.3 Goals *8*

3 SDJV PRIORITIES 9

3.1 Focus on Species of Management Concern *9*

3.2 Assess Population Status and Distribution *9*

3.3 Improve Harvest Management *15*

3.4 Conserve Important Habitats *17*

3.5 Understand Consequences of Environmental Change *20*

3.5.1 CLIMATE CHANGE 20

3.5.2 CHANGING PREDATOR COMMUNITIES 21

3.6 Understand and Mitigate Effects of Industrial Development *22*

4 STRATEGIES TO ADDRESS PRIORITIES 24

4.1 Support Sea Duck Research and Monitoring *24*

4.2 Integrate Human Dimensions, Communications, and Partner Development *25*

5 JOINT VENTURE EVALUATION PROCESSES 28

6 LITERATURE CITED 28

7 APPENDIX A: SDJV ACCOMPLISHMENTS 30

8 APPENDIX B: SPECIES OF MANAGEMENT CONCERN RANKING PROCESS 36

2 INTRODUCTION

The fifteen species of sea ducks (Tribe *Mergini*) exemplify diversity in their striking, bold plumages and specialized bill morphologies, and in their preferred habitats ranging from estuaries of the Atlantic coast, to tree cavities in the boreal forest, to the vast tundra and sea ice of the Arctic. In many places, sea ducks play an important role in the culture and food security of Indigenous peoples, and their beauty, and unique behaviors make them desirable for birdwatchers and hunters. Sea ducks are also the least studied group of waterfowl in North America. Most species are difficult to investigate because they inhabit remote locations that are not easily accessed (e.g., the Arctic tundra and offshore marine waters); they are relatively difficult to capture and mark in large numbers for studies of demographics, survival, and migration patterns; and, they have lower harvest rates compared to most other species of waterfowl. Unfortunately, the ecosystems and sensitive habitats used by sea ducks are undergoing rapid environmental change and human development, and urgent action is needed to inform conservation and management decisions.

In the early 1990s, it became apparent that several populations of sea ducks were declining for unknown reasons and basic biological information was lacking for most sea duck species. An increased awareness of sea duck conservation issues followed, and the Sea Duck Joint Venture (SDJV) was established to address information gaps needed to improve management and conservation of North American sea ducks. The North American Waterfowl Management Plan (NAWMP) Committee endorsed the SDJV in 1999. Since then, the U.S. Fish and Wildlife Service has provided annual budget allocations to the SDJV that leverage funding from federal, state, provincial, university, and non-governmental partners. The SDJV partnership set out to improve our understanding of sea duck ecology and conservation by identifying the scale at which sea ducks should be considered for management, assessing distribution and abundance during different life-cycle periods, identifying population limiting factors, characterizing important habitats, and determining sustainability of harvest.

Since its inception, accomplishments of the SDJV have included delineating populations throughout the annual range, identifying migratory routes and important habitats for several species, prioritizing monitoring needs and conducting experimental surveys and methods development to improve detection and species identification, and developing the Sea Duck Key Habitat Sites Atlas to help guide conservation in North America. A more detailed description of SDJV accomplishments through 2021 can be found in Appendix A. In addition, a complete list of projects supported by the SDJV, and associated reports and scientific publications, can be found on the SDJV website: seaduckjv.org.

Until 2009, the SDJV science program targeted a broad array of priority information needs as identified in previous strategic plans. In 2010, the SDJV held an internal strategic planning session that identified the highest priority species groups and information gaps, and then followed up with surveys of waterfowl and habitat managers to confirm that those SDJV priorities would provide information most needed by managers. These efforts helped focus the SDJV science program on a narrower set of high

priority initiatives and resulted in a more directed science program that supported research and monitoring projects through a competitive proposal process.

In 2021, the SDJV Continental Technical Team (CTT) reviewed and revised priorities based on new information acquired since completion of the last strategic plan (2014) and direction provided by the most recent update to the NAWMP (2018). The most recent versions of the NAWMP (NAWMP 2012 and 2018) provide a substantial change in priority, clearly reminding partners of the ever-changing social and environmental conditions influencing waterfowl management and the need for the conservation community to self-assess and change to meet new challenges. The NAWMP now includes an overarching theme: Be relevant to society or risk losing financial and political support. Current NAWMP goals explicitly recognize the role of people – waterfowl hunters, bird watchers, and other members of the public – who enjoy and benefit from waterfowl and their habitats. In addition, particularly in Alaska and northern Canada, wildlife managers must recognize the important role of abundant and resilient waterfowl populations in supporting the food security and cultures of Indigenous peoples.
It has also become clear that conservation in a future shaped by a changing climate and development driven by a rapidly increasing human population requires different information than the SDJV set out to gather in 1999. Filling some information gaps on the basic biology of sea ducks is still necessary, but the SDJV's focus is evolving to address data needs explicitly linked to conservation and management decisions, including the human dimensions aspect of conservation.

This Strategic Plan defines the general, comprehensive direction of the SDJV over the next 10 years and outlines strategies for achieving the SDJV partnership's vision of sustainable populations of North American sea ducks maintained throughout their ranges. The SDJV also intends this plan to serve as an over-arching communication tool used to increase knowledge and awareness of key conservation issues that require action from entities within and outside the SDJV partnership. In addition, the SDJV will develop a work plan identifying specific, achievable actions with associated timelines and responsible parties that will allow the SDJV to track and demonstrate progress linked to the priorities identified in this plan. The work plan will be updated on a regular basis by SDJV Coordinators in consultation with the CTT and Management Board, after annually reviewing progress of the SDJV.

Over the next decade, the SDJV will continue to support research that informs critical aspects of sea duck management, especially related to harvest and recreational enjoyment, habitat protection, and the identification and mitigation of threats; and increase partnerships, awareness, and engagement in sea duck conservation through strategic communication and increased focus on human dimensions. The SDJV will continue to be flexible and adaptive by taking advantage of opportunities presented by partners and maximize application of knowledge gained through SDJV accomplishments.

2.1 VISION

Sustainable populations of North American sea ducks are maintained throughout their ranges.

2.2 MISSION

The SDJV promotes conservation of all North American sea ducks through partnerships that provide greater knowledge and understanding for effective population and habitat conservation and management.

2.3 GOALS

The SDJV works with partners to generate and disseminate knowledge that informs management decisions, habitat protection initiatives, and sea duck conservation in North America.

The SDJV increases awareness of sea ducks and encourages engagement of management and scientific communities, industry, and the public in sea duck conservation through effective communications and outreach.

King Eiders.

3 SDJV PRIORITIES

To achieve the goals stated above, SDJV has identified the following priorities to guide actions over the next decade.

3.1 FOCUS ON SPECIES OF MANAGEMENT CONCERN

The SDJV used a prioritization process to determine species or populations that warrant increased effort and funding towards research or specific conservation actions. Through an in-depth review by the CTT completed in 2021, Common Eider (*Somateria mollissima*), King Eider (*Somateria spectabilis*), Long-tailed Duck (*Clangula hyemalis*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), White-winged Scoter (*Melanitta deglandi*), Harlequin Duck (*Histronicus histronicus*), and Barrow's Goldeneye (*Bucephala islandica*) were identified as high priority species due to lack of baseline data, historical or current population declines, and concerns about harvest potential or habitat limitations. In addition, populations were ranked as high, medium, or low management concern and those of high concern are noted in each section. See Appendix B for methods and results of the ranking process. Steller's Eiders (*Polysticta stelleri*) and Spectacled Eiders (*Somateria fischeri*) ranked high but are not included as SDJV high priority species because of their listing as Threatened under the U.S. Endangered Species Act. This designation results in significant allocation of conservation resources and the SDJV has chosen to focus on species that have historically received less attention. The CTT may revisit and revise the species of management concern list if new information becomes available.

3.2 ASSESS POPULATION STATUS AND DISTRIBUTION

Information regarding population size, trend, and delineation (i.e., identifying demographically or spatially independent population sub-units) improves our ability to manage and conserve sea duck populations. The NAWMP relies on population abundance information to establish continental or regional population objectives (NAWMP 2018) which in turn affect harvest management and conservation planning decisions at regional, national, or continental scales. In addition, demographic parameter estimates (e.g., survival or recruitment) allow for a better understanding of factors affecting sizes and trends of populations and subsequently more targeted management and conservation actions.

While North American waterfowl are generally well-monitored, sea ducks as a group are not. Aspects of their distribution and biology make several species challenging to survey as many species breed in remote northern areas or winter in marine environments that are both difficult and costly to access and monitor. As a result, existing waterfowl surveys do not effectively cover the ranges of most sea ducks, creating the need for novel surveys that specifically target sea ducks. For instance, the Waterfowl Breeding Population and Habitat Survey (WBPHS), flown each spring and used as a basis for setting population goals for many North American waterfowl, does not cover core breeding ranges of about half

of the sea duck species and is not optimally timed to capture peak counts of breeding sea ducks because many nest later than dabbling ducks. Additionally, some groups of sea ducks (e.g., scoters, goldeneyes, mergansers [*Mergus spp*.]) are not differentiated to species during the WBPHS and other surveys. Consequently, for most species of sea ducks, we cannot accurately estimate abundance, relative densities, or population trends, nor determine abundance objectives (Tables 1 and 2). Such information would improve harvest management and allow managers to identify priority conservation efforts more effectively. Additionally, targeted sea duck surveys would illuminate spatial and temporal distribution, which is integral in identifying areas in need of protection and to document the effects of disturbance and climate change.

Since its inception, the SDJV has contributed a significant amount of funding to review and test survey methods and conduct reconnaissance surveys to determine the best way to monitor sea duck populations. Recent advancements in aerial survey methods and results of experimental surveys will aid in developing monitoring strategies that are adapted to sea ducks. However, additional work will be required to fill monitoring gaps, notably in relation to species for which there is a conservation concern and little or no monitoring data (e.g., scoters, Long-tailed Ducks). New surveys, or expansion of existing surveys, will be required in many instances, and long-term commitments are required to gain information useful for management.

In 2018, the Sea Duck Monitoring Working Group reviewed the recommendations compiled in a 2007 SDJV report that identified monitoring needs for North American sea ducks. The 2018 update prioritized monitoring that provides information to support management (e.g., harvest and habitat management and tracking population status and trends; SDJV 2018). The SDJV recommends that federal and state agencies continue six currently funded surveys that provide information for addressing management priorities of one or more sea duck populations and add an additional five surveys that would fill knowledge gaps (Tables 3 and 4). In addition, the WBPHS and Parts Collection Survey require design changes to fully meet data needs for sea duck management.

While the SDJV and partners have made significant progress in delineating populations of several sea duck species (See Appendix A), some information gaps remain, particularly for Long-tailed Ducks, western Harlequin Ducks, and King Eiders. The SDJV will support projects to address these gaps with a particular emphasis on information to inform decisions related to harvest, monitoring, and habitat protection.

Demographic data can aid in estimating population trends and provide information for population models used in harvest management or population conservation. Monitoring of demographic parameters (e.g., survival, fecundity) relies heavily on banding and the information that comes from recoveries of dead banded birds by hunters and the public, or through live recapture of previously banded individuals. Capturing and banding sea ducks is also very challenging and is only regularly done for a few species and at a few locations. New and innovative methods are needed; therefore, the SDJV

will support research into methods of obtaining unbiased estimates of sea duck demographic parameters to better inform management decisions.

Species and populations were identified as high priority for assessment based on three categories: population delineation (i.e., the need for knowledge of population spatial structure), population size, and population trend. High priority populations include eastern and western populations of King Eider, Long-tailed Duck, and the western population of Harlequin Duck (Appendix B).

To address this priority, the SDJV will:

- **Encourage federal and state agencies to continue currently funded surveys that provide sea duck data, revise existing surveys, and develop new surveys to expand the ability to measure abundance and trend of sea ducks**
- **Develop, fund, and/or provide technical guidance for targeted projects to address information gaps with a particular emphasis on information to inform decisions related to harvest, monitoring, and habitat protection**
- **Develop, fund, and/or provide technical guidance for research projects focused on obtaining unbiased estimates of sea duck demographic parameters to better inform management decisions**

Common Mergansers.

Table 1. Summary of population status and trends for North American sea ducks using data through 2013, from Bowman et al. (2015).

Species	Recent trend	Status relative to historical levels	Confidence in trend
Bufflehead	Stable to increasing	Above	High
Hooded Merganser	Stable to increasing	Above	High
Common Goldeneye	Stable to increasing	Above	Medium
Common Merganser	Stable to increasing	Above	Medium
Red-breasted Merganser	Stable to increasing	Above	Medium
Spectacled Eider	Stable to increasing	Below	High
Pacific Black Scoter	Stable to increasing	Below	Medium
Western King Eider	Stable to increasing	Below	Low
Long-tailed Duck	Stable to increasing	Below	Low
Eastern Harlequin Duck	Stable to increasing	Unknown	High
Eastern Barrow's Goldeneye	Stable	Unknown	Low
Steller's Eider	Decline	Below	Medium
American Common Eider	Decline	Below	Low
Surf Scoter	Unknown	Below	
White-winged Scoter	Unknown	Below	
Eastern King Eider	Unknown	Unknown	
Hudson Bay Common Eider	Unknown	Unknown	
Northern Common Eider	Unknown	Unknown	
Pacific Common Eider	Unknown	Unknown	
Atlantic Black Scoter	Unknown	Unknown	
Western Harlequin Duck	Unknown	Unknown	
Pacific Barrow's Goldeneye	Unknown	Unknown	

King and Common Eiders.

Table 2. From Appendices B and C of 2018 NAWMP Update (NAWMP 2018). Objectives and mean population sizes are for total birds in spring or early summer unless otherwise noted. Population size is the mean annual from 2008-2017 unless otherwise noted.

Species/Population	NAWMP Objective	Population Size (NAWMP 2018)
Eastern Harlequin Duck	3,000	4,000[1,2]
Western Harlequin Duck	Not established	250,000[1,2]
Long-tailed Duck	Not established	1,000,000
Eastern King Eider	Not established	200,000[2]
Western King Eider	Not established	400,000[2]
American Common Eider	165,000 breeding pairs	250,000[2]
Northern Common Eider	400,000	260,000[1,2,3]
Hudson Bay Common Eider	275,000	260,000[1,2]
Pacific Common Eider	Not established	100,000[2]
Steller's Eider	Recovery from Threatened status	1,000[4]
Spectacled Eider	Recovery from Threatened status	20,000[4]
Atlantic Black Scoter	Not established	200,000[2]
Pacific Black Scoter	160,000	300,000[2]
Surf Scoter	Not established	700,000[1]
White-winged Scoter	Not established	400,000[2]
Goldeneyes (combined)[5]	559,000[6]	1,239,000
Common Goldeneye	Not established	Not estimated
Eastern Barrow's Goldeneye	7,500	8,500
Western Barrow's Goldeneye	Not established	260,000
Bufflehead	Not established	1,306,000
Mergansers (combined)[5]	594,000[6]	1,331,000[7]
Hooded Merganser	Not established	Not estimated
Red-breasted Merganser	Not established	Not estimated
Common Merganser	Not established	Not estimated

[1] Index derived from winter surveys.
[2] Estimate from most recent surveys (at the time of the 2018 NAWMP Update).
[3] Eastern Canada winter component only.
[4] North American breeders only.
[5] Species not differentiated in surveys.
[6] Eastern Survey Area objective only.
[7] Sum of Eastern and Traditional Survey Area estimates.

Table 3. Surveys that the SDJV recommends for continuation. These surveys are currently funded by management agencies and provide information for addressing management priorities of one or more sea duck populations (SDJV 2018).

Survey	Lead	Recommendation
Waterfowl Breeding Population and Habitat Survey	USFWS[8]/CWS[9]	Continue but requires design changes to fully meet sea duck data needs
Central Arctic Canada Pacific Common Eider Breeding Survey	CWS	Continue
Parts Collection Survey	USFWS/CWS	Continue but requires design changes to fully meet sea duck data needs
Puget Sound Assessment and Monitoring Program	WDFW[10]	Continue
Arctic Coastal Plain Survey	USFWS	Continue
Quebec/Newfoundland Common Eider Winter Survey	CWS	Continue

Table 4. If additional resources were available through SDJV or partner agencies, these surveys would fill knowledge gaps and/or improve the quality or precision of data useful for management and conservation of sea ducks (SDJV 2018).

Survey	Lead	Status	Limiting Factors
Pacific Black Scoter Breeding Survey	USFWS	Fully developed, not funded	Funding
Atlantic Coast Wintering Sea Duck Survey	USFWS	Needs funding and development	Funding, flight capacity
Pacific Flyway Winter Sea Duck Survey	USFWS/CWS/States	Needs funding and development	Logistics, safety
Great Lakes Winter Survey	CWS/USFWS/States	Needs funding and development	Survey design, staff capacity, funding
American Common Eider Breeding Survey	CWS/USFWS/States	Needs funding and development	Flight capacity, design

[8] U.S. Fish and Wildlife Service
[9] Canadian Wildlife Service
[10] Washington Department of Fish and Wildlife

3.3 IMPROVE HARVEST MANAGEMENT

Sustainability of current or potential sea duck harvest levels is largely unknown. Compared to most other waterfowl species, estimates of the number of sea ducks harvested and total number of hunters taking sea ducks is less precise, making it difficult to accurately assess the level of take and measure the impact of harvest on their populations.

In response to perceived declines in population abundance, waterfowl managers have taken measures to reduce sea duck harvest during the fall-winter general hunting season in some areas. The Atlantic Flyway in the United States reduced harvest opportunity for scoters, Long-tailed Ducks, and Common Eiders, and in the Pacific Flyway the state of Washington has a specific harvest management strategy for scoters and Harlequin Ducks. In Canada, restrictions have targeted reducing harvest of American Common Eiders and scoters in the east, and Barrow's Goldeneyes and Harlequin Ducks throughout their range. Despite changing regulations, the influence of harvest on sea duck populations remains uncertain.

In addition to harvest during the fall-winter general hunting season, subsistence harvest of sea ducks by Indigenous peoples of North America is important and may account for a large proportion of total harvest for some populations. This is particularly true for species that spend their entire life cycle within northern Canada, Alaska, Greenland, and Russia (e.g., King Eider; Table 5). Indigenous harvest is managed differently than the fall-winter general hunt in North America. In Alaska, a spring-summer subsistence hunt is authorized annually under the Migratory Bird Treaty Act and is co-managed through the Alaska Migratory Bird Co-Management Council (alaskamigratorybirds.com). Indigenous peoples in Canada also harvest sea ducks throughout the year under various treaties and agreements. Estimates of subsistence harvest are not available for most sea duck populations, and existing surveys are usually not conducted annually. Accuracy and precision of subsistence harvest surveys vary considerably between years and locations.

In addition to the paucity of harvest data, factors influencing population dynamics of many sea duck species are poorly understood, which hinders the ability to evaluate the influence of harvest on population sustainability. Ideally, reliable estimates of harvest at all times of year and accurate estimates of population vital rates would be available; however, this may not be a reasonable expectation for challenging species such as sea ducks. Identifying the specific information required to develop a sea duck harvest management and monitoring plan, and the elements deemed most important by the harvest management community (e.g., Flyway Councils and the Alaska Migratory Bird Management Council), is a useful first step towards prioritizing actions to improve harvest management of sea ducks within the context of the NAWMP.

The SDJV will support research and monitoring to reduce high levels of uncertainty around harvest estimates, critical population parameters, and changing demographics to inform harvest management decisions. Fortunately, SDJV partners are currently conducting targeted research to address some of

those data needs. Koneff et al. (2017) identified parameters for which higher accuracy and precision would most improve future population models and assessments of harvest of seven high priority sea duck populations. The Canadian Wildlife Service has recently developed methods that may result in more accurate sea duck harvest estimates and allow measurement of how regulations affect harvest rates of sea ducks in Canada (Smith 2021). Several management and research groups are also exploring new methods to obtain population demographic estimates, such as testing the use of photography to estimate fecundity rates and stable isotopes to determine the origin of harvested sea ducks. The CTT identified a high need for information on harvest potential, and harvest estimates and derivation (i.e., differential exposure to harvest on wintering or migrating birds affects components of the population) for American Common Eider, Atlantic Black Scoter, Eastern White-winged Scoters, and Atlantic Surf Scoters.

Along with improving estimates of harvest, it is important to maintain the tradition of sea duck hunting and thereby increase the number of people who are interested in and actively supporting sea duck conservation. The number of North American waterfowl hunters has been in decline for decades, leading to the NAWMP goal of "growing numbers of waterfowl hunters" because of hunters' historical contributions to waterfowl conservation. Fortunately, there is some indication that interest in sea duck hunting is increasing: separate seasons for sea ducks in the Atlantic Flyway may have increased opportunity for waterfowl hunters, and sea duck hunting is increasing in the state of Washington. This expansion may increase overall waterfowl hunting recruitment and retention. The diversity of waterfowl species is what draws many people to pursue ducks and geese, and sea ducks contribute to that diversity given their varied habitats, behaviours, and morphologies, and are considered a trophy species by some hunters. Harvest management that allows opportunities for hunters, while also resulting in stable or increasing sea duck populations, should continue. An increased focus on understanding values and behaviours of sea duck hunters, including those that engage in the fall/winter general hunt and the spring/summer subsistence hunt, would also improve harvest management and provide opportunities for engagement of important stakeholder groups and partners.

To address this priority, the SDJV will:

- **Identify the information required to develop sea duck harvest management and monitoring plans by working with the harvest management community**
- **Develop, fund, and/or provide technical support for research and monitoring projects aimed at reducing high levels of uncertainty around harvest estimates, critical population parameters, and changing demographics**
- **Develop, fund, and/or provide technical support for projects that focus on understanding values and behaviours of sea duck hunters, including hunters that engage in the fall/winter general hunt and those that engage in subsistence harvest activities**

Table 5. Estimated fall/winter general sea duck harvest in North America and spring/summer subsistence harvest of sea ducks in Alaska. The annual fall/winter harvest is the average annual harvest estimated from the U.S. and Canada Harvest Information Program from 2001-2020. Annual spring/summer subsistence harvest is the average reported harvest from surveys conducted by the Alaska Migratory Bird Co-Management Council from 2016-2019 (Naves et al. 2021). Canada-wide subsistence harvest estimates are not available (A. Hanson, pers. comm.).

Species/Population	Annual Fall/Winter Sport Harvest (US and Canada)	Annual Spring/Summer Subsistence Harvest (Alaska)
Harlequin Duck	1,655	1,464
Long-tailed Duck	26,414	3,507
King Eider	127	19,087
Common Eider	16,650	7,808
Steller's Eider	0	4
Spectacled Eider	0	852
Black Scoter	14,905	9,160
Surf Scoter	28,236	1,872
White-winged Scoter	7,968	2,684
Common Goldeneye	79,918	2,838[11]
Barrow's Goldeneye	4,641	n/a[11]
Bufflehead	205,155	1,109
Common Merganser	18,218	379
Red-breasted Merganser	15,955	118
Hooded Merganser	92,009	n/a[12]

3.4 CONSERVE IMPORTANT HABITATS

Sea ducks occupy a broad range of habitats over the course of the year. Species of sea ducks breed across vast expanses of arctic and subarctic tundra, throughout the boreal and northern deciduous forest, in riverine habitats, and in coastal areas, including islands. During the non-breeding season, including staging (spring, summer, fall), moulting, and wintering periods, sea ducks congregate on traditional coastal and fresh-water areas that have historically provided reliable food resources and relatively stable environments, sometimes for up to eight months of the year. SDJV-supported surveys and research have increased our understanding of the location and relative importance of sea duck habitats throughout North America. To prioritize and target aquatic and terrestrial sea duck habitats for conservation and restoration, the SDJV will engage with North American bird habitat Joint Ventures and others in the waterfowl conservation community to understand information needs and develop tools and strategies for habitat conservation and restoration.

Despite the progress made in identifying important sea duck habitat, information on seasonal distribution, habitat associations, and habitat limitations for sea ducks remains incomplete. Additional

[11] Common and Barrow's Goldeneye not distinguished in survey.
[12] Does not occur in Alaska.

evaluation would enhance development and implementation of effective strategies for protecting or restoring essential habitats at local and larger scales. Therefore, the SDJV will support continued research to: (1) improve understanding of specific habitat requirements of sea ducks; (2) define and predict distribution; (3) define important characteristics of key sites and identify habitat parameters that must be measured for developing habitat protection recommendations; and, (4) identify factors that could shift or reduce key marine and lacustrine resources and habitat quality over time, which could inform sea duck habitat conservation in the face of a changing climate and increasing pressures on these aquatic systems.

SDJV products, including the Sea Duck Key Habitat Sites Atlas, are currently providing information to evaluate potential effects from near-shore and offshore energy and resource development, as well as emergency response planning. For example, these data have been incorporated into Environment and Climate Change Canada's National Environmental Emergencies Centre system for planning and response, as well as off-shore wind energy assessments by Natural Resources Canada and could be used for assessments of future off-shore wind development by the U.S. Bureau of Ocean and Energy Management. Further, distribution and habitat use data can be used to target important habitats for protection. Recent initiatives in both Canada and the U.S. demonstrate an increasing emphasis to protect and conserve important aquatic and terrestrial habitats. For example, the Government of Canada has a goal to conserve 25% of Canada's marine and coastal areas by 2025 and work toward 30% by 2030. Marine spatial planning and the protected area network initiatives currently being advanced in Canada will integrate coastal and marine areas important for sea ducks. Similarly, the U.S. Federal Government has set a goal of conserving 30% of U.S. lands and waters by 2030 through the *Conserving and Restoring America the Beautiful* initiative, which could include coastal marine and freshwater aquatic habitats important for sea ducks. A near-term goal for informing such habitat protection initiatives is to finalize and disseminate the Sea Duck Key Habitat Sites Atlas to partners and stakeholders including the habitat Joint Ventures. In addition, given the evolving conservation priorities and habitat initiatives in North America, the SDJV will actively engage with the conservation community to better understand key management decisions and the information needed to support them.

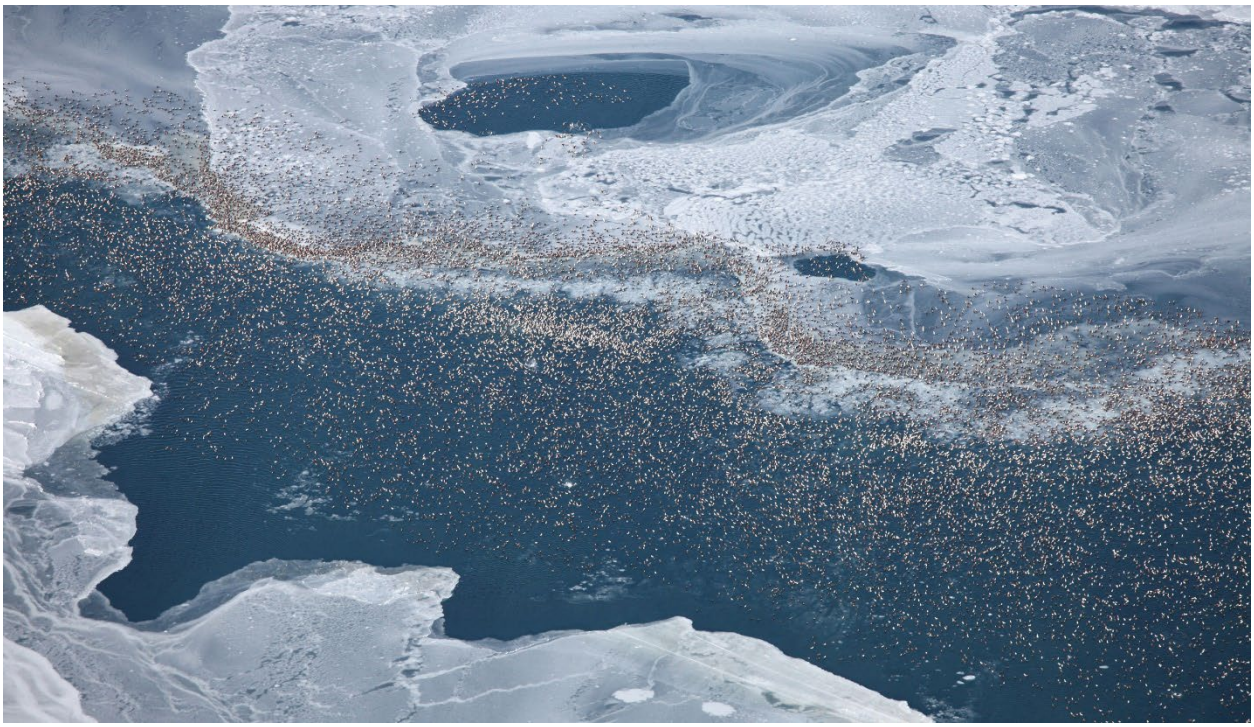
During the SDJV's triennial review in 2018, the NAMWP Committee recommended strengthening interactions between the SDJV and bird habitat joint ventures, especially in coastal habitats, to incorporate sea duck habitat requirements in nearshore conservation planning. Several joint ventures operate within the distribution of sea ducks in North America; in particular, Pacific Birds Habitat, San Francisco Bay, Upper Mississippi/Great Lakes, Atlantic Coast, and Eastern Habitat Joint Ventures. The SDJV will continue building connections with the habitat joint ventures, determine overlapping priorities and opportunities for collaboration, and share decision support tools such as the Sea Duck Key Habitat Sites Atlas. Furthermore, engaging local communities and Indigenous peoples in protected area planning and habitat restoration will result in better outcomes.

Priority species for aquatic and terrestrial landscape conservation were ranked based on the following categories of information needs: protected area planning (i.e., the species habitat should be considered

for future protected area planning exercises), availability of habitat and its susceptibility to changes, and habitat requirements for breeding, rearing, staging, migrating, moulting, and overwintering populations. High priority species for habitat conservation include Common Eider (Pacific and American populations), western White-winged Scoters, Pacific Surf Scoters, and both eastern and western populations of Barrow's Goldeneye and Harlequin Ducks (Appendix B).

To address this priority, the SDJV will:

- **Develop, fund, and/or provide technical guidance for research projects on habitat requirements and distribution of sea ducks**
- **Engage with the conservation community and federal, state, or local permitting agencies to better understand information needs for conservation planning and habitat protection and restoration**
- **Identify overlapping priorities and opportunities for collaboration with other Migratory Bird Habitat Joint Ventures, marine bird conservation groups, Indigenous peoples, and local communities**



Spectacled eiders in sea ice in the Bering Sea.

3.5 UNDERSTAND CONSEQUENCES OF ENVIRONMENTAL CHANGE

3.5.1 Climate Change

In North America, global climate change is disproportionately affecting northern latitudes, where temperatures are increasing at twice the rate as the rest of the world, and where large temperature shifts are occurring in the marine environment. Changes have already been documented in Arctic, subarctic, and more southern coastal marine ecosystems upon which sea ducks rely, making sea ducks highly susceptible to effects of climate change. This is reflected in the large number of populations identified as being potentially highly impacted by climate change: all populations of Common and King Eider, all scoters, Long-tailed Duck, Barrow's Goldeneye, and Harlequin Duck (Appendix B).

It is difficult to characterize and predict how climate change will impact sea duck populations, and whether the effects will be positive or negative. Potential negative effects include distributional shifts, habitat loss and fragmentation, changes to productivity and/or survival due to changing ecological communities, weather conditions, disease risk, and anthropogenic factors such as increased shipping, tourism, and industrial development. In marine habitats, sea ducks may shift distributions in response to changes in prey quality and availability driven by warming ocean temperatures and ocean acidification, which could also result in increased competition with other species. Sea duck body condition during moulting and wintering periods may also be affected by changing marine conditions, which can lead to reduced breeding propensity, productivity, or survival. Warming ocean temperatures have been linked to recent massive die-offs of marine birds and are predicted to increase the incidence of harmful algal blooms and disease outbreaks, particularly in the southern extent of sea duck distribution (e.g., avian cholera in Common Eider colonies). A reduction in sea ice likely will result in increased fishing and shipping traffic in Arctic waters, increasing risk of disturbance, oil spills, and collisions.

In breeding areas, increasing air temperature results in: earlier vegetative growth and phenology; higher intensity and more frequent wildfires; changing hydrologic conditions; more erratic weather patterns; and wetland drying and salinization due to permafrost melt and coastal flooding and erosion. In boreal and northern deciduous forest, tundra, and coastal breeding habitats, changes to ecological communities, such as reductions in various prey and introduction of new predators, may reduce productivity (e.g., reduction in magnitude of lemming population cycles). Higher-intensity forest fire regimes, and more erratic weather patterns leading to flooding of low-lying tundra breeding habitat and subsequent salinization, may affect reproductive success in some years or lead to a change in nesting distributions over time.

Alternatively, warming temperatures may result in earlier nest initiation, which could have positive effects for nest and duckling success and renesting potential. Likewise, reduced ice coverage will result in expanded wintering habitat and food resources for some species, for example, in the Great Lakes and Bering Sea.

In summary, climate change has and will continue to affect North American sea duck populations, likely in both negative and positive ways. Unfortunately, management actions to directly curb negative effects of climate change on sea ducks are extremely limited. However, a better understanding of future scenarios for sea ducks, for example through climate models that predict distribution of sea ducks or their prey, would improve the ability to prioritize habitats for conservation. The SDJV will support research to characterize effects of climate change on North American sea ducks, particularly studies designed to directly improve management actions such as optimizing the design and interpretation of monitoring programs, prioritizing habitats for protection, and developing tools to effectively mitigate threats from increasing anthropogenic activities spurred by a warming climate. The SDJV will encourage a broad approach that integrates existing data and expertise from partners and other scientific disciplines, such as marine fisheries, oceanography, landscape ecology and Indigenous Ecological Knowledge, to predict future sea duck habitat use and distribution.

3.5.2 Changing predator communities

Changes in distributions and numbers of predators like Bald Eagles *(Haliaeetus leucocephalus)*, Common Ravens (*Corvus corax*), polar bears (*Ursus maritimus*), racoons (*Procyon lotor*), and mustelids are negatively affecting some species of sea ducks. For example, the numbers of Bald Eagles on the Pacific and Atlantic Coasts have increased significantly in recent decades, and via their direct predation or a perceived predation threat they can alter the foraging behaviour and distribution patterns of sea ducks like scoters, Harlequin Duck, Barrow's Goldeneye, and Common Eider. Potential distribution shifts caused by Bald Eagles may bias how survey data from long-term monitoring studies are interpreted. In addition, the continental Common Raven population is increasing, and their distribution is expanding into previously uninhabited areas such as on the North Slope and Yukon-Kuskokwim Delta of Alaska because of the increased availability of buildings and other structures used for nesting.

Distribution of some mammalian predators is also changing. For example, earlier break up of sea ice is forcing polar bears to terrestrial environments where Common Eiders nest, increasing nest mortality. An increase in mink (*Neovison vison*) and river otters (*Lontra canadensis*) in Nova Scotia has been hypothesized to result in increased mortality of nesting female Common Eiders. Similarly, as raccoons arrived in the 1950s and spread in the prairies and adjacent boreal forest, they became significant nest predators for cavity-nesting sea ducks. Projects that study interactions between changing predator communities and sea duck population dynamics will be important to inform management actions, specifically for populations of Common Eider and Western Harlequin Duck.

To address this priority, the SDJV will:

- **Develop, fund, and/or provide technical guidance for projects that characterize effects of climate change on sea ducks, particularly in relation to improving management actions and prioritizing habitats for protection**

- **Seek the integration of existing data and expertise in other disciplines with traditional biological studies when supporting projects that predict future sea duck habitat use and distribution.**
- **Develop, fund, and/or provide technical guidance for projects that study interactions between changing predator communities and sea ducks.**

3.6 Understand and Mitigate Effects of Industrial Development

As economies expand in marine and coastal environments, concern about how sea ducks interact with industrial activities increases. Research and conservation efforts are needed to understand and mitigate potential negative impacts industries have on sea duck populations. Currently, these industries include mariculture, wind energy, oil, gas and mineral development, transportation and shipping, and fisheries.

Mariculture, including bivalve, kelp and finfish farming operations, is an important and growing commercial industry for many coastal economies around the world. These activities co-occur in areas used by some species of sea ducks, such as scoters, goldeneyes, and eiders, especially during the non-breeding season. Some sea duck species like Common Eider may affect profit margins by reducing the amount of product through their consumption of bivalves. This motivates companies to find methods (e.g., nets) to minimize losses due to sea ducks. Although these reduce product loss, there is concern over net entanglement of sea ducks in mariculture operations and how that might influence survival and long-term stability in some sea duck populations. The CTT identified American Common Eider and Pacific Surf Scoter as high priority species when considering impacts of mariculture.

Renewable energy development, including wind energy, is an important component of larger initiatives to reduce carbon emissions and decrease the rate of climate change. However, there are concerns that wind energy projects in the nearshore and offshore marine environment may negatively affect sea ducks. The U.S. Federal Government has a goal to produce 30 gigawatts of offshore wind energy by 2030. In Massachusetts, Vineyard Wind is poised to be the first large scale offshore wind energy project, 15 miles (24 km) off the coast. A 5-turbine facility has been operating in state waters off the coast of Block Island, Rhode Island since 2016, and Maine is moving forward on a major offshore wind energy initiative. Planning for wind energy development is also underway along the Pacific coast of California and Oregon. As energy development increases in these areas, federal and state authorizing agencies require robust species and site-specific information on seasonal distribution and abundance of marine species, including sea ducks. This necessitates coordinated monitoring of sea duck distribution and movements (both baseline information and after development) to assess possible adverse effects, such as habitat displacement, and whether population level impacts may occur. Additionally, given the rapid pace and scale of development in U.S. waters, authorizing agencies need specific information that helps to assess impacts and provides practical recommendations to avoid, minimize, and compensate for potential adverse impacts of these facilities, including information that informs facility siting decisions to avoid key habitats and evaluation of lighting options for structures and vessels to minimize strikes. The CTT identified several eastern sea duck populations as a high priority for research related to wind energy development, including American Common Eider, Atlantic Black and Surf Scoters, and eastern White-

winged Scoters (Appendix B). While not identified in the prioritization exercise, wind energy development is also likely to occur on the Pacific coast, resulting in a need to also better understand interannual use of offshore areas by Pacific scoters.

Onshore and offshore oil and gas development have occurred within the range of some sea duck species, particularly those breeding, staging, and moulting in the Arctic, and will likely continue in the future. Underwater oil pipelines also pose a threat, such as the line crossing the Straits of Mackinac at the top of Lakes Michigan and Huron. With this development comes risk of hydrocarbon exposure due to spills in both aquatic and terrestrial habitats and an increased need for seasonal distribution and abundance information for informed damage assessment and oil-spill prevention and response plans, particularly for areas with high concentrations of sea ducks, such as the Salish Sea in Washington state and British Columbia. Given the reliance on benthic invertebrates by many sea ducks, the ecological consequences of using oil spill dispersants that transfer surface oil into the water column and ultimately to the benthos also requires further study. Oil and gas development can also result in habitat loss, increased predator abundance, disturbance, and collisions with structures. Furthermore, with increased development and longer ice-free seasons in the Arctic and on the Great Lakes, shipping and fishing vessel traffic has increased, amplifying the risk of hydrocarbon spills, collisions, and disturbance.

Sea ducks inhabit coastal areas that are also used by nearshore and offshore fisheries. Sources of mortality related to fisheries include incidental bycatch of sea ducks in fishing gear and collisions with fishing vessels. Understanding both the factors related to mortality risk of sea ducks (i.e., fishing location, timing, and gear type; lighting regimes on large fishing vessels), and the population-level impacts of such mortality, is important for developing appropriate mitigation and management strategies. Indirect effects could occur if fisheries negatively impact other species such as sea duck prey. Considering the intersection of climate change and fisheries when evaluating impacts will be vital as fisheries activity redistributes with species expansions and longer ice-free seasons. American Common Eider and Pacific Surf Scoter populations were identified by the CTT as being highest priority for investigating the interaction between sea ducks and fisheries.

To address this priority, the SDJV will:

- **Develop, fund, and/or provide technical guidance for projects that evaluate interactions between sea ducks and industries**
- **Work with stakeholders and partners to identify opportunities to reduce and offset potential negative effects to sea ducks by industrial development**
- **Engage with the development community to better understand information needs for project planning and mitigation opportunities**

4 STRATEGIES TO ADDRESS PRIORITIES

The SDJV will use the following strategies and tools to address the priorities described above.

4.1 SUPPORT SEA DUCK RESEARCH AND MONITORING

One of the primary goals of the SDJV is to support sea duck research and monitoring projects that inform management decisions. The U.S. Fish and Wildlife Service, subject to annual U.S. Congressional appropriations, provides ongoing funds to the SDJV. These funds allow the SDJV to leverage other sources of funding from federal, state, provincial, university, and non-governmental partners to address large-scale research needs. The SDJV conducts an annual competitive process to select projects that address key science priorities based on the overarching guidance in this Plan. In addition to traditional biological investigations, the SDJV will look for interdisciplinary studies and those that incorporate human dimensions, communications, and Indigenous Ecological Knowledge aspects into their investigation plans.

The number of North American universities and colleges that provide mentorship and research opportunities in waterfowl biology and conservation has declined over the past few decades. The 2018 NAWMP Update identified a critical need to maintain and expand formal education and field experience of university students to ensure that an appropriately skilled workforce to meet the conservation goals of NAWMP. In 2020, the North American Waterfowl Professional Education Plan (NAWPEP) called for academic institutions to increase opportunities for undergraduate- and graduate-level students focused on waterfowl research and conservation (Objective 4, NAWPEP 2021). To help address this need, the SDJV is uniquely positioned to support relevant academic waterfowl research, and ultimately increase the number of early career professionals addressing sea duck biology. Therefore, the SDJV is developing a graduate student fellowship program with Ducks Unlimited, Inc. to provide students with financial support as they pursue research linked to SDJV science priorities. The first fellowships were awarded in early 2022.

In addition to supporting priority research, monitoring, and conservation projects, the SDJV will apply an increased focus on data management. Following US and Canadian federal mandates, the SDJV will ensure data and products from its projects are archived, protected, and accessible for use by partners and the public. Improvement of data management practices will preserve valuable data for future analyses, reduce time and effort required for integrating datasets, and ultimately improve the science that supports sea duck conservation and management.

To address this priority, the SDJV will:

- **Develop, fund, and/or provide technical guidance for research projects as outlined above in priority topics**
- **Develop, fund, and/or provide technical guidance for interdisciplinary studies and those that incorporate human dimensions, communications, and Indigenous Traditional Ecological Knowledge aspects into their investigation plans**
- **Continue developing a graduate student fellowship program that supports students researching sea duck management and conservation**
- **Improve management of existing and future data sets resulting from SDJV-supported projects**

4.2 Integrate Human Dimensions, Communications, and Partner Development

Sea ducks occupy habitats of high importance for conservation (Arctic ecosystems, aquatic environments) and areas that support high human populations and related activities (Northwest and Atlantic coasts and the Great Lakes region). Hence, sea ducks are a visible part of landscapes that are going through intense change by anthropogenic use. Moreover, the same healthy aquatic systems on which many sea ducks depend during part of their life cycle also provide important functions to human society, such as food security, fishing, and drinking water. The ability to view sea ducks, or to simply know they are present, may be important to millions of hunters, birdwatchers, and the public.

The NAWMP calls for better human dimensions (HD) integration into waterfowl planning and habitat delivery or the conservation community risks becoming irrelevant to society (NAWMP 2012). Social concerns may be related to hunting or bird-watching opportunities or planning and operating economic activities in areas important to sea ducks. Measuring these various values and using those measures in conservation planning and decision-making is important. For example, habitat and harvest management can be improved with increased integration of social and biological objectives. Recent changes in harvest management of other waterfowl species in North America utilized hunter or birdwatcher opinions to derive harvest objectives including providing user groups opportunities to see birds, maintaining sustainable population levels, and allowing maximum harvest opportunity.

There is also opportunity to utilize results of the NAWMP National Survey of Hunters, Birdwatchers and the General Public to better understand public interests and engage a broader constituency to support sea duck conservation and management. In addition, more information is needed regarding how industries include sea ducks in their planning, and how they are obtaining information about sea duck populations for use in planning. Finally, Indigenous peoples have a long history of interactions with sea ducks, and live side-by-side with sea ducks throughout much of their annual life cycle. It is important to understand the importance of sea ducks to Indigenous peoples, and how views vary among cultures to

better understand shared conservation priorities and promote meaningful engagement in sea duck conservation.

In addition to measuring and considering the HD aspects of sea duck management and conservation, strategic communications and outreach can be effective conservation tools. In 2015, the SDJV developed a Strategic Communications Plan to communicate information collected by the SDJV and its partners, and ensure that it informs management decisions (Dayer 2015). The plan defined four Joint Venture goals:

> (1) The SDJV contributes to scientific information about sea ducks and their habitats, and ensures that this information is readily available and used by stakeholders;
> (2) SDJV partners collaborate on research and monitoring to address gaps in sea duck conservation and management;
> (3) SDJV priority actions are implemented to advance sea duck conservation and management; and,
> (4) The SDJV is widely recognized as the leading conservation program for sea ducks and has a strong and informed constituency for sea ducks.

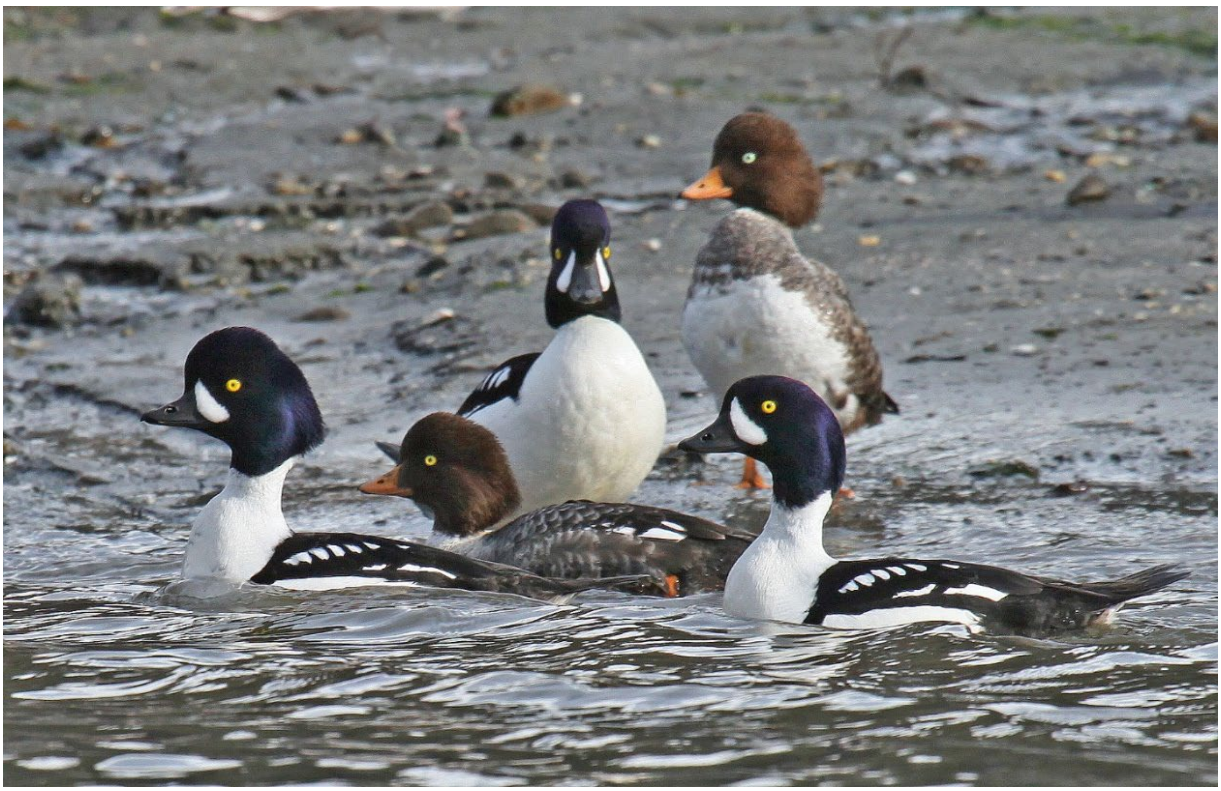
The plan defined audiences, communication objectives and messages, and recommendations and tools for achieving the objectives. Some plan recommendations have been accomplished, such as development of a new website, talking points, and factsheets, but many are on-going tasks that remain relevant to SDJV goals (e.g., updating the website with latest results and information, and supporting conferences and workshops to stimulate technical papers and collaboration). Given the emerging challenges of climate change, industrial development, landscape conservation planning, and an increased emphasis on human dimensions and remaining relevant to the public, additional communication tools will need to be explored.

Meeting these challenges requires the SDJV to broaden its audience and partnership to include Indigenous communities and organizations, other conservation groups, hunters, and the public. Specifically, the SDJV recognizes that Indigenous communities throughout North America are important partners in sea duck conservation. The SDJV will develop methods to increase communication with Indigenous communities to better understand their interests and shared conservation priorities and identify potential areas for developing partnerships. In addition, the SDJV will strengthen our existing relationships with other Joint Ventures, as well as seabird and marine conservation groups such as the Pacific Seabird Group and the Atlantic Marine Bird Cooperatives. For example, opportunities for collaboration include studies that evaluate how conservation efforts or habitat restoration during one or more parts of the annual cycle (e.g., at the habitat JV level) affect population abundance and trends of sea duck species and other marine birds. This, and linking conservation efforts across JV boundaries, could support full annual cycle management of sea ducks. In summary, identifying overlapping goals, common habitat objectives, or other conservation priorities with conservation partners will allow us to

make more efficient progress towards conservation of sea ducks and the habitats on which they depend.

To address this priority, SDJV will:

- **Develop, fund, and/or provide technical guidance for projects that use human dimensions data to guide sea duck harvest objectives, management plans, and conservation actions**
- **Develop and implement methods to increase communication with Indigenous peoples to better understand their interests and shared conservation priorities related to sea ducks, and identify potential areas for developing partnerships**
- **Expand partnerships and collaborations to include other Migratory Bird Joint Ventures, seabird and marine conservation groups, and others with common priorities.**



Barrow's Goldeneyes.

5 JOINT VENTURE EVALUATION PROCESSES

The NAWMP has been revised or updated at 5 to 10-year intervals. Between these revisions, Joint Ventures deliver progress reports to the NAWMP Plan Committee triennially to address recommendations and concerns noted during the comprehensive assessments. Feedback from the Plan Committee provides direction to the SDJV and helps ensure that the SDJV contributes effectively to meeting goals of the NAWMP. The SDJV reported to the Plan Committee in July 2018 and will likely report to the Plan Committee again in 2022. In addition to reporting to the NAWMP Committee, the U.S. and Canadian SDJV Coordinators review the SDJV program annually to document progress and report the status to the Management Board.

This strategic plan has been formulated to span a period of 10 years but will be reviewed in 2026 and updated if deemed necessary by the SDJV Management Board. In addition, a work plan that identifies specific actions will be developed and updated on a regular basis by SDJV Coordinators in consultation with the CTT and Management Board. The work plan will lay out relevant and achievable actions linked to the focal areas in this strategic plan, with associated timelines and responsible parties, and will allow the SDJV to track and demonstrate progress.

6 LITERATURE CITED

Bowman, T. D., E. D. Silverman, S. G. Gilliland, and J. B. Leirness. 2015. Status and trends of North American sea ducks: Reinforcing the need for better monitoring. Pages 1–28 *in* J.-P. L. Savard, D. V. Derksen, D. Esler, and J. M. Eadie, editors. Ecology and Conservation of North American Sea Ducks.

Dayer, A. A. 2015. Sea Duck Joint Venture Strategic Communications Plan 2015-2019. Available at www.seaduckjv.org.

Koneff, M. D., G. S. Zimmerman, C. P. Dwyer, K. K. Fleming, P. I. Padding, P. K. Devers, F. A. Johnson, M. C. Runge, and A. J. Roberts. 2017. Evaluation of harvest and information needs for North American sea ducks. PLOS ONE 12.

Naves, L. C., A. J. Knight, and L. F. Mengak. 2021. Alaska subsistence harvest of birds and eggs, 2004-2020 data book, Alaska Migratory Bird Co-Management Council. Special Publication No. 2021-05. Anchorage, Alaska.

North American Waterfowl Management Plan. 2012. North American Waterfowl Management Plan 2012: Conserving Waterfowl and Wetlands.

North American Waterfowl Management Plan. 2018. North American Waterfowl Management Plan Update 2018: Connecting People, Waterfowl, and Wetlands.

Sea Duck Joint Venture Continental Technical Team. 2018. Review of Sea Duck Monitoring Priorities in North America. Available at seaduckjv.org.

Smith, A. C. 2021. Hierarchical Bayesian Model for Estimating Migratory Bird Harvest in Canada. Journal of Wildlife Management In Press.

Harlequin Ducks.

7 APPENDIX A: SDJV ACCOMPLISHMENTS

From 1999-2021, the SDJV supported research projects aimed at improving management decisions, including projects that: (1) address the scale at which sea ducks should be considered for management, (2) identify population limiting factors, characterize important habitats, and (3) determine sustainability of harvest. In the last five years, 27 scientific publications have resulted from SDJV funded projects, not including student dissertations/theses, agency reports, or environmental assessments that relied on data produced through SDJV work (Table A-1). Specifically, the SDJV has devoted a large effort over the past two decades to providing knowledge necessary to understand the delineation of sea duck populations that are demographically or spatially independent sub-units. Population delineation requires an understanding of how populations of migratory birds are geographically linked throughout the annual cycle (i.e., connectivity among breeding, moulting, and wintering areas), as well as individual site-fidelity to those areas. This information has been used to help design monitoring surveys, interpret numerical trends, set harvest regulations, assess effects of disease, and identify key habitats.

SDJV-supported surveys and research studies have greatly increased our understanding of the location and relative importance of sea duck habitats throughout North America. Some of the most important areas for sea ducks have been included in the NAWMP map of Areas of Greatest Continental Significance for North American Ducks, Geese, and Swans (NAWMP 2012). These data and other SDJV-supported surveys and studies are providing information at flyway scales to better inform and evaluate potential effects from near-shore and offshore energy and resource development.

There are numerous examples of information obtained from SDJV-supported projects using telemetry, genetics, surveys, and other methods that ultimately led to management actions. A few highlights include:

- Satellite telemetry data led to an understanding of the importance of wintering and moulting areas in Greenland for **northern Common Eiders and eastern Harlequin Ducks** that breed in Canada. These findings were used by Canadian Wildlife Service (CWS) to open a discussion with the Greenland Government to restrict commercial exploitation of eiders there, manage hunting allocations in Canada, and for emergency response planning. These data were also used by the CTT to define sites for the Key Habitat Sites Atlas.
- **Pacific Surf Scoters** marked on wintering areas from Mexico to British Columbia generated data to describe migration routes, timing, and affiliations between wintering and breeding areas. These findings were used to identify sites for the Key Habitat Sites Atlas, in environmental assessments of development projects, and made available for emergency response planning.
- Telemetry studies of **Black Scoters** resulted in identification of two independent populations in North America – one that breeds and winters in the eastern part of the continent and one in the west; documented previously unknown breeding areas; and, identified key habitats used by eastern Black Scoters. These findings were used to help develop new survey methods for

scoters and other late breeding species, which have been tested and will soon be ready for regular implementation. The data were also included in environmental assessments of offshore wind energy and aquaculture projects and used to support developing separate harvest management plans for each coast.

- Satellite telemetry data determined that **King Eiders and Common Eiders** breeding in Alaska and the western Canadian Arctic migrate west to winter along coasts of Alaska and Russia, while those breeding in the eastern Canadian Arctic migrate east to winter in western Greenland and Maritime Canada. These findings have been used by USFWS to develop harvest surveys with Russian partners in areas where these species are thought to be harvested in high numbers, with the intention of increasing awareness and participation in sea duck conservation in eastern Russia.
- Analysis of sea duck telemetry data gathered in the Atlantic region (**scoters and Long-tailed Ducks**; https://seaduckjv.org/science-resources/atlantic-and-great-lakes-sea-duck-migration-study/) identified areas of high species distribution overlap, such as breeding habitat in the Barrenlands west of Hudson Bay; showed that these species strongly select preferred habitats during post-breeding migration, which may be good areas to target for conservation; and, identified important environmental characteristics of breeding and non-breeding habitats. These findings have been used in environmental assessments concerning natural resources development in Canada and the U.S., develop new survey methodology for scoters and other late breeding species (see bullet above), and identify sites for the Key Habitat Sites Atlas.
- Analysis of telemetry data for **Atlantic scoters and Long-tailed Ducks** identified the importance of staging and moulting sites in James Bay, the St. Lawrence River, and southern New England to scoters and Long-tailed Ducks and highlighted the value of Long-tailed Ducks as an umbrella species that could represent movement patterns of other Atlantic sea duck species. These findings were used to identify sites for the Key Habitat Sites Atlas as well as environmental assessments of offshore wind energy development.
- For **American Common Eiders** breeding in the southern part of their range, satellite telemetry identified important moulting areas in coastal Maine and Massachusetts and wintering areas in coastal waters of Cape Cod and Nantucket Sound. These findings were used to identify sites for the Key Habitat Sites Atlas, in environmental assessments of offshore wind energy development, and made available for emergency response planning.

In addition to the research projects identified above that contributed to management decisions, products internally developed by the SDJV have addressed many needs of the management community. For example:

- The SDJV's Sea Duck Monitoring Working Group identified and **prioritized monitoring needs for North American sea ducks** in 2005, and updated these priorities in 2018 (SDJV 2018). Important recent investments by the SDJV and its partners have allowed implementation of experimental breeding ground surveys for scoters and other sea ducks in the boreal and Arctic regions, as well as development of methods to improve detection and species identification during aerial

surveys. The monitoring needs report was used as the basis for additional years of a breeding Black Scoter survey in Alaska and is used to illustrate the need of sea duck information to agencies that conduct waterfowl monitoring. Sea Duck Joint Venture members have presented the monitoring information for use in larger redesigns of waterfowl surveys (i.e., the Waterfowl Population and Habitat Survey).

- The SDJV produced a **sea duck harvest management report** (SDJV 2016) that had a significant impact on harvest management of sea ducks in the Atlantic Flyway. The results of that report, among other SDJV products, lead to a reduction in hunting season length and bag limits to align harvest potential with realized harvest levels. The report also led to new monitoring efforts by managers to obtain important vital rate information so harvest management models can be improved.
- The SDJV supported the publication of the book ***Ecology and Conservation of North American Sea Ducks*** (Savard et al. 2015) through discussion and content contributions.
- The SDJV has synthesized the available habitat use and population delineation information into a product titled the **Sea Duck Key Habitat Sites Atlas**. The Atlas' purpose is to identify areas of special importance to sea ducks throughout North America and make information on seasonal distribution and abundance of sea ducks readily available to habitat-based Joint Ventures and government regulatory agencies, conservation organizations, natural resource agencies, industry, and planners. The Atlas can be used to provide justification for protecting areas of importance to sea ducks; improve decision making for resource development in key areas; direct research investigating biotic and abiotic features that characterize sea duck habitats; and predict how habitat conditions may change and potentially impact populations. It has already been used for informing feasibility assessments (e.g., in Canada, for the Torngat Area of Interest, and the Regional Assessment of Offshore Oil and Gas Exploratory Drilling east of Newfoundland and Labrador [iaac-aeic.gc.ca]). The Atlas and its associated shape files will be available on the SDJV website (seaduckjv.org) in 2022.

A complete list of projects supported by the SDJV, and associated reports and scientific publications, can be found on the SDJV website: seaduckjv.org.

Table A.1. Publications in peer-reviewed scientific journals stemming from SDJV-supported projects (2017-2021).

Bartzen, B. A., D. L. Dickson, and T. D. Bowman. 2017. Migration characteristics of long-tailed ducks (*Clangula hyemalis*) from the western Canadian Arctic. Polar Biology 40:1085–1099.

Bowman, T.D., Gilliland, S.G., Schamber, J.L., Flint, P.L., Esler, D., Boyd, W.S., Rosenberg, D.H., Savard, J.-P., Perry, M.C. & Osenkowski, J.E. 2021. Strong evidence for two disjunct populations of Black Scoters *Melanitta americana* in North America. Wildfowl 71: 000–000.

Brooks, M. L., J. R. Lovvorn, J. H. Behnke, and E. M. Anderson. 2021. Detecting silent stressors: Trace element effects on nutritional status of declining scoter ducks of Puget Sound, USA. Science of the Total Environment 766:144247.

Brown, J. I., P. Lavretsky, R. E. Wilson, C. L. Haughey, W. S. Boyd, D. Esler, S. L. Talbot, and S. A. Sonsthagen. 2020. High site fidelity does not equate to population genetic structure for common goldeneye and Barrow's goldeneye in North America. Journal of Avian Biology 51:1–12.

Fara, L. J., S. Ford, B. R. Lubinski, S. C. Houdek, and M. W. Eichholz. 2019. Long Nights, Airplanes, and Avian Surgery: A Tale of Working With Volunteers to Study Long-tailed Ducks (*Clangula hyemalis*) Wintering on Lake Michigan. Journal of Avian Medicine and Surgery 33:82–88.

Garrettson, P. R., K. L. Kruse, T. J. Moser, and D. J. Groves. 2020. Exploratory Surveys of Migratory Birds Breeding in the Western and Central Canadian Arctic 2005-2011. Journal of Fish and Wildlife Management 11:321–340.

Gilliland, S.G. & Savard, J.-P. 2021. Variability in remigial moult chronology and nutrient dynamics of Surf Scoters *Melanita perspicillata*. Wildfowl 71: 193–220.

Giroux, J. F., M. Patenaude-Monette, S. G. Gilliland, G. R. Milton, G. J. Parsons, M. L. Gloutney, K. R. Mehl, R. B. Allen, D. G. McAuley, E. T. Reed, and N. R. McLellan. 2021. Estimating Population Growth and Recruitment Rates Across the Range of American Common Eiders. The Journal of Wildlife Management:1–10.

Lamb, J. S., S. G. Gilliland, J.-P. L. Savard, P. H. Loring, S. R. McWilliams, G. H. Olsen, J. E. Osenkowski, P. W. Paton, M. C. Perry, and T. D. Bowman. 2021. Annual - Cycle Movements and Phenology of Black Scoters in Eastern North America. The Journal of Wildlife Management:1–18.

Lamb, J. S., P. W. C. C. Paton, J. E. Osenkowski, S. S. Badzinski, A. M. Berlin, T. Bowman, C. Dwyer, L. J. Fara, S. G. Gilliland, K. Kenow, C. Lepage, M. L. Mallory, G. H. Olsen, M. C. Perry, S. A. Petrie, J.-P. L. P. L. Savard, L. Savoy, M. Schummer, C. S. Spiegel, and S. R. McWilliams. 2019. Spatially explicit network analysis reveals multi-species annual cycle movement patterns of sea ducks. Ecological Applications 29:1–17.

Lamb, J. S., P. W. C. C. Paton, J. E. Osenkowski, S. S. Badzinski, A. M. Berlin, T. Bowman, C. Dwyer, L. J. Fara, S. G. Gilliland, K. Kenow, C. Lepage, M. L. Mallory, G. H. Olsen, M. C. Perry, S. A. Petrie, J.-P. L. P. L. Savard, L. Savoy, M. Schummer, C. S. Spiegel, and S. R. McWilliams. 2020. Assessing year-round habitat

use by migratory sea ducks in a multi-species context reveals seasonal variation in habitat selection and partitioning. Ecography 43:1842–1858.

Lamb, J. S., P. W. C. Paton, J. E. Osenkowski, S. S. Badzinski, A. M. Berlin, T. Bowman, C. Dwyer, L. J. Fara, S. G. Gilliland, K. Kenow, C. Lepage, M. L. Mallory, G. H. Olsen, M. C. Perry, S. A. Petrie, J.-P. L. Savard, L. Savoy, M. Schummer, C. S. Spiegel, and S. R. McWilliams. 2020. Implanted satellite transmitters affect sea duck movement patterns at short and long timescales. Condor 122:1-16.

Lavretsky, P., R. E. Wilson, S. L. Talbot, and S. A. Sonsthagen. 2021. Phylogenomics reveals ancient and contemporary gene flow contributing to the evolutionary history of sea ducks (Tribe Mergini). Molecular Phylogenetics and Evolution 161:107164.

Le Net, R., D. M. Mulcahy, A. Santamaria-Bouvier, S. G. Gilliland, T. D. Bowman, C. Lepage, and S. Lair. 2019. Intranasal administration of midazolam hydrochloride improves survival in female surf scoters (*Melanitta perspicillata*) surgically implanted with intracoelomic transmitters. Journal of Zoo and Wildlife Medicine 50:167 – 175.

Lepage, C., J.-P. L. J.-P. L. Savard, and S. G. S. G. Gilliland. 2020. Spatial Ecology of White-Winged Scoters in Eastern North America : A Multi-Year Perspective. Waterbirds 43:147–162.

Mallory, M. L., J. Chardine, and S. Gilliland. 2020. First report of scoters (*Melanitta spp.*) along eastern Baffin Island, Nunavut, Canada. Arctic 73(2): 261— 264.

Mallory, A., L. Mark, A. Robert, R. Bradford, M. L. Mallory, R. A. Ronconi, R. B. Allen, C. Dwyer, S. S. Lair, C. D. Mallory, N. R. McLellan, G. R. Milton, G. J. Parsons, L. Savoy, and M. D. Tomlik. 2020. Annual movement patterns of American common eiders *Somateria mollissima dresseri*. Wildlife Biology 2020:1–10.

McGuire, R., R. Suydam, L. Quakenbush, and A. N. Powell. 2019. Population trends of king and common eiders from spring migration counts at Point Barrow, Alaska between 1994 and 2016. POLAR BIOLOGY 42:2065–2074.

Meattey, D. E., S. R. McWilliams, P. W. C. Paton, C. Lepage, S. G. Gilliland, L. Savoy, G. H. Olsen, and J. E. Osenkowski. 2018. Annual cycle of white-winged scoters (*Melanitta fusca*) in eastern North America: Migratory phenology, population delineation, and connectivity. Canadian Journal of Zoology 96:1353–1365.

Meattey, D. E., S. R. McWilliams, P. W. C. Paton, C. Lepage, S. G. Gilliland, L. Savoy, G. H. Olsen and J. E. Osenkowski. 2019. Resource selection and wintering phenology of White-winged Scoters in southern New England: Implications for offshore wind energy development. Condor 121: 1–18.

Noel, K., N. McLellan, S. Gilliland, K. A. Allard, B. Allen, S. Craik, A. Demagny, M. D. English, A. Diamond, J.-F. Giroux, A. Hanson, H. W. Heusmann, L. E. King, C. Lepage, H. Major, D. McAuley, D. E. Meattey, G. R. Milton, J. Osenkowski, A. Roberts, G. J. Robertson, M.-C. Roy, L. Savoy, K. Sullivan, and M. L. Mallory. 2021. Expert opinion on American common eiders in eastern North America: international information needs for future conservation. Socio-Ecological Practice Research 3:153–166.

Pearce, J.M., Flint, P.L, Whalen, M. E. 2019. Visualizing Populations of North American Sea Ducks : Maps to Guide Research and Management Planning: U.S. Geological Survey Open-File Report 2019-1142.

Roberts, A., E. Silverman, and S. Gifford. 2018. Sample size considerations for satellite telemetry and animal distributions. Journal of Wildlife Management 82:1536–1544.

Slattery, S. M., and R. G. Clark. 2019. Annual Survival in Female White - Winged Scoters and Lesser Scaup. The Journal of Wildlife Management 83:1151–1162.

Smith, A. D., B. Hofner, J. E. Osenkowski, T. Allison, G. Sadoti, S. R. McWilliams, and P. W. C. Paton. 2017. Spatiotemporal modelling of sea duck abundance: implications for marine spatial planning.

Sonsthagen, S. A., R. E. Wilson, P. Lavretsky, and S. L. Talbot. 2019. Coast to coast: High genomic connectivity in North American scoters. Ecology and Evolution 9:7246–7261.

Willie, M., D. Esler, W. S. Boyd, T. Bowman, J. Schamber, and J. Thompson. 2020. Annual winter site fidelity of Barrow's Goldeneyes in the Pacific. Journal of Wildlife Management 84:161–171.

Surf Scoters.

8 APPENDIX B: SPECIES OF MANAGEMENT CONCERN RANKING PROCESS

In 2021, the SDJV Continental Technical Team (CTT) updated a species prioritization exercise previously used in 2010 (see Appendix 1 of the 2015-2019 SDJV Implementation Plan). A sub-committee of six CTT members independently ranked sea duck populations against priorities, threats, and information needs that are outlined in this document. Species ranks are at the population level, allowing the SDJV to focus on regional population management and information needs.

The sub-committee is evenly split between countries and East/West/Northern experts. Individuals ranked species and populations based on their expert opinions and knowledge of the need for information or risk of not having information /data for each species and priority. Individuals only ranked populations for which they have knowledge (e.g., if an individual is an expert on Pacific populations, Atlantic populations were left blank).

For the detailed ranking based on threats, information needs, and priorities by focal area, rank values were limited to 1 for low, 2 for medium, and 3 for high. Ranks for each population were averaged across categories for an overall population rank (Table B-1). A population that scored an average of 2.0 or above was categorized as high priority, and any population with an average rank of less than 2.0 was deemed low priority. All eider and scoter populations, as well as Barrow's Goldeneye, Long-tailed Duck, and Harlequin Duck, were ranked as high priority overall, whereas Common Goldeneye, Bufflehead, and all three merganser species were ranked low priority overall (Table B-1). Average ranks for each focal area are reported in Table B-2.

Table B.1. Priority ranking of North American sea duck populations based on population status, trends, and critical information needs in focal areas identified by the Sea Duck Joint Venture. Average score was calculated from scores in each focal area, as seen in Table B.2. Overall rank was assigned as high if average score was 2.0 or greater, and low if average score was less than 2.0.

Genera, Species	Population	Score	Rank
Common Eider (*Somateria mollissima*)			
	Pacific (*v-nigrum*)	2.3	HIGH
	Northern (*borealis*)	2.3	HIGH
	Hudson Bay (*sedentaria*)	2.2	HIGH
	American (*dresseri*)	2.7	HIGH
King Eider (*Somateria spectabilis*)			
	Western	2.1	HIGH
	Eastern	2.1	HIGH
Spectacled Eider (*Somateria fischeri*)		2.2	HIGH
Steller's Eider (*Polysticta stelleri*)		2.2	HIGH
Black Scoter (*Melanitta americana*)			
	Atlantic	2.3	HIGH
	Pacific	2.0	HIGH
White-winged Scoter (*Melanitta deglandi*)			
	Eastern	2.3	HIGH
	Western	2.4	HIGH
Surf Scoter (*Melanitta perspicillata*)			
	Atlantic	2.3	HIGH
	Pacific	2.5	HIGH
Barrow's Goldeneye (*Bucephala islandica*)			
	Eastern	2.0	HIGH
	Western	2.2	HIGH
Common Goldeneye (*Bucephala clangula*)		1.4	LOW
Bufflehead (*Bucephala albeola*)		1.3	LOW
Long-tailed Duck (*Clangula hyemalis*)		2.4	HIGH
Harlequin Duck (*Histrionicus histrionicus*)			
	Eastern	2.1	HIGH
	Western	2.5	HIGH
Common Merganser (*Mergus merganser*)		1.3	LOW
Red-breasted Merganser (*Mergus serrator*)		1.4	LOW
Hooded Merganser (*Lophodytes cucullatus*)		1.2	LOW

Table B.2. Priority ranking of sea duck populations by focal area, conducted by a subcommittee of the Sea Duck Joint Venture.

Genera, Species	Population	SDJV Focal Area: Population Assessment Score	Population Assessment Rank	Harvest Management Score	Harvest Management Rank	Aquatic and Terrestrial Landscape Conservation Score	Aquatic and Terrestrial Landscape Conservation Rank	Climate Change Score	Climate Change Rank	Aquaculture Score	Aquaculture Rank	Off-shore energy Score	Off-shore energy Rank	Predator Population Effects Score	Predator Population Effects Rank
Common Eider (*Somateria mollissima*)															
	Pacific (*v-nigrum*)	2.3	MEDIUM	1.5	MEDIUM	2.6	HIGH	3.0	HIGH	1.0	LOW	1.0	LOW	3.0	HIGH
	Northern (*borealis*)	2.2	MEDIUM	1.5	MEDIUM	2.4	MEDIUM	3.0	HIGH	1.5	MEDIUM	1.5	MEDIUM	3.0	HIGH
	Hudson Bay (*sedentaria*)	2.2	MEDIUM	1.5	MEDIUM	2.4	MEDIUM	3.0	HIGH	1.0	LOW	1.0	LOW	3.0	HIGH
	American (*dresseri*)	2.2	MEDIUM	3.0	HIGH	2.7	HIGH	3.0	HIGH	3.0	HIGH	3.0		3.0	HIGH
King Eider (*Somateria spectabilis*)															
	Western	2.7	HIGH	1.5	MEDIUM	2.2	MEDIUM	3.0	HIGH	1.0	LOW	1.0	LOW	1.0	LOW
	Eastern	2.8	HIGH	1.5	MEDIUM	2.0	MEDIUM	3.0	HIGH	1.0	LOW	1.0	LOW	1.5	MEDIUM
Spectacled Eider (*Somateria fischeri*)		2.3	MEDIUM	2.5	HIGH	2.6	HIGH	3.0	HIGH	1.0	LOW	3.0	HIGH	1.0	LOW
Steller's Eider (*Polysticta stelleri*)		2.3	MEDIUM	2.5	HIGH	2.6	HIGH	3.0	HIGH	1.0	LOW	3.0	HIGH	1.0	LOW
Black Scoter (*Melanitta americana*)															
	Atlantic	2.4	MEDIUM	2.8	HIGH	2.2	MEDIUM	2.5	HIGH	2.0	MEDIUM	3.0	HIGH	1.0	LOW
	Pacific	2.0	MEDIUM	1.9	MEDIUM	2.2	MEDIUM	2.7	HIGH	1.7	MEDIUM	1.7	MEDIUM	1.3	LOW
White-winged Scoter (*Melanitta deglandi*)															
	Eastern	2.4	MEDIUM	2.8	HIGH	2.3	MEDIUM	2.5	HIGH	2.0	MEDIUM	3.0	HIGH	1.0	LOW
	Western	2.4	MEDIUM	2.2	MEDIUM	2.7	HIGH	2.7	HIGH	2.3	MEDIUM	1.7	MEDIUM	1.3	LOW
Surf Scoter (*Melanitta perspicillata*)															
	Atlantic	2.3	MEDIUM	2.8	HIGH	2.2	MEDIUM	2.5	HIGH	2.0	MEDIUM	3.0	HIGH	1.0	LOW
	Pacific	2.4	MEDIUM	2.3	MEDIUM	2.7	HIGH	2.7	HIGH	2.7	HIGH	2.0	MEDIUM	1.7	MEDIUM
Barrow's Goldeneye (*Bucephala islandica*)															
	Eastern	1.9	MEDIUM	1.1	LOW	2.5	HIGH	2.5	HIGH	1.3	LOW	2.0	MEDIUM	1.0	LOW
	Western	2.3	MEDIUM	2.0	MEDIUM	2.5	HIGH	2.7	HIGH	1.7	MEDIUM	1.3	LOW	1.7	MEDIUM
Common Goldeneye (*Bucephala clangula*)		1.6	MEDIUM	1.5	MEDIUM	1.4	LOW	1.3	LOW	1.0	LOW	1.0	LOW	1.0	LOW
Bufflehead (*Bucephala albeola*)		1.3	LOW	1.4	LOW	1.4	LOW	1.0	LOW	1.0	LOW	1.0	LOW	1.0	LOW
Long-tailed Duck (*Clangula hyemalis*)		2.7	HIGH	2.3	MEDIUM	2.3	MEDIUM	2.8	HIGH	1.4	LOW	2.6	MEDIUM	1.8	MEDIUM
Harlequin Duck (*Histrionicus histrionicus*)															
	Eastern	2.0	MEDIUM	1.0	LOW	2.5	HIGH	2.5	HIGH	1.3	LOW	2.3	MEDIUM	1.7	MEDIUM
	Western	2.7	HIGH	2.1	MEDIUM	2.9	HIGH	3.0	HIGH	1.3	LOW	1.7	MEDIUM	3.0	HIGH
Common Merganser (*Mergus merganser*)		1.5	MEDIUM	1.4	LOW	1.2	LOW	1.3	LOW	1.2	LOW	1.4	LOW	1.0	LOW
Red-breasted Merganser (*Mergus serrator*)		1.6	MEDIUM	1.3	LOW	1.3	LOW	1.0	LOW	1.2	LOW	1.6	MEDIUM	1.0	LOW
Hooded Merganser (*Lophodytes cucullatus*)		1.3	LOW	1.3	LOW	1.2	LOW	1.0	LOW	1.0	LOW	1.2	LOW	1.0	LOW