Sea Duck Joint Venture Strategic Plan 2008-2012

Plan Conjoint des Canards de Mer
Plan Stratégique 2008 - 2012

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A North American Waterfowl Management Plan
Conservation Partnership

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

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Executive Summary

The Vision of the Sea Duck Joint Venture (SDJV) is to maintain sustainable populations of North American sea ducks throughout their ranges. The SDJV is guided by the following Mission Statement: the SDJV promotes the conservation of North American sea ducks through partnerships by providing greater knowledge and understanding for effective management.

The goals of the SDJV promote development of short and long-term information gathering programs to determine basic parameters of sea duck populations, such as delineation of ranges and subunits, abundance and trends, production, harvest, and survival rates.

The following outlines the objectives of the 2008-2012 Strategic Plan, under the 4 central pillars of the SDJV (Science, Communications, Funding, and Conservation Actions):

Science:
The SDJV concentrated much of its initial effort on population delineation in an effort to provide a firm foundation for monitoring programs. Effective monitoring of sea duck populations is now a top priority as population trends for most species are based on limited information and abundance estimates are not possible. The Continental Technical Team and Management Board of the SDJV will continue to document the filling of information gaps and improvements in the state of our knowledge of sea ducks as projects are initiated and carried out. The SDJV has identified several important initiatives, based on the aggregate information needs of individual populations, on which to focus over the course of this Strategic Plan:

- Development of effective population survey techniques
- Delineation of populations: Linking breeding, molting and winter ranges
- Population dynamics in Mergini and development of population models
- Improvement of harvest surveys
- Identification of important habitats
- Documentation of biological impacts of contaminants, parasites and disease

Communication:
Effective communication and proactive provision of knowledge and advice are fundamental to achieving SDJV objectives by: raising awareness, developing partnerships, building support within the conservation, industrial, scientific and political communities, and acquiring the requisite resources necessary to achieve goals of the SDJV. These strategies embrace both communication and marketing.

The SDJV successfully sponsored and coordinated two North American sea duck conferences (2002 and 2005) filling a communications gap within the science community. There continues to be a need for facilitated communications so the Third North American Sea Duck conference is planned for November 2008, in Québec City, Québec.

Funding:
While funding has steadily increased from 2001 to 2006 it remains insufficient to support the information needs of the sea duck community. The SDJV has a long-term goal of establishing stable funding sources and increasing capabilities to cooperatively fund sea duck science projects throughout North America. Over the next 5 years the SDJV will pursue the following strategies:

- Incorporate sea duck priorities into base programs from a broad range of partners
- Seek supplemental appropriations
- Develop corporate partnerships
- Secure court awards for environmental damage

Proactive Conservation Strategies:
The SDJV has agreed that proactive conservation (beyond a basic research and inventory program) is imperative to its success. The following outlines the approach the SDJV will take over the next five years to influence the conservation of Sea Ducks in North America:

- continue to provide access to science information to partners, government agencies, non-government organizations, and the private sector via web-based information, annual reports, and international symposia.
- focus proactive conservation work (outreach and engagement) in the following sectors: aquaculture, coastal wind energy, and offshore oil and gas development and production.

TABLE OF CONTENTS

INTRODUCTION

The fifteen species of sea ducks (Tribe *Mergini*) are the most poorly understood group of waterfowl in North America. The most basic biological information is unknown for some species. Few species have reliable population indices or estimates of annual productivity, and much of our knowledge is based on a very few, localized studies. Also, current survey design is unable to accurately estimate sea duck harvest.

Sea ducks, as a group, have evolved in relatively stable environments resulting in, for most species, delayed sexual maturity, long life spans and low annual recruitment. For many reasons, the environments inhabited by sea ducks are changing; human endeavors are expanding in northern breeding areas and many traditional wintering areas are increasingly affected by urbanization and industrialization. Thriving gull and other predator populations are placing greater pressure on annual production of some species. Indirect factors, such as bioaccumulation of contaminants and climate change, may be negatively affecting survival and production in some populations; exposure to lead is a documented source of mortality. Only through a concerted effort to determine the interaction of these factors can we hope to effectively conserve sea ducks.

History and Purpose of the Joint Venture

Sea ducks were not given special consideration under the 1986 North American Waterfowl Management Plan (NAWMP). Although few data were available, most populations were thought to be relatively stable. However, in 1986 the eastern population of Harlequin Ducks was listed as endangered in Canada (later downgraded to a Species of Special Concern), and in 2000 the eastern population of Barrow's Goldeneye was designated as a Species of Special Concern in Canada. Harlequin Ducks and Barrow's Goldeneye are both state-listed as threatened in Maine. Spectacled Eiders and the Alaska breeding population of Steller's Eiders are listed as threatened by the United States.

Analysis of previous survey and harvest data, along with new surveys and studies conducted in the 1990's, indicated population declines in 10 of the 15 species of North American sea ducks. In 1997 Federal, State, Provincial and NGO management agencies proposed a Sea Duck Joint Venture (SDJV) to address these issues at a continental scale. The NAWMP Committee approved the SDJV in November 1998 as the best vehicle to coordinate the conservation of sea ducks. The organizational structure and functions of the SDJV are similar to other species joint ventures under NAWMP and are described in Appendix A.

The SDJV will endeavor to address the needs for information about all 15 species of Mergini that occur in North America. Although the focus of the joint venture is on sea duck populations in North America, partnerships with other circumpolar countries sharing these populations will be encouraged.

Vision

The SDJV strives to maintain sustainable populations of North American sea ducks throughout their ranges.

Mission Statement

The SDJV promotes the conservation of North American sea ducks through partnerships by providing greater knowledge and understanding for effective management.

Goals

- The SDJV facilitates and supports the development of knowledge and understanding critical to sea duck conservation in North America.
- The SDJV promotes proactive conservation of sea ducks.
- The SDJV strives to increase the profile and provide technical advice on sea ducks within the conservation, industrial, and scientific communities.
- The SDJV develops a program to involve the partners and leverage resources needed to accomplish the Mission.

PURPOSE OF THE STRATEGIC PLAN

The goals of the SDJV promote development of short-term and long-term information-gathering programs to determine basic parameters of sea duck populations, such as delineation of ranges and subunits, abundance and trends, production, harvest, and survival rates. In many instances, undefined breeding distributions, changes in abundance and winter distributions, uncertain status of populations, and mixing during migration and wintering are issues that require attention for effective management. The amount of information available to management agencies varies widely among populations.

The information requirements of sea duck managers in North America will be dynamic. Research and monitoring needs will change as conservation issues emerge and new information becomes available. It is intended that the goals, objectives and strategies, first presented in the 2001 Strategic Plan, be reviewed and revised as necessary at five year intervals. This revision of the previous plan covers the period 2008-2012.

The objectives of the 2008-2012 Strategic Plan are to:

- briefly summarize key accomplishments during the first 5-year period of implementation;
- identify science needs and priority information necessary to facilitate understanding of critical sea duck conservation issues in North America;

- describe implementation strategies to meet the information needs;
- address recommendations from the 2007 North American Waterfowl Management Plan Assessment Steering Committee.
- articulate proactive conservation and funding strategies to meet the Mission and Vision of the SDJV.

KEY ACCOMPLISHMENTS AND CHALLENGES IN 2001-2007

The Sea Duck Joint Venture has focused its efforts on four fronts: Science, Communications, Funding and Conservation Actions. Advances, summarized below, were made in all areas during implementation of the first strategic plan, and are helping to direct the partnership's priorities for this updated Strategic Plan.

Science Initiatives

One of the key missing pieces that limits our ability to manage sea ducks is the largely unknown spatial structure of populations. The SDJV vision to maintain populations throughout their ranges requires definition of functional population units, which is vital to provide a firm foundation for activities as basic as designing effective monitoring programs. For this reason, the SDJV concentrated much of its initial effort on population delineation, particularly for species suspected of being in decline.

The SDJV has taken advantage of developing technologies such as satellite radio telemetry and genetic techniques to establish affinities among wintering, molting, staging and breeding sites for eastern and western Harlequin Ducks; eastern Barrow's Goldeneye, Common Eider northern and Pacific races; Atlantic Black and Surf Scoters; Pacific Black, Surf and White-winged Scoters; and western Arctic King Eiders. Population delineation efforts also demonstrated that work by, or with, other countries, particularly Russia and Greenland, is important for conservation of shared populations.

While it is known that the continental populations of Harlequin Ducks and Barrow's Goldeneye comprise discrete eastern and western units, preliminary information now suggests that the same is true for several other species. More research will be conducted to confirm these results and expand the effort to other species. However, assuming this preliminary evidence of structuring is correct and widespread among sea ducks, there are important implications for conservation, as the threats are different on the Atlantic and Pacific coasts. For example, although harvest is still poorly quantified, sport hunting for sea ducks is much more prevalent on the east coast through a variety of specialized outfitters along the eastern seaboard. A special winter hunt for eiders occurs in Newfoundland, New Brunswick, and in Saint-Pierre and Miquelon, France.

Research to track bird movements also led to the identification of coastal habitats important to sea ducks for migration, staging and molting. For example, key fall stopover areas for Pacific Common Eiders and King Eiders were identified in the Beaufort Sea and habitats used by Black

Scoters during spring migration were identified in the Baie de Chaleur, New Brunswick and the Gulf of Saint Lawrence, Quebec. The value of herring spawn as a food source for migrating western scoters was highlighted, as were concerns about the expansion of aquaculture in areas used by sea ducks along both coasts. As the database of important areas grows, and we become better able to describe the habitat features that characterize important areas, we will improve our ability to advise the NAWMP habitat Joint Ventures and other habitat conservation efforts to benefit sea ducks. Building stronger ties to the habitat Joint Ventures (the Pacific Coast Habitat Joint Venture, the Eastern Habitat Joint Venture, and the Atlantic Coast Joint Venture, among others) is an important part of the SDJV direction for the term of this plan.

Investment by the SDJV in research on population dynamics was not extensive during the initial implementation phase. Even so, the SDJV supported banding studies to determine annual survival rates (and ultimately, a population model) for Common Eiders (American race) marked on breeding areas, and for Surf Scoters marked on molting sites off the coast of northern Labrador; the latter demanded development of an innovative capture technique for ducks molting at sea. Research was conducted toward estimation of vital rates for White-winged Scoters at a remote location in the heart of the primary breeding range in Canada's Northwest Territories. One important result was that apparent breeding propensity of paired females, as determined by blood assays, was highly variable annually. Many of the paired but non-breeding females were sub-adults, implying that surveys counting pairs may not reliably index local breeding populations. These studies provided important results, but we have barely scratched the surface of information needs and research gaps in the realm of population dynamics. The estimation of vital rates is likely to become a higher priority, particularly with greater clarity about the definition of functional population units.

In the first 7-year period of implementation, the SDJV also supported research on population ecology of several species. Of note, a study of the winter ecology of the Hudson Bay race of Common Eider demonstrated the precarious energy balance for eiders wintering at arctic polynyas, some of which are permanent in all but the most severe winters, while others are transient and depend on daily weather and winds. Breeding ecology studies were also supported, examining White-winged Scoters, Long-tailed Ducks, and Barrow's Goldeneye. An extensive project was conducted to describe the availability and distribution of food resources for scoters during spring migration along the Pacific coast.

Since 2001, the requirement for effective monitoring of sea duck populations became a top priority. For most species, our understanding of population trends is based on limited information and abundance estimates are not possible. This gap prevents the establishment of population benchmarks and objectives as desired under the North American Waterfowl Management Plan. Recognizing the importance of this gap, the SDJV Management Board recommended that, beginning in 2006, a portion of U.S. congressionally appropriated funds be devoted to priority monitoring projects.

The SDJV formed a working group, composed of SDJV Technical Team Members and others from U.S. and Canadian wildlife management agencies, to identify and prioritize monitoring needs for sea ducks. This group evaluated existing and potential surveys, identified priorities, and estimated costs of initiating monitoring surveys; the final report was completed in 2008 and

is available at http://seaduckjv.org/monitor.htm. As planning toward operational surveys continues, the SDJV has supported projects focused on developing survey methods, which has led to an operational survey of the Alaskan breeding population of Black Scoters. The SDJV has also supported studies to evaluate assumptions of specific survey methodologies, such as how to survey offshore areas, and estimate turnover rates at staging or molting areas.

Communications

The SDJV created and regularly updates an extensive website (http://www.seaduckjv.org/) which provides a wealth of information on sea ducks, as well as the JV planning documents, calls for research proposals, and research progress reports. In addition, the website provides technical information about surgical implantation of transmitters and capture techniques, and educational tools for teachers.

Two North American sea duck conferences were sponsored and coordinated by the SDJV member agencies (in 2002 and 2005); the conference abstracts are posted on the SDJV website. Activities included science presentations describing the current status of populations, our understanding of sea duck biology, habitat needs, population delineation, migration ecology, foraging and energetics, and the effects of contaminants. In addition, a number of workshops on specific issues were held, such as the need to improve estimation of harvest, advances in satellite telemetry technology, and the potential effects of offshore and nearshore wind power production.

The conferences clearly filled a need of the science and management communities, being attended by 200 scientists and managers representing 9 countries. In the second conference, results of research were discussed in 57 oral and 48 poster presentations. Because the first two conferences were judged overwhelming successes, and there continues to be a need for facilitated communications, the Third North American Sea Duck conference is planned for November 2008, in Québec City, Québec.

The number of peer-reviewed publications focused on North American sea ducks has increased steadily since the mid-1970s (Fig. 1). General awareness of sea ducks and apparent declines in population size increased notably in the 1990s and sizable increases in publications occurred after the listing of the Spectacled and Steller's eider in the U.S. Following the formation of the SDJV and dedicated funding beginning in 2001, there has been a dramatic increase in the number of North American sea duck publications. Although the SDJV cannot take credit for all of this increase, it has certainly accelerated the pace and breadth of sea duck research in North America and the rate of publications will likely continue to increase as studies are completed, data analyzed, and eventually published.

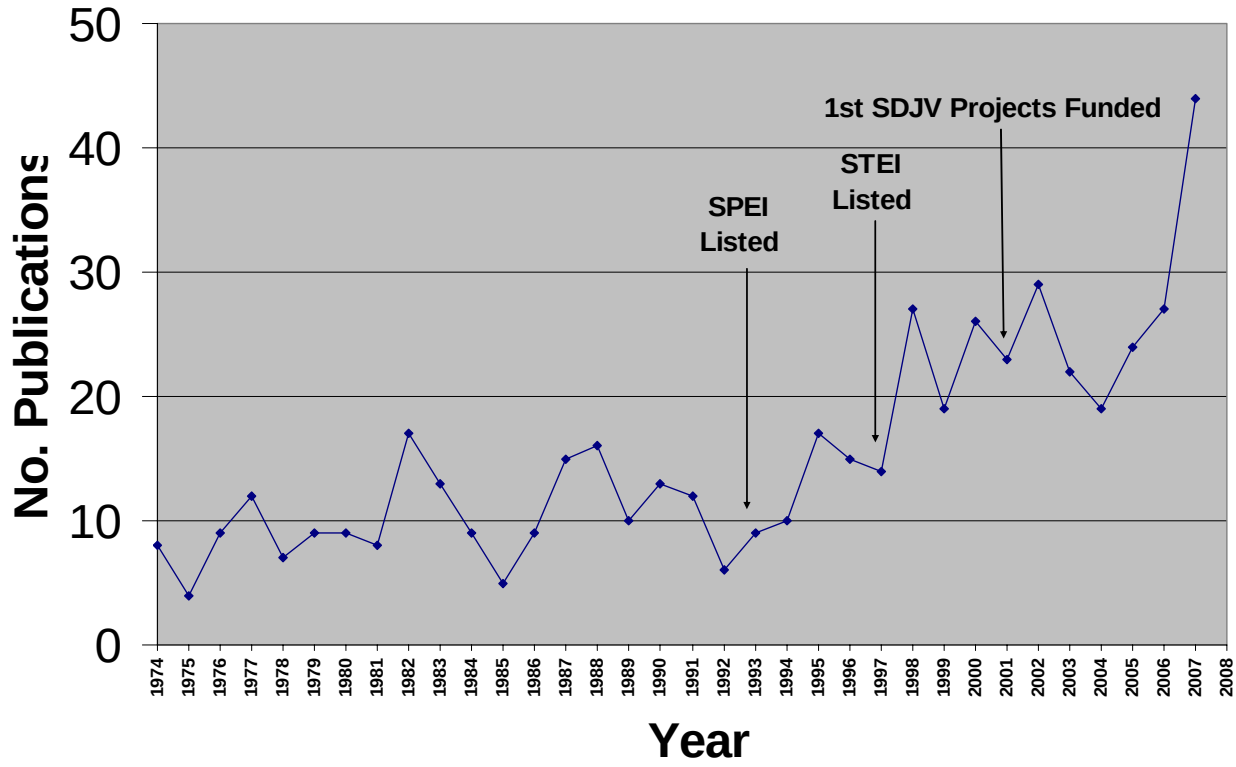

Figure 1. Number of peer-reviewed publications on North American sea ducks, by year.

Funding

Funding to implement the priorities of the SDJV ramped up significantly over the initial planning interval (Fig. 2), with more than 60 projects funded in part by the SDJV from 2001-2007. (Appendix C). Total annual funding contributions of all partners, including SDJV contributions, increased from just over $400,000 USD in 2001 to nearly $2,000,000 by 2006; but this remains insufficient to support the myriad of information needs of the sea duck community. The challenge now is to increase and diversify partner funding commitments into the future. A significant advancement to ensuring success of the SDJV could be achieved with matching contributions to the research and monitoring fund from the Canadian federal government to complement those contributed by the United States government.

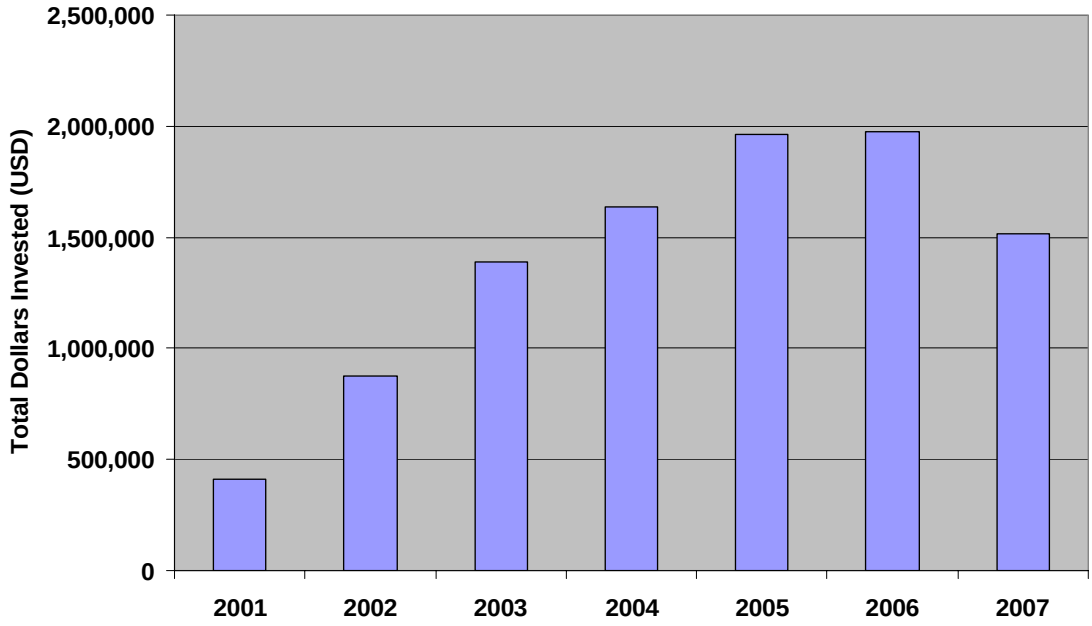

Figure 2. Total funds invested annually in SDJV- sponsored projects, 2001 – 2007.

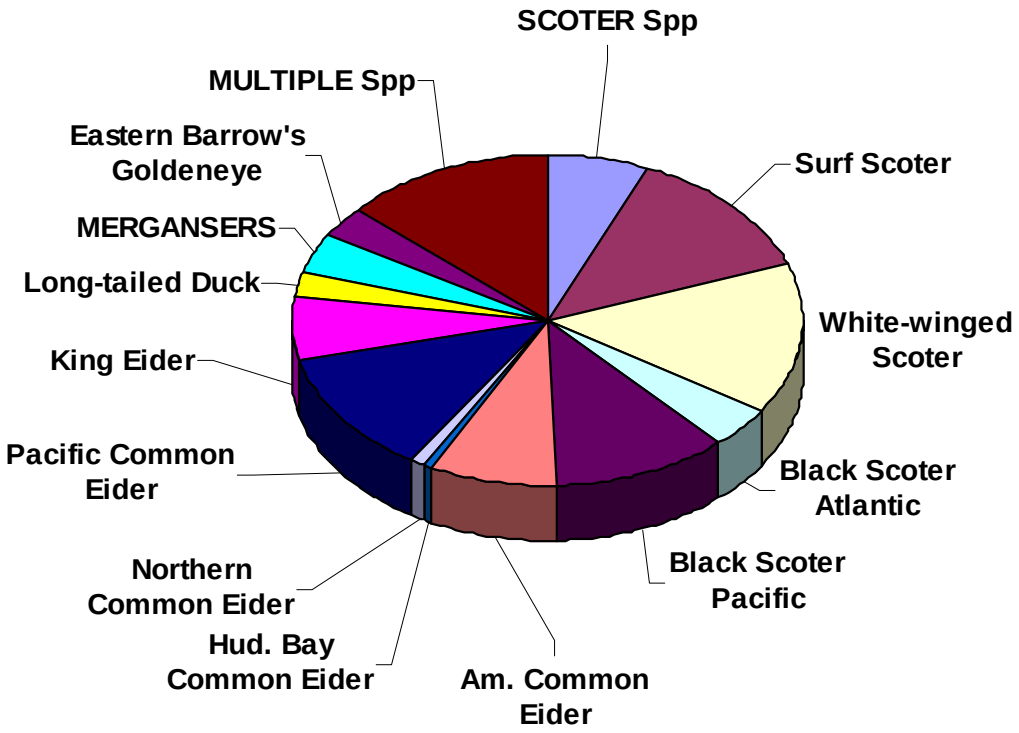

Figure 3. Distribution of funds by species or species groups, 2001 – 2007.

The three species of scoters and Pacific and American races of Common Eider received the largest allocation of funds in 2001 – 2007 (Fig. 3). Among the science initiatives, population delineation was the most funded effort during this period (Fig. 4).

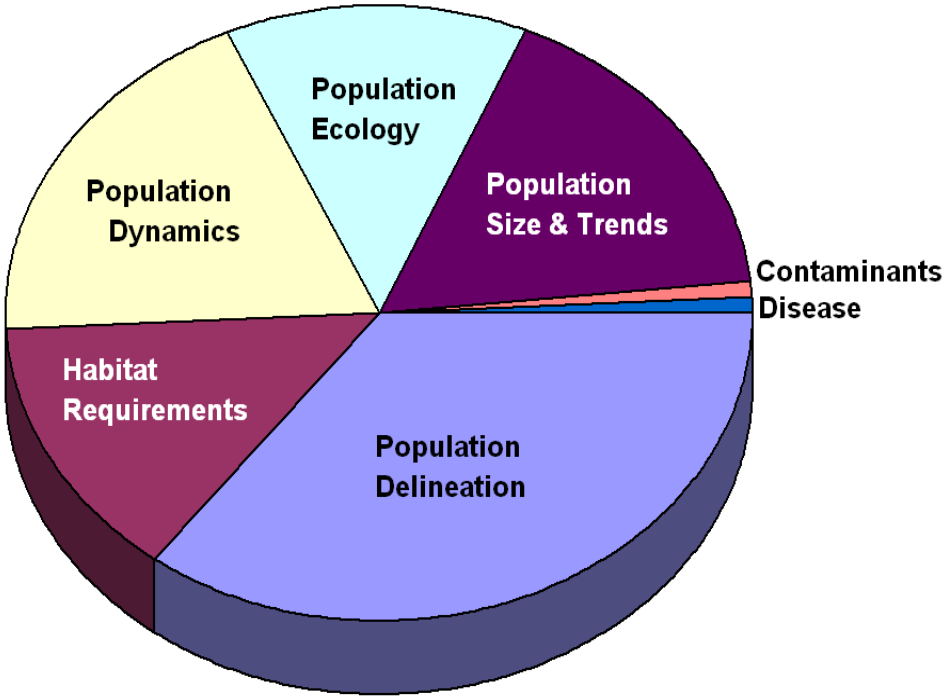

Figure 4. Distribution of funds by category of information need, 2001 - 2007.

Conservation Actions

Substantial progress has been made to increase the sea duck knowledge base since the formation of the SDJV, but there clearly remains much more to be done. The SDJV is primarily focused on collecting information for management purposes, but in most cases we remain unable to provide advice regarding population limiting factors, threats, or habitat needs. The priority directions to move us closer to this objective during the next five-year implementation period are described in the following sections of the Strategic Plan.

SCIENCE AND INFORMATION NEEDS FOR SEA DUCK MANAGEMENT

Approach

Seven categories of information needs have been evaluated for each of the 22 populations of 15 North American species, summarized in Table 1. More specific descriptions of information needs and general strategies to address them are presented for individual populations in Appendix B. High, Medium, or Low designations in Table 1 refer to the importance of addressing these categories of information needs for purposes of improving population management. Rankings do not necessarily reflect the overall level of knowledge in these subject areas; in fact, the paucity of information in some categories precludes an evaluation of their importance to management. The summary in Table 1 reflects information needs ranked only within each population; it does not compare the importance of needs across populations.

It is the intent of the SDJV to be adaptive in its approach to identifying and addressing the information needs of sea duck managers in North America. Although Table 1 highlights issue rankings currently considered most important, this plan must be dynamic to accommodate changes in information needs as objectives are met. Furthermore, studies of sea duck population affinities may warrant designation of additional populations within the scope of the joint venture.

Categories of Information Needs

Population Size and Trends refers to the availability of a reliable annual or periodic population estimate (index or census) to monitor the status of the population and enable managers to detect significant changes soon enough to affect remedies.

Population Definition and Delineation refers to the assessment of demographically functional units within species and description of the geographic ranges of those units. This also addresses the degree to which presently recognized populations are distinct enough in their geographic distribution to be managed separately.

Population Dynamics refers to the measurement of specific population parameters such as rates of survival, productivity, recruitment, and age/sex ratios; and the interrelationships between these parameters as they affect abundance over time. Obtaining the parameters for sea ducks will often require basic life history studies.

Population Ecology refers to an understanding of population dynamics and how it relates to a range of biotic and abiotic environmental factors such as weather, habitat, food, competition, and predation, as well as temporal changes in these factors.

Habitat Requirements refers to identification of habitats that are important to the long-term health and security of sea duck populations within breeding, migration, molting, and wintering periods.

Harvest Assessment refers to the ability of management agencies to accurately measure and assess the effects of sport and subsistence harvest on specific sea duck populations.

Parasites, Disease and Contaminants refers to understanding of biotic and anthropogenic agents that directly influence the health of the populations, either through direct mortality or indirect impacts such as lowered reproductive potential or synergistic effects with other agents.

Table 1. Summary of prioritized categories of information needs for management of 22 populations of sea ducks included in the Sea Duck Joint Venture. For a more detailed description of needs by population, see Appendix B. High priority (H) indicates an immediate need for information most necessary for management. Medium priority (M) indicates a demonstrated need for information, but for various reasons, other information is required first. Low priority (L) suggests that the information is relevant, but either the information need has been adequately addressed or other needs should take precedence in SDJV activities. Categories of needs are ranked only within each population; readers are cautioned not to consider relative ratings across populations. Although the needs of each population are ranked, nothing in this table is intended to discourage work on information needs in any cell. For comparison, the relative priorities from the initial 5-year plan are attached as Appendix D.

POPULATION	COEI				KIEI		SPEI	STEI	HARD		BLSC		SUSC	WWSC	LTDU	BUFF	COGO	BAGO		HOME	COME	RBME
INFORMATION NEED	P	H	N	A	W	E			W	E	W	E						W	E			
Population Size & Trend	H	M	H	M	H	H	L	H	H	H	M	H	H	H	H	M	M	H	H	H	M	H
Population Definition/ Delineation	M	M	M	L	M	M	L	L	H	H	L	H	H	H	H	H	H	H	M	H	H	H
Population Dynamics	H	H	H	H	H	H	M	H	M	H	H	M	H	H	H	H	H	M	H	M	H	H
Population Ecology	H	H	M	L	H	M	M	M	M	H	H	M	M	M	M	M	M	M	M	M	M	M
Habitat Requirements	L	M	M	M	L	L	H	L	H	M	M	L	M	M	M	M	M	M	H	M	L	M
Harvest Assessment	M	H	H	H	M	H	H	M	L	L	H	M	L	L	L	L	L	L	M	L	L	L
Disease/Contaminants	L	L	H	M	L	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	M	L

Because of differences in accepted taxonomy or marked differences in breeding and/or winter range, some species are subdivided into populations: Common Eider races: Pacific, Hudson Bay, Northern, American. W = western North America, E = eastern North America

Species names and abbreviations:

Common Eider	COEI	*Somateria mollissima*	Long-tailed Duck	LTDU	*Clangula hyemalis*
King Eider	KIEI	*Somateria spectabilis*	Bufflehead	BUFF	*Bucephala albeola*
Spectacled Eider	SPEI	*Somateria fischeri*	Common Goldeneye	COGO	*Bucephala clangula*
Steller's Eider	STEI	*Polysticta stelleri*	Barrow's Goldeneye	BAGO	*Bucephala islandica*
Harlequin Duck	HARD	*Histrionicus histrionicus*	Hooded Merganser	HOME	*Lophodytes cucullatus*
Black Scoter	BLSC	*Melanitta nigra americana*	Common Merganser	COME	*Mergus merganser*
Surf Scoter	SUSC	*Melanitta perspicillata*	Red-breasted Merganser	RBME	*Mergus serrator*
White-winged Scoter	WWSC	*Melanitta fusca deglandi*			

SDJV Science Initiatives for Sea Ducks

In order to promote more rapid advancement of knowledge about sea ducks and achieve efficiency in program delivery, the SDJV has identified several important initiatives, based on the aggregate information needs of individual populations (Table 1 and Appendix B). These encompass issues that can be addressed collectively for: (1) several populations, (2) broad geographic regions, or (3) particular research topics. The SDJV encourages integration of studies with similar objectives to increase the applicability to entire populations or ranges.

DEVELOPMENT OF EFFECTIVE POPULATION SURVEY TECHNIQUES

Collection of data on population size and trends for sea ducks has been hampered by the lack of effective and feasible survey techniques. The traditional waterfowl survey (Waterfowl Breeding Population and Habitat Survey –WBPHS) flown in spring and used as a basis for setting population goals for many North American waterfowl, does not cover the core breeding ranges of about half the sea duck species and is not optimally timed to capture peak counts of breeding sea ducks, which generally nest later than dabbling ducks. Additionally, some groups of sea ducks have not been differentiated to species during this survey (e.g., scoters, goldeneyes, mergansers). Consequently, for most populations of sea ducks, we cannot accurately estimate abundance, relative densities, or population trends.

There is an urgent need for more intensive, precise surveys that will provide an index of population size and robust detection of long term trends for all sea ducks. Analysis of the existing limited data suggests long term population declines in at least 8 of the 15 species of North American sea ducks, although confidence in some data sets is low due to reasons noted above. Monitoring at a population level or a large geographic scale is needed to track changes in abundance and develop population objectives under NAWMP. Such information is needed to manage harvest, and to help identify priority conservation efforts required to meet abundance objectives. Information on seasonal habitat use obtained during monitoring surveys may also be helpful in identifying areas in need of protection, documenting effects of disturbance, and documenting effects of climate change.

In 2005, the SDJV Management Board asked the CTT to develop a prioritized list of sea duck monitoring needs to help guide funding decisions. This list of surveys has been completed (see Recommendations for Monitoring Distribution, Abundance, and Trends for North American Sea Ducks on *seaduckjv.org*), along with survey plans developed for each species or population of concern. Beginning in 2006, SDJV assigned approximately 20% of its funds to development of survey techniques to monitor sea ducks. A pilot study to develop a survey suitable for Black Scoter breeding in Alaska has been successfully completed and is now an operational monitoring program. A survey to monitor King Eiders and Long-tailed Ducks breeding in western Arctic Canada is still in developmental stage, testing a more cost effective aircraft for the surveys. Other pilot studies, funded in part by SDJV, include work toward development of surveys to: effectively survey wintering sea duck populations off the Atlantic coast; count Black Scoters molting in James Bay; estimate numbers of sea ducks wintering in the Great Lakes; and monitor Pacific Common Eider nesting in arctic Canada.

Whether it is more effective to monitor a species population on the wintering or breeding area will vary depending on biological, logistical and economic considerations. Surveys on the breeding grounds can be expensive if the species is widely distributed over a large breeding range in a remote area. This problem can be alleviated through stratification by major habitat and sampling small portions of each stratum. Also, pilot and aircraft availability may be a limiting factor during the breeding season. The late chronology of sea duck breeding will require dedicated surveys in addition to traditional dabbling duck and goose surveys. Surveys on wintering areas are confounded by the difficulty of counting birds in large flocks, the effects of glare and sea state on detection of birds on water, distributional shifts both among years and within a season, and the challenges of conducting surveys in extended periods of severe winter weather and short photoperiod in northern wintering areas. Additionally, significant portions of northern wintering surveys would likely have to be conducted with extremely expensive twin-engine charter aircraft. Monitoring on staging areas during migration, and on molting areas, is confounded by turn-over rates which are generally unknown and likely variable among years, as well as uncertainty about origins and composition of these aggregations. However, for some species this might be the only feasible way to develop a reliable index of abundance.

It is important to note that interpreting data on sea duck population sizes and trends will remain compromised until the populations are properly delineated through use of techniques described above (e.g., satellite telemetry, stable isotope, genetics).

Population surveys are an effective way of measuring trends only if they are conducted over the long term and on a frequent basis. Counts are affected by numerous factors such as survey conditions or seasonal weather patterns which in turn affect bird behavior (e.g. timing of nest initiation, winter distribution, length of stay on a staging area). Some factors influencing the count, such as observer skill, can be quantified to a degree by measuring detection rates. Others are not readily quantified (e.g. a late spring thaw that affects timing of nesting). Still others may go unnoticed (e.g. low breeding propensity due to poor body condition). Consequently, counts can vary markedly from one year to the next, making it difficult to interpret results, especially if there are gaps of several years between surveys. Generally, the more frequent the surveys, the sooner a population trend can be detected with a reasonable degree of certainty. Thus, monitoring should ideally be done annually, but this requires adequate resources over the long term. Development of multiple partnerships is a potential means to initiate and test new survey protocols, but ultimately operational surveys will require a base of reliable funding. Realistically, once monitoring methods are developed, the government agencies responsible for sea ducks should take on the task of monitoring over the long term.

In summary, most sea duck populations are still not adequately monitored, including several populations suspected to be in decline (e.g. all three species of Scoters, Long-tailed Duck). Cost effective survey techniques for monitoring sea duck populations need to be developed and resources identified to implement long term monitoring.

DELINEATION OF POPULATIONS: LINKING BREEDING, MOLTING AND WINTER RANGES

In many cases, it is unclear how to delineate populations of sea duck species geographically and temporally. For example, King Eiders breeding in 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 west Greenland and Maritime Canada. Where the breeding ranges of these populations meet and overlap in Arctic Canada remains unclear.

Geographic delineation of populations is important because it defines demographic units to be assessed and conserved, helps to identify factors affecting specific populations throughout the year (e.g. harvest levels, pollution), and indicates the vulnerability of populations to challenges. The most promising and practical approaches to determine links between breeding, molting and wintering sites of sea ducks include satellite telemetry, stable isotope, and genetic techniques. Banding and mark-recapture techniques are of limited use because most sea duck species are difficult to catch in large numbers and they range widely and are not easy to observe (for visual markers).

Much of the emphasis in the first few years of the SDJV has been on population delineation, and satellite telemetry has been the primary tool used to identify breeding ranges, migration routes, molting and wintering areas, and timing of bird movements among these areas. Using this technique, satellite transmitters with percutaneous (i.e. external) antennae are surgically implanted into the body cavity of ducks and tracked via signals to satellites. Success with these transmitters has generally been high, but variable among species, location, and time of year. Questions remain about the effects of implanted transmitters and more research is needed to understand effects on behavior and reproduction, and to reduce mortality after implantation. Technological improvements in transmitters and batteries now allow for extended life of transmitters enabling researchers to track birds for more than one year and potentially address questions about annual variability in habitat use patterns and site fidelity.

Considerable progress has been made toward delineating some populations (e.g., Surf Scoter, Black Scoter, Pacific Common Eider, northern Common Eider, eastern Harlequin Duck). For example, satellite telemetry has shown the importance of Greenland as wintering and molting areas for northern Common Eiders and eastern Harlequin Ducks breeding in Canada. On the Pacific coast, Surf Scoters have been marked on wintering areas from Mexico to Alaska and a more complete picture of migration routes, timing, and affiliations between wintering and breeding areas is emerging. Satellite telemetry of Black Scoters suggest two completely independent populations in North America – one that breeds and winters in the central and eastern part of the continent and one in the western part. Despite progress made so far, nothing is known about population delineation for a few species and a varying amount of additional work is needed for nearly every other sea duck species in North America.

Stable isotope markers are providing another tool that can help describe movements of sea ducks between geographically separated areas. Stable isotopes in animal tissues reflect those values in food webs and thus provide insights into feeding location and diet. For example, stable isotopes signatures in wing feathers reflect preferred food types in molting areas. Similarly, signatures in certain body feathers reflect foods from wintering areas. Thus, isotopic ratios of feathers can be useful in identifying wintering and molting areas on a relatively broad geographic scale.

Genetic data offer considerable potential for delineating sea duck populations and describing links between nesting, staging, and winter habitats. Population differences in gene frequencies can be used to infer migratory affinities and dispersal. Genetic markers can be employed to quantify population divergence, identify or clarify management and taxonomic units, and offer insights into historical and contemporary processes involved in levels of divergence. Choice of markers depends on the specific questions to be addressed. For example, recent research on Steller's Eider employing multiple genetic markers has shown low levels of population differentiation within Atlantic and Pacific nesting areas, but higher levels of differentiation between these regions (for mtDNA). Further, analyses of microsatellite data from wintering and molting Steller's Eider showed no signs of sub-population structure, even though band-recovery data indicates multiple breeding areas are present. Therefore, to describe patterns of population relatedness for sea ducks, genetic markers should be coupled with other proven techniques such as stable isotopes and radio telemetry, as discussed above.

POPULATION DYNAMICS IN MERGINI AND DEVELOPMENT OF POPULATION MODELS

Sea ducks are typically long-lived, and have low reproductive rates that vary greatly annually and with age. As a result, their life cycles are complex making it difficult to isolate factors that affect population dynamics. Construction of simulation models formalizes our thinking about population-level processes and can advance our understanding of population regulation. Models also provide the means to determine the relative contribution of demographic parameters to population growth and to help identify gaps in existing knowledge. As such, they can facilitate development of hypotheses to help prioritize research and they provide a means to assess potential outcomes of different management scenarios. Optimally, population models are species or even population specific, and are built on robust estimates of age-specific survival and reproduction. This may require estimates of breeding propensity, clutch size, nest success and juvenile dispersal.

Demographic studies that measure age-specific survival and reproduction require long-term commitments to field programs. However, research on population dynamics faces financial and logistical challenges given the remote locations typically occupied by most sea ducks. Still, some studies are relatively easily accomplished and could yield valuable information. For example, the well known locations of colonies and brood rearing areas for Common Eiders on the east coast of North America make possible the capture of a large number of adults and young and would permit efficient quantification of demographic parameters needed for this heavily hunted population. Studies on Harlequin Ducks on both the east and west coasts have also indicated that demographic information for this species can be relatively easily obtained; one of the more important studies needed includes estimation of dispersal rates of sub-adults. Similarly, cavity-nesting sea ducks (goldeneyes, Bufflehead, mergansers) readily nest in man-made nest boxes that are more readily studied than natural cavity sites (although there are considerations about how well demographics from birds using nest boxes reflect those nesting in natural conditions).

Clearly, ease of study should be only one factor that determines the best investment of SDJV resources. Other species of equal or greater conservation concern breed, migrate, or winter in

hard to study locations, which does not devalue the need to learn more about their population demography, but rather constrains it. Therefore, it is incumbent upon the SDJV to help foster greater funding and collaborative thinking about how to overcome those constraints.

Despite limitations to obtaining data, models have already influenced our understanding of population dynamics and were useful in guiding management for some species of sea ducks. In Alaska, the number of Spectacled Eiders was declining. A series of well-designed demographic studies were implemented and a sophisticated demographic model was used to identify lead poisoning as the key factor responsible for their decline. Another example was for Northern Common Eiders in eastern Canada and Greenland that are intensively harvested throughout their range. Little information exists for this population and the model identified key areas for research and monitoring. This model was also used to inform decisions about harvest management despite the lack of information on this population. Given these demonstrated benefits of population models, it is clear that overcoming logistical and financial constraints associated with obtaining estimates of demographic rates should remain a high priority for the SDJV.

IMPROVEMENT IN HARVEST SURVEYS

In Canada, since 1967, the National Harvest Survey has been used to provide wildlife managers with data on harvest and hunter activity of migratory game species. Despite these long standing surveys the estimates for sea duck harvest remain relatively poor. This is because sea duck hunters are relatively few in number (giving small sample sizes), major sea duck hunting areas tend to coincide with regions of lowest survey response rate, harvest is clustered geographically, and the survey sampling period tends to miss late season harvests when the majority of sea ducks are taken. As a result, the number of sea duck hunters participating in the survey is relatively small. In addition, parts collection data may be inadequate to reliably assess quantity, species and sex-age composition of the harvest. Further, subsistence harvest by indigenous peoples has not been assessed in many areas; those surveys lack data on harvest composition, and have not been repeated to detect trends. Harvest and parts collection surveys for sea ducks have improved in the U.S. with the implementation of the Harvest Information Program in 2001, which improved the ability to select survey participants from a stratified sample, with sea duck hunters identified a priori. These data should be adequate to estimate harvests (total, sex, age) and model population effects of regulatory changes.

Sea duck harvest data are generally good in Greenland. Recent data generated from satellite telemetry of sea ducks breeding in the western Canadian Arctic and Alaska have confirmed that several populations winter along coasts of northern Russia. Sea duck harvest data from Russia are sparse or non-existent for this region, yet the true harvest of North American sea ducks wintering there may be significant.

IDENTIFICATION OF IMPORTANT HABITATS

During their annual cycle, sea ducks occupy a broad range of habitats, mostly in northern and coastal regions where ecological information is limited. Most sea ducks breed across vast expanses of arctic and subarctic tundra, boreal forest zones, and coastal maritime areas. Sea ducks travel long distances to secure inland freshwater areas and coastal sites for the post-breeding molt and staging during migration. From fall through spring, sea ducks congregate on traditional coastal wintering areas that offer reliable food resources and stable environments, sometimes for up to 8-9 months of the year.

Compared to knowledge of other waterfowl, information on seasonal distribution, habitat associations, and ecology of sea ducks is often scarce. There is a need to investigate the ecology of sea ducks in remote, poorly described environments to understand factors that influence productivity, survival, and vulnerability to environmental changes. Principal information needs include: (1) descriptions of seasonal distribution and abundance of species in relation to habitat types; (2) ecological characterization of breeding, brood-rearing, molting, staging, and wintering habitats; and (3) investigation of seasonal habitat requirements of species in relation to food resources, predation, and other factors.

In addition to the need for basic ecological information, we need to understand the potential effects of natural and anthropomorphic alterations of sea duck habitats. On northern breeding and molting areas, climate change may have dramatic effects on tundra and boreal forest environments. In some areas, resource extraction (oil and gas, mining, timber harvest) is impinging on important sea duck habitats. Coastal staging, molting, and wintering areas are subject to more intensive challenges, such as urbanization and industrial development in coastal zones, shipping and commerce (including petroleum and other hazardous cargo), commercial shellfish/finfish harvest and aquaculture, nearshore wind energy development, increasing recreational activities, and general degradation of nearshore water quality and contamination. Because sea ducks concentrate at key areas throughout the year, particularly during winter, there is a pressing need for information on: (1) identification of habitat sites that are vulnerable to particular threats; (2) research on specific impacts in order to assess population-level effects; (3) development of strategies to protect important habitats, avoid and mitigate impacts, and restore degraded habitats; and (4) assessment of habitat conservation efforts at landscape scales.

Here are a few specific themes for research on sea duck habitats that are important for management and conservation.

Cavity-nesting species—Four species of sea ducks are considered obligate cavity nesters (Common Goldeneye, Barrow's Goldeneye, Bufflehead, Hooded Merganser) and two facultative (Common Merganser, Red-breasted Merganser). We need to know more about the specific ecological requirements of these specialists, particularly factors that sustain productivity. Research and management programs need to focus on protection of ground and arboreal nest habitats, along with wetlands conservation.

Island-nesting species—A few species often nest at high densities on coastal islands (Common Eider) or occasionally on freshwater islands (White-winged Scoter, Red-breasted Merganser, northern Common Eider, King Eider). More information is needed on these unique nesting areas to describe their importance and identify special conservation challenges. Island nesting birds are often affected by unique climates, limited habitats in colonial situations, insular predation and competition, and outbreaks of avian cholera and other diseases.

River specialists—There is only one sea duck species that can be classified as a river specialist—the Harlequin Duck. Common Mergansers and Red-breasted Mergansers are also found on some rivers and streams. More information is needed on the ecology of these species in relation to the dynamics of hydrologic conditions, key characteristics of riparian habitats, food resources and foraging patterns, and brood-rearing requirements. River specialists also face challenges from urban/suburban development in riparian zones, adjacent timber harvest, stream alteration (channelization, small hydropower), water-born recreation, and fisheries management.

Staging areas—Most species of sea ducks stage for a few weeks at specific sites during spring and fall migration. Some take advantage of ephemeral but rich food resources such as spawning herring and salmon, and blooms of marine organisms. The location and critical characteristics of these areas need to be described in terms of the seasonal abundance of sea ducks and ecological significance. Additional information is needed on the management of fisheries that support staging sea ducks, and potential spatial and temporal habitat protection from disturbance.

Molting areas—A few important molting sites have been identified for sea ducks, both in coastal and inland waters. Molt is a crucial time in the yearly cycle of a sea duck as they all become flightless for a period of about 3-4 weeks. They are especially sensitive to disturbance during this time and they remain in relatively small areas. Sea ducks tend to molt in the same areas from year to year, but more information is needed on the origin and turnover of birds at these critical sites, as well as annual variation in the location and size of molting sites. Habitat use and feeding ecology of molting birds is still poorly documented.

Nearshore species—Four species of sea ducks molt and/or winter in shallow coastal waters, often in great numbers (Harlequin Duck, Common Goldeneye, Barrow's Goldeneye, Bufflehead). Their diet includes small shellfish and crustaceans in the intertidal zone. More information is needed on the relation of these species to intertidal environments (e.g., coastal processes, icing, etc.), as well as potential effects of shoreline development and contact with human activities.

Offshore species—Several species are known to frequent offshore deep waters (King Eider, Spectacled Eider, Long-tailed Duck), and the scoter species sometimes use subtidal areas. It is crucial to understand the diet and ecology of these species in relation to benthic systems and changes to marine environments. Because these species congregate in high densities at traditional sites, ecological information is needed to promote conservation of key sites.

Shellfish feeding sea ducks—Four species of sea ducks (Black Scoter, Surf Scoter, White-winged Scoter, Common Eider) feed mostly on various species of clams and mussels and can be found at all seasons in marine shellfish habitats in numbers ranging from a few hundreds to several

thousand birds. Threats facing these sites include offshore oil, gas, and wind energy development, other industrial activities, bioaccumulation of contaminants, and shellfish aquaculture.

DOCUMENTATION OF BIOLOGICAL IMPACTS OF CONTAMINANTS, PARASITES, AND DISEASE

There is relatively little information available about the impact of parasites, diseases, and contaminants on the population dynamics of sea ducks. Nevertheless, considerable documentation exists regarding the presence of a diversity of internal and external parasites, numerous diseases, and many chemical toxins in the tribe Mergini.

Internal and external parasites that are known to occur in sea ducks include protozoans, trematodes, cestodes, nematodes, acanthocephalans, haematozoans, mallophaga, and siphonapterans. Some sea duck die-offs have been attributed to parasites. For example, renal coccidiosis, which is caused by protozoal parasites that infect the kidneys and associated tissues, is common in some species and known to kill many ducklings. A holarctic acanthocephalid has been identified as the cause of epizootics and subsequent mortality in Common Eiders. Larval *Eustrongylides,* a nematode, was responsible for a die-off of Red-breasted Mergansers.

Significant sea duck mortality events also have been associated with contagious diseases such as avian cholera resulting from infection by the bacterium *Pasteurella multocida*. The St. Lawrence River estuary population of Common Eiders has experienced large die-offs (i.e., 7,000—10,000 in 2002) that were attributed to avian cholera. Adenoviruses and reoviruses have been linked to mortality events of Long-tailed Ducks and Common Eiders, respectively. In Alaska, Steller's Eider, Spectacled Eider, King Eider, Common Eider, Long-tailed Duck, and Bufflehead tested positive for low pathogenic strains of avian influenza, but sea duck die-offs have not been attributed to these forms of influenza A viruses. No highly pathogenic strains of avian influenza (e.g., H5NI) have yet been identified in sea ducks in North America.

Screening for contaminants in Mergini has revealed a diversity of persistent organic pollutants (i.e., chlorinated pesticides, polychlorinated biphenyls, polycyclic aromatic hydrocarbons), metals (i.e., arsenic, cadmium, copper, chromium, lead, zinc, mercury), and trace elements (i.e., selenium) in most species examined. Generally, the impact of these contaminant loads on sea ducks is poorly understood. However, lead toxicosis resulting from consumption of spent shot has been identified as a limiting factor in the recovery of threatened populations of Spectacled Eiders in Alaska. Perhaps the most significant and well documented contaminant affecting sea ducks is petroleum and related products spilled into marine and fresh waters. For example, oil toxicosis was the cause of large mortality events of king eiders in the Pribilof Islands, Alaska, Long-tailed Ducks and scoters in Prince William Sound, Alaska, and Long-tailed Ducks in eastern Nova Scotia; all of these incidents were linked to spills from vessels. Petroleum spills can affect sea ducks directly through contact and hyporthermia or indirectly through contamination of food resources.

Research should focus on the susceptibility of sea ducks to parasites, diseases, and persistent organic pollutants. Areas of emphasis include avian cholera, viral diseases, and other agents that might affect seasonal aggregations of sea ducks. Most baseline data on the effects of

contaminants on waterfowl are from studies using mallards. Very little is known about the specific histological and physiological effects of various contaminants, critical exposure levels, and direct or indirect impacts on survival and reproduction. There is a need for laboratory studies to document mobility and fate of contaminants in sea ducks, specific histological and physiological effects, and critical exposure rates. Areas of emphasis include: (1) petroleum hydrocarbons; (2) heavy metals and trace elements; and (3) organic compounds.

SCIENCE PRIORITIES AND IMPLEMENTATION

A Common Science Agenda

A primary function of the SDJV is to maintain a common agenda of scientific information needs for conservation and management of sea ducks. With this revision of the Strategic Plan, the Continental Technical Team and Management Board will continue to document the filling of information gaps and improvements in the state of our knowledge of sea ducks as projects are initiated and carried out. No later than the end of each five year planning horizon, the CTT will review and revise the slate of information needs for the 22 sea duck populations currently recognized by the SDJV. A joint venture evaluation process will include updating and prioritizing SDJV scientific objectives. In addition, the SDJV participated in the 2006 NAWMP Assessment of all Joint Ventures. No science related deficiencies were identified as part of this assessment.

Current Funding and Program Status

The SDJV has a long-term goal of establishing stable funding sources and increasing capabilities to cooperatively fund sea duck science projects throughout North America. The SDJV currently receives limited funds appropriated by the U.S. Congress and administered by the U.S. Fish and Wildlife Service to sponsor new research and monitoring programs and support coordination efforts. These funds are used to support the administration of the SDJV in the United States but also to provide a proposal driven science fund accessible to sea duck scientists and researchers throughout North America. Other member agencies have also redirected a portion of their operating budgets toward work on sea ducks, but new resources are needed if the goals of the SDJV are to be met. Members of the SDJV Management Board will develop a strategy and work within their organizations and/or with potential partners to secure stable funding to stimulate and amplify the advancement of sea duck science and knowledge. The SDJV promotes its scientific agenda to meet information needs through three main avenues:

- The SDJV members direct funds toward meeting SDJV information needs; by necessity, distribution of most of these funds is constrained by legislative or policy mandates of member organizations;
- The SDJV facilitates funding and support for work by partner organizations, with the expectation that funding contributions will have favorable matching and multiplier effects to increase science program benefits; and

- The SDJV provides technical advice and assistance to cooperators who wish to contribute toward meeting SDJV science objectives with their own resources.

In the past, oil pollution, particularly that deriving from marine oil spills, has caused significant damage to sea ducks and their habitats. All too frequently, such spills are either deliberate or preventable, and court action has ensued. In both Canada and the United States, mechanisms are in place to direct court awards towards conservation efforts. Amendments in 2005 to Canada's *Migratory Birds Convention Act* now require that all fines paid under the MBCA be directed to the Environmental Damages Fund. This fund is now a regular source of funding for SDJV projects, particularly on the east coast of Canada.

Criteria for Prioritizing Work Plans

With the numerous and extensive information gaps on sea duck species and growing conservation concerns, the SDJV will apply its limited resources to expand capacities in diverse areas of research and monitoring activities, while building a sustained base of funding. At present, it would be counterproductive to invest heavily in either a few sea duck populations or an ineffectually wide array of projects. To achieve an efficient balance in its work plans, the SDJV will use a hierarchical system of prioritization to identify preferred areas of work on: (a) both short-term (reactive) topics to address pressing conservation problems and long-term (proactive) subjects to expand the base of biological information; (b) both applied management projects and basic research to improve our fundamental understanding of sea duck biology and ecology; and (c) range-wide information needs that capitalize on regional opportunities. Over this planning cycle, the SDJV will apply these considerations to develop a program of priority work for member organizations and partners.

Proposal and Endorsement Process

Project proposals will be the primary instrument by which the SDJV Management Board endorses and supports relevant scientific work on sea ducks. The SDJV uses an objective process to solicit, evaluate, and endorse scientifically sound and economical projects that address elements of its scientific agenda (i.e. Appendix B: Information Needs). The U.S. Fish and Wildlife Service, a partner in the SDJV, administers funds via grants, purchase orders, and contracts on a competitive basis. In addition, the SDJV offers endorsement of scientifically sound sea duck studies to aid applicants seeking funding independent of the SDJV. The most recent Request for Proposals is posted on the SDJV web site, seaduckjv.org. The RFP will likely be further modified as the SDJV science program evolves.

PROACTIVE CONSERVATION STRATEGIES

In drafting the first SDJV Strategic Plan in 2001, the Management Board agreed that the joint venture should engage in some level of proactive conservation—that is, go beyond a basic research and inventory program and get involved in some of the pressing challenges to sea ducks caused by the impact of human activities on sea ducks and sea duck habitats. As a consequence, the 2001 Strategic Plan included four broad strategies outlining the SDJV approaches to

proactive conservation. However, the experience gained in managing the SDJV since 2001 has allowed the Board to understand where such an approach could and should be applied. This Strategic Plan clarifies the approach the SDJV will take over the next five years to influence the conservation of Sea Ducks in North America.

Facilitating Access to Sea Duck Science and Information

The SDJV will continue to provide access to science information to partners, government agencies, non-government organizations, and the private sector. Activities to facilitate access will include:

- Using the SDJV web page (seaduckjv.org) as a portal to sea duck science information. For example, annual reports from SDJV-supported research and monitoring studies are posted on the web.
- Sponsoring an international symposium on sea duck science and management every three years. Three such symposia have been held: Vancouver (2002), Annapolis (2005) and Quebec City (2008). All stakeholders with an interest in sea duck science and conservation, as well as those who influence sea duck populations (e.g., industry), are encouraged to attend.
- Providing information or links to information to ensure that accurate, reliable and current information and data are available to primarily government management agencies but also other stakeholders to support activities such as environmental assessment, harvest management, coastal zone planning and habitat conservation and protection.

Outreach and Engagement on Critical Issues

The experience of the SDJV since 2001 has shown that not only has the provision of sea duck science and information been very important particularly to the users of this information, but that there is a perception that the SDJV should proactively engage in issues and provide advice to decision-makers. The SDJV Board plans to strategically "reach-out" on a limited number of thematic issues. The goal of this strategy, therefore, is to provide education on sea ducks themselves and on human activities/processes that influence sea ducks. The SDJV would provide advice particularly when requested to do so, and in very specific situations to either seek a "place in the discussion" or to invite stakeholders, such as industry, to work with the SDJV. It is not the intent of the SDJV to become an advocacy group by attempting to create position statements or influence policies or actions of governments or the private sector.

Discussions by the SDJV Board have indicated that in the period of this strategic plan the SDJV should focus its proactive conservation work in the following sectors: aquaculture, coastal wind energy, and offshore oil and gas development and production. In order to do this the Management Board will follow two strategies. The first, which would take place over two years, will be to develop an advocacy policy which will articulate the approaches to be used and the roles which SDJV Board members and Continental Technical Team members will play when engaged in proactive conservation. It is anticipated that such a policy could indicate that the role of the SDJV is to provide science information and non-partisan advice but not to advocate a particular position especially if such advocacy would be contrary to agency responsibilities.

The second strategy would be the implementation of the policy. This would focus on developing and implementing a focused plan to bring sea duck science and information to the key decision-makers in the sectors selected.

Activities that may be undertaken to support Strategy 2 include:

- providing information, presentations, and scientific advice when asked to do so;
- attending sector specific conferences and meetings that discuss activities that affect sea ducks;
- attending or participating in specialist working groups and trade associations;
- developing or participating jointly in projects of mutual interest in better understanding sea duck biology, ecology, or habitat needs;
- creating a simple general communication strategy in order provide targeted outreach activities on the themes identified by the Board; and,
- using the SDJV web site as a clearinghouse for information on sea ducks, and for thematic presentations as determined in the communication strategy.

In addition to the strategies outlined above, the SDJV will strive to work more closely with habitat joint ventures – Eastern Habitat, Atlantic Coast, San Francisco Bay, Upper Mississippi Valley/Great Lakes, Gulf Coast, and Pacific Coast -- to incorporate sea duck conservation needs into habitat conservation plans over the period of this Strategic Plan. This was one of the recommendations from the North American Waterfowl Management Plan Assessment Steering Committee (Appendix E).

FUNDING STRATEGIES

The Sea Duck Joint Venture, when fully operational, will require several millions of dollars annually over a period of at least ten years. This is due to the magnitude of effort required to fill essential data gaps, address research needs, and initiate critical population monitoring projects. In addition, sea ducks tend to be widely dispersed in remote locations for much of their lives, making field operations difficult and expensive.

The Sea Duck Joint Venture will use four principal strategies to fund its activities:

Incorporate Sea Duck Priorities into Base Programs from a Broad Range of Partners

The SDJV is a partnership of Federal, State and Provincial governments, major non-government organizations, the private sector, and the academic community. Each partner is committed to playing a meaningful role in the implementation of SDJV programs and is committed to make best efforts to secure new, or redirect existing, internal funds to SDJV priorities to the highest degree possible.

Members of the SDJV Management Board and the Continental Technical Team have an important role in attracting funding to support SDJV activities. All members will make every

attempt to integrate SDJV interests into the programming of their respective agency or organization. In addition, members are expected to make every effort to access additional support, long-term and short-term, which may be available from time to time within their respective organizations. Government members of the Board and CTT are expected to extend these efforts across their government networks to seek support from other agencies which may have a mutual interest between their mandate and sea ducks and sea duck conservation.

Seek Supplemental Appropriations

Government agencies have mandated responsibilities for the conservation of sea ducks and yet, in general, funds have not been dedicated to sea duck work by legislators. Given that the tasks outlined by the SDJV greatly exceed the capacity of government agencies to respond under existing budgets, opportunities will be sought to obtain additional appropriations.

Develop Corporate Partners

Certain industries operate within areas frequented by sea ducks and, in many cases, their operations can pose threats to sea ducks and habitats. These include merchant shipping; cruise ship operators; offshore oil and gas exploration and development; offshore wind farms; petroleum shipping; and aquaculture.

A workshop with industry representatives was held in conjunction with the first North American Sea Duck Conference in 2002. The main conclusions regarding improved cooperation with industry were:

1. Personal contact is key to developing working relationships.
2. Conservation groups must articulate objectives in business planning language (i.e. mission, goals, plans, deliverables, business justification).
3. Industrial associations provide an effective mechanism for information distribution.
4. Shipping seems to be a reactive industry- when a problem is demonstrated, they will take action. Identification of partners within the shipping industry is complicated by the prevalence of foreign ownership.
5. Data need to be publicly available or part of published public record to foster transparency.
6. Industry's interest in conservation comes from compliance issues (policy and regulations), corporate commitments to the environment, sustainable development, and being good corporate neighbors (basically maintaining the public consent to operate), and to have realistic assessments of the impacts of their activities.
7. Industry has information needs that must be met before developing conservation actions and to reduce operating uncertainties. Operating and regulatory uncertainties can have large planning and economic implications for corporations.
8. Industry also needs to demonstrate not only the value of their investment for conservation, but also for their economic objectives.
9. Policy changes often take a long time to create, even when working cooperatively with affected industries.

10. Voluntary conservation actions may be adopted more readily by industry provided there is no loss of competitive advantage.

It is recognized by the Management Board that, because of the nature of threats to sea duck populations, the private sector has an important role to play in the SDJV and its activities. During the period of this strategic plan, the Management Board, Continental Technical Team, and individual researchers will make links with industrial sectors identified in the Proactive Conservation Strategy. Members may be asked to make specific links or the Board may decide to invite new members to the Management Board in order to enhance the interaction of the SDJV and the private sector.

JOINT VENTURE EVALUATION PROCESS

The NAWMP community has scheduled repeat comprehensive assessments of the NAWMP at approximately 10-year intervals. Between those assessments, NAWMP JVs will deliver progress reports to the Plan Committee triennially to address recommendations and concerns noted during the comprehensive assessments and to report on the four topics listed below. These reports are reviewed by both the National Science Support Team (NSST) and the Plan Committee (Fig. 4).

Biological Foundation Elements

1) Progress toward accomplishment of JV biological goals.

2) Progress with adaptive management and testing key JV planning assumptions.

Joint Venture Leadership & Administration

3) Progress in cooperating and sharing ideas outside across individual JV boundaries.

4) The state of the JV partnership.
   i. New partners or expanded partner roles?
   ii. New or expanded funding sources?
   iii. New or expanded communication initiatives?

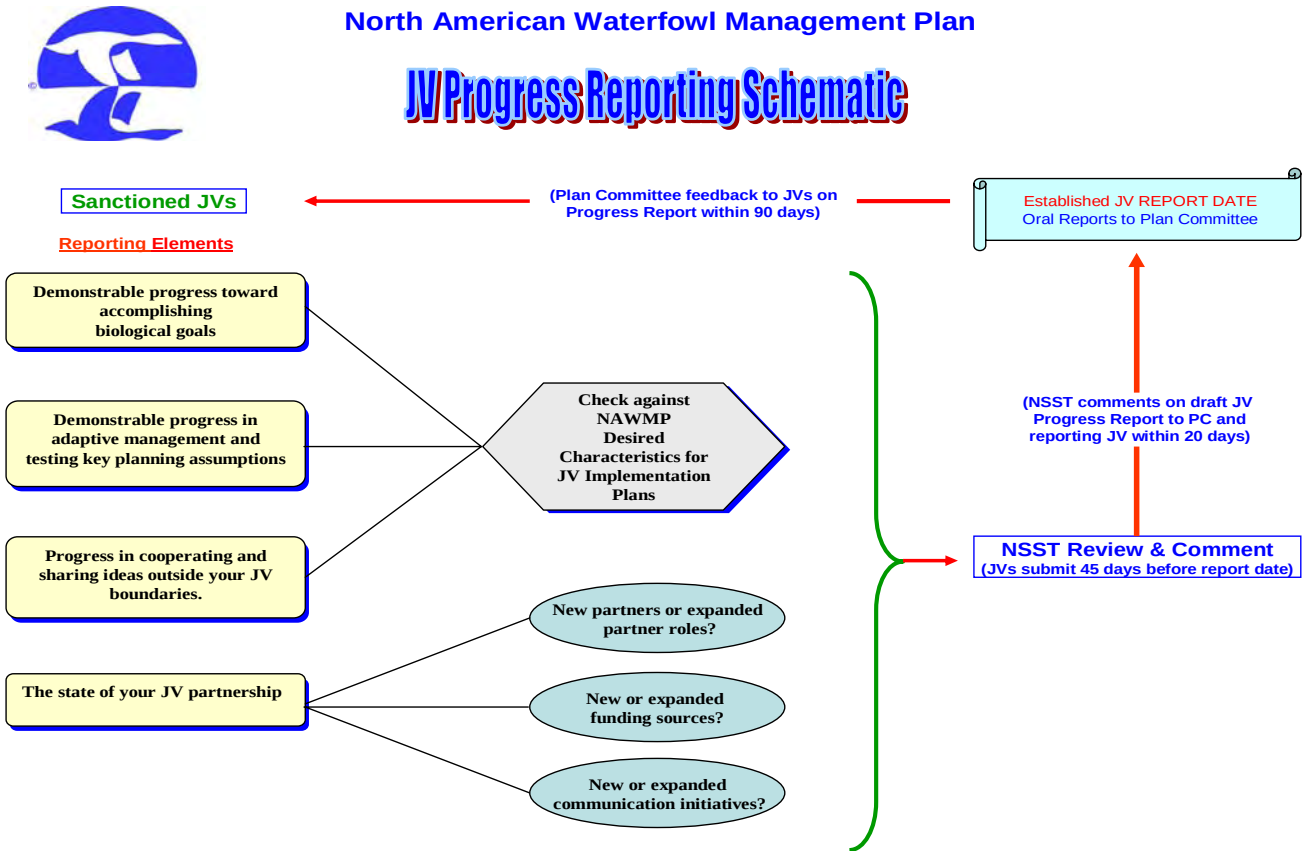

Figure 5. Joint Venture progress reporting schematic. The product referred to as "NAWMP Desired Characterisitics for JV Management Plans" is currently under development by the Joint Venture Coordinators and USFWS Division of Habitat and Bird Conservation.

IN CLOSING

A team of expert scientists and policy makers responsible for assessing the overall progress of the North American Waterfowl Management Plan, and all of its Joint Ventures, commended the SDJV for its accomplishments over the initial period of implementation (see letter from Assessment Steering Committee, Appendix E). The assessment team felt that the SDJV had come a long way in a short period of time and had accomplished much with modest funding and resources. One outstanding gap is the absence of strong links between the SDJV and the habitat Joint Ventures, a gap that the SDJV intends to address.

The SDJV Management Board and Continental Technical Team appreciated the positive review of their efforts, and look forward to great accomplishments during the implementation of this revised Strategic Plan.

APPENDIX A – SDJV ORGANIZATIONAL STRUCTURE AND FUNCTIONS

The SDJV will be guided by an international management board that receives technical advice from a Continental Technical Team. The joint venture will work to the maximum extent possible with existing NAWMP, Flyway, and agency structures to plan for and implement sea duck conservation.

SDJV Management Board

The Management Board will consist of a maximum of 18 members, distributed approximately 50/50 between the United States and Canada. One co-chair from the U.S. and one from Canada are elected for three-year terms. Each country will independently select its members to be most responsive to its sea duck constituencies. Approximately one-third of the seats will be filled by non-governmental members, and the SDJV will strive to include aboriginal and industry interests. Current (i.e., 2008) Board composition is summarized in the table below. Each member organization will be asked to reconfirm its commitment to the Board every three years.

ROLE OF MANAGEMENT BOARD

1. Provide leadership and determine the policies and strategies of the SDJV.
2. Provide linkage to the NAWMP Committee and other joint ventures, especially habitat joint ventures.
3. Develop new funding and partnerships.
4. Review, endorse, and forward recommendations for consideration by funding organizations.
5. Promote the SDJV.
6. Periodically evaluate the progress of the SDJV.

Continental Technical Team

The Continental Technical Team (CTT) is composed of 14 members from organizations represented on the Management Board, appointed by the board. Current (i.e., 2008) CTT composition is summarized in the table below. The CTT has two co-chairs, one each from the U.S. and Canada; co-chairs are elected by their respective delegation and serve staggered 2-year terms. The board may appoint additional CTT members for specific needs (e.g. communications, technical task groups, fundraising).

ROLES OF CONTINENTAL TECHNICAL TEAM

1. Provide technical support to the Management Board.
2. Develop draft SDJV strategic, implementation, and evaluation plans for Management Board review and approval. Implement such plans as directed by the Management Board.

3. Prioritize information needs and coordinate teams for writing species status reviews, management plans, and other special reports, drawing on external expertise as needed.
4. Promote partnership development.
5. Facilitate implementation.
6. Review and recommend projects for funding and endorsement.
7. Provide technical information and recommendations.

Joint Venture Coordinators

The coordination of this multi-species and geographically diverse joint venture will require dedicated positions on the Pacific and Atlantic coasts. One Coordinator will be from the U.S., funded by the USFWS, and the other will be from Canada, funded by the CWS. Both coordinators will provide support to the Continental Technical Team and the Management Board, but are not members of either body and cannot chair committees of the SDJV.

FUNCTIONS OF THE COORDINATORS

1. Serve as secretariat for the Management Board and CTT.
2. Facilitate communication of issues and products among Board and CTT members.
3. Facilitate information exchange with other NAWMP programs, management agencies, and other stakeholders.

Composition of SDJV Board and Technical Team (2008)

Partner	Management Board	Technical Team
U.S. Fish and Wildlife – national - Region 9	X	X
U.S. Fish and Wildlife Service – Pacific - Region 7	X	X
U.S. Fish and Wildlife Service – Atlantic – Region 5	X	X
Environment Canada - CWS – national		X
Environment Canada - CWS – Atlantic	X	X
Environment Canada - CWS – Quebec	X	X
Environment Canada - CWS – Central Arctic	X	X
Environment Canada – Science & Technology	X	XX
U.S. Geological Survey – Alaska Science Center	X	X
U.S. Geological Survey – Patuxent WRC	X	X
Atlantic Flyway – states and provinces	XX	X
Pacific Flyway – states	X	X
Ducks Unlimited	X	X
Bird Studies Canada	X	
Pacific Coast JV	X	

APPENDIX B – INFORMATION NEEDS AND CONSERVATION STRATEGIES FOR NORTH AMERICAN SEA DUCKS

Common Eider, Pacific Race

(Somateria mollissima v-nigra)

Population Size and Trends: Surveys that provide abundance indices of breeding populations are currently operational or in development in parts of their range, including the western Canadian arctic, Alaska arctic coastal plain, and Yukon-Kuskokwim Delta (YKD). The Pacific race is roughly estimated to number 170,000 birds. Surveys of migrating birds at Point Barrow, Alaska during spring suggest significant declines from 1976 to 1996, but possible increases since then; current estimates remain well below those obtained in the mid_1970s. Surveys in northwest Alaska, Aleutian Islands, and northwest Canada are still too recent to detect trends.

1. Continue and further develop surveys for YKD, Alaska arctic coastal plain, and western Canadian arctic.
2. Repeat spring migration counts at Point Barrow every 5-10 years.
3. Develop long-term monitoring plan for western arctic Canada, northwest Alaska and Aleutian Islands.
4. Conduct exploratory breeding surveys of St. Lawrence Island, St. Matthew Island, and Nunivak Island.
5. Conduct periodic breeding pair survey of Russia breeding habitats.

Population Definition/Delineation: Satellite telemetry studies of Pacific Common Eider suggest geographic structuring within the population. Specifically, those breeding in the western Canadian Arctic and Alaska arctic coastal plain seem similar in regard to wintering areas (i.e., eastern Russia). Common Eiders marked on the YKD exhibited different migratory patterns and used different wintering areas. Initial satellite telemetry results support the assumption that the Aleutian birds are resident; however, further study is needed to ascertain whether the Aleutians, which represent an immense area, contain subpopulations of Common Eiders. Preliminary satellite telemetry data for eiders breeding on the Seward Peninsula, Alaska, suggest wintering areas in both eastern Russia and western coastal Alaska.

1. Identify links among breeding, molting, wintering, and staging areas of Common Eiders breeding on the Seward Peninsula.
2. Identify links among breeding, molting, wintering, and staging areas of Common Eiders breeding in the Aleutian Islands.

Population Dynamics: Detailed studies on breeding biology and estimates of vital rates exist only for a few local breeding areas, most notably YKD, Alaska north coast, and central arctic Canada. A generic population model has been developed for YKD Pacific Common Eiders, but some key population model parameters are missing or lack estimates of variation.

1. Determine reproductive success for this race in all major nesting areas.
2. Determine age-specific survival rates throughout range.
3. Estimate breeding propensity (percentage of hens attempting to breed in a given year) in declining vs. stable populations.

4. Estimate recruitment rates in declining vs. stable populations.
5. Investigate the feasibility of conducting regular winter surveys to determine age and sex ratios in the population.

Population Ecology: Potential or real limiting factors for Pacific Common Eider are numerous, however, the relative importance of these factors is unknown. Little is known about molt or winter ecology, and only a few localized studies of nesting ecology have been conducted. Initial modeling results for the YKD population suggest that although proportional changes in survival may have a much greater influence on population change than reproductive parameters, variation in nest success may be responsible for year to year fluctuations in population growth. Predation has been a major limiting factor for Common Eiders in the Aleutian Islands where foxes were introduced to most islands by the 1920s. Removal of foxes from some islands has demonstrated the potential rebound effect on population size. Predation by grizzly bear, wolverine and arctic fox is the primary cause of nest failure in central arctic Canada.

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival on both North American and Russian wintering areas.
3. Determine important factors (weather, predators, food, etc.) affecting survival of adult males and adult females during the molting period.
4. Determine important factors (weather, predators, food, etc.) affecting survival of sub-adults.
5. Identify the most efficient methods to enhance production and survival during breeding season.
6. Study feeding ecology on spring staging areas in Chukchi Sea and in southeastern Beaufort Sea to assess importance of areas as an energy source for survival and productivity.

Habitat requirements: Nesting habitats are described fairly well for most breeding areas. However, habitat use during other periods of the annual cycle has not been adequately described and threats to many important habitats are unknown. Satellite telemetry has provided insights into seasonal habitat use by some populations at a relatively coarse scale. Potential effects of climate change on these habitats are speculative at best.

1. Characterize (i.e., describe important biotic and abiotic features of) habitats preferred by breeding pairs and by broods.
2. Characterize molting sites of adult males and adult females.
3. Characterize and quantify benthic communities in seasonally important use areas.
4. Document annual migration patterns and habitat use of subadults.
5. Identify habitats used in the Beaufort Sea and Chukchi Sea during fall and spring migration; document chronology of migration.

6. Build predictive model of potential impacts to nesting and wintering habitats due to climate change.

Harvest Assessment: Pacific Common Eiders are harvested primarily in the spring by Aboriginal and Native people of northern communities, and to a small extent by sport hunters. Estimates of subsistence harvest have been derived by periodic, directed studies in specific locales and by more systematically sampling rural communities. Approximately 2500 individuals are taken annually, with harvest split about equally between Alaska and Canada. Some eggs of Common Eider are also taken. Estimates of subsistence harvest in most areas are typically old, biased, imprecise, or lacking for some areas, and do not include losses due to crippling or unretrieved birds. No reliable quantitative harvest data are available for Russia.

1. Update and improve estimates of subsistence harvest in Alaska and western Canada.
2. Improve estimates of eider harvest in Russia.
3. Develop a population model to determine the impact of various harvest levels.

Parasites, Disease, Contaminants: The vulnerability and threats from offshore oil and gas development and contamination are increasing on the Alaska ACP and Mackenzie Delta. Oil and gas leases in other parts of its range (e.g., Bristol Bay, Alaska and Chukchi Sea) may eventually put some populations at increased risk during certain periods of the year. There is general concern about contamination of benthic foods in northern areas. Lead (Pb) and selenium (Se) appear to be the most prevalent trace elements found in Pacific Common Eiders. Lead poisoning has caused direct mortality of Pacific Common Eiders in Alaska. There is concern that the avian cholera outbreak in the Northern Eider in Hudson Bay will spread westward into the Pacific Common Eider breeding population.

1. Examine exposure to avian cholera, avian influenza, and other communicable diseases.
2. Determine prevalence and effects of acanthacephalan (and other) parasite loads.
3. Determine physiological effects of selenium and other contaminants on Common Eiders.
4. Opportunistically sample birds for contaminants, diseases and parasites.

Common Eider, Hudson Bay Race

(Somateria mollissima sedentaria)

Population Size and Trends: Hudson Bay Common Eiders are resident to Hudson Bay, and it is both logistically difficult and expensive to conduct surveys for this subspecies. Data on size and trends throughout this range are required to monitor the population and establish a sustainable harvest.

1. Periodically repeat surveys of eider breeding colonies where historical data exist (e.g. Belcher, Sleeper, and Nastapoka Islands, and La Perouse Bay)
2. Initiate new surveys to establish baseline data throughout the breeding range. Locations include the Ottawa Islands and Mansel Island in western Hudson Bay, and islands near Rankin Inlet in East Hudson Bay.
3. Develop new survey techniques (e.g. aerial surveys of drakes, winter surveys at polynyas) and refine existing techniques.
4. Survey a sample of islands annually to quantify annual variation in colony size (e.g. proportion of non-breeders), long term response to perturbations (e.g. Polar Bear predation) and intra-colony movements within a region.

Population Definition and Delineation: The zone of contact between the Hudson Bay Eider and Northern Eider occurs in northern Hudson Bay. The links between nesting areas and wintering areas (where harvest levels vary) is poorly known. This information is required to assess population size and trends, and the effects of harvest and other factors on population dynamics within Hudson Bay.

1. Use satellite telemetry and banding to determine affiliations between breeding, molting, and wintering areas.
2. Conduct offshore aerial and boat-based surveys to define boundaries and level of use of staging, molting, and wintering areas. Conduct winter surveys of eider distribution in relation to sea ice.

Population Dynamics: Very little information exists on annual productivity, survival, and recruitment of the Hudson Bay Eider. Some information is available for La Perouse, but there is a need to concurrently measure these parameters at other breeding sites (e.g. Belcher Islands, Ottawa Islands).

1. Initiate a study of survival, productivity, and recruitment at a major nesting area in Hudson Bay where, (a) a study would be logistically feasible, (b) some baseline data already exist, and (c) where significant proportions of the Hudson Bay Eiders nest.
2. Conduct regular winter surveys in the Belcher, Sleeper, and Macopeet Islands to detect changes in population size, and sex ratios.
3. Establish several colony sites that are monitored concurrently each year, perhaps with the assistance of a community-based environmental monitoring program.

Population Ecology: Little is known about the factors that influence adult survival and reproductive success of Hudson Bay Common Eiders. This information is required to establish models that assess the sustainability of harvest, population trends, and the potential of a species to recover from population declines.

1. Continue to study factors affecting winter survival in the Belcher Islands. These include predation, weather, ice conditions, contaminants, parasitology, diet, and body condition.
2. Establish a study to examine the reproductive ecology and survival of eiders at a site where, (a) a study would be logistically feasible, (b) some baseline data exist, and (c) where significant proportions of the Northern Common Eiders nest.
3. Link eider distributions to sea ice conditions (through aerial and snowmobile surveys near the Belcher Islands). This information is required to set a base line in anticipation of a large hydro development in western Quebec that could alter sea ice conditions in the region).

Habitat Requirements: During nesting, molting, brood rearing, and at over-wintering sites, Hudson Bay Common Eiders are vulnerable to disturbance and potentially, food shortages. Large concentrations of eiders may exist for several weeks at a single location, and these sites must be identified with the long-term view of formal marine habitat protection under the Oceans Act and the revised Canadian Wildlife Act. Research methods include boat-based and aerial surveys, and satellite telemetry. The latter technique has great potential, particularly in the Canadian Arctic and Greenland, where constrained logistics and extreme weather conditions often prohibit surveys.

1. Identify key molting, brood-rearing, and wintering areas in Hudson Bay. Quantify the key environmental and habitat factors that influence habitat selection, and annual variation in habitat use.
2. Identify key nesting areas in Hudson Bay. Quantify key environmental and habitat factors that influence nest site selection, colony size, and annual variation in habitat use (e.g. island size, proximity to a mainland, and frequency of Polar Bear predation).

Harvest Assessment: The Hudson Bay Eider is harvested in Québec and the Belcher Island, and a fairly intense harvest of eiderdown occurs in the Belcher Islands. Our understanding of the influence of harvest on population dynamics remains poor.

1. Monitor the subsistence and sport harvests in Nunavik, northern Quebec, northern Ontario and northern Manitoba.
2. Assess sources and degree of bias in harvest reporting from each area, and establish correction factors to refine harvest estimates.
3. Assess crippling loss of eiders under various harvest scenarios (e.g. shot over pack ice, solid ice, from shore over open water, from boats etc.). Given their large size, fast flight, and often dense flocks, crippling loss is likely an important parameter in harvest assessment.
4. Implement a monitoring program do document levels of eiderdown harvest and develop guidelines for sustainable down harvesting. The participation and input of local residents should be sought.

Parasites, Disease, and Contaminants: There are few data on the levels of contaminants, parasites and disease in the Hudson Bay Common Eider. However, collections are feasible because this race is harvested by Inuit throughout the year, and across its range.

1. Compare levels of contaminants in recently collected Hudson Bay Eiders to museum specimens to determine if levels have increased over the past century.

2. Compare levels of contaminants found in Hudson Bay Eiders to other North American and Circumpolar eider duck populations. A recent pan-Arctic comparison suggests that the Hudson Bay Eiders carry lower levels of trace metal concentrations (e.g. cadmium) than other northern eider populations. The effect of these levels on reproduction and survival are not known and require further study.
3. Compare parasite loads (i.e. parasite species and numbers) found within Hudson Bay Common Eiders across the population, during different times of year, with other circumpolar Common Eiders in the Arctic, and with other sea duck species. Such a comparison would provide insights into whether Hudson Bay Common Eiders are heavily parasitized. Preliminary studies indicate that nesting hens are heavily parasitized, and that parasite levels vary considerably between individuals nesting within a colony. The effect of these levels on reproduction and survival are not known, and require further study.
4. Severe outbreaks of Avian Cholera have occurred along the zone of contact between Hudson's Bay and Northern Eiders in northern Hudson Bay. Although there have been no reports for Hudson's Bay Eiders, a reporting network should be developed among northern residents and the Canadian Wildlife Service to detect and document outbreaks.

Common Eider, Northern Race

(Somateria mollissima borealis)

Population Size and Trends: Northern Common Eiders breed in the eastern Canadian Arctic, northern Québec, Labrador, and west Greenland. Thus, it is both logistically difficult and expensive to conduct breeding population surveys for this subspecies. However, data on population size and trends throughout this range are needed for monitoring and to establish levels of sustainable harvest.

1. Periodically repeat surveys of eider breeding colonies where historical data exist (e.g. south Baffin Island, Ungava Bay, west Greenland).
2. Initiate new surveys to establish baseline data throughout the breeding range. Locations include Frobisher Bay and Cumberland Sound, where large numbers of Common Eiders are thought to breed.
3. Develop new survey techniques (e.g. aerial surveys of drakes) and refine existing techniques.
4. Survey a sample of islands annually to quantify annual variation in colony size (e.g. non-breeding), long term response to perturbations (e.g. Polar Bear predation) and intra-colony movements within a region.

Population Definition/Delineation: The zone of contact between the Hudson Bay Eider and Northern Eider occurs in northern Hudson Bay, and between the American Eider and Northern Eider in central Labrador. The zone between the Pacific Common Eider (v-nigra) and the Northern Eider is less clear. Further, the links between nesting areas and wintering areas (where harvest levels vary) are poorly known. This information is required to assess population size and trends, and the effects of harvest and other factors on population dynamics.

1. With the use of ongoing satellite telemetry and banding programs, continue to determine affiliations between breeding, molting, and wintering areas in the Eastern Arctic, western Greenland and eastern Canada. In particular, information is needed on movements of birds from breeding areas along eastern Baffin Island and the north coast of Labrador, and from wintering areas in Quebec and Newfoundland and whether patterns of population movements change over time.
2. Conduct offshore aerial and boat-based surveys to define boundaries and level of use of coastal staging, molting, and wintering areas.
3. Monitor the sub-specific composition across their wintering range in eastern Canada where they are sympatric with *S. m. dresseri*. This information is important for estimating population size and apportioning harvest between subspecies.

Population Dynamics: Very little information exists on annual productivity, survival, and recruitment. Although a project is underway on Southampton Island, a second is required to concurrently measure these parameters at other breeding areas.

1. Quantify annual survival, productivity and recruitment of Northern Common Eiders recolonising the eider colony of East Bay, Southampton Island, Nunavut, following an avian cholera epidemic that killed nearly all the birds of that colony.
2. Initiate other studies of survival, productivity, and recruitment at a few other major nesting areas in Ungava Bay and the low eastern Canadian Arctic, perhaps in Frobisher Bay or along the south

coast of Baffin Island where, (a) a study would be logistically feasible, (b) some baseline data already exist, and (c) where significant proportions of the Northern Common Eider ducks nest.

3. Conduct regular winter surveys in west Greenland, Quebec, and Newfoundland to detect changes in population size, and sex ratios.
4. Establish several colony sites that are monitored concurrently each year. This would determine for the first time whether changes at colonies reflect only regional variation during summer or instead changes in the population over the entire geographic range. The latter finding would suggest that any factors impacting large proportions of the population do so at wintering areas, where eiders originating from several nesting areas across the eastern Canadian Arctic congregate.
5. Expand surveys in summer to detect the prevalence and locations of cholera outbreaks, perhaps with the assistance of northern Inuit residents

Population Ecology: Little is known about the factors that influence adult survival and reproductive success of Northern Common Eiders. This information is required to establish models that assess the sustainability of harvest, population trends, and the potential of a species to recovery from population declines.

1. Continue to study factors affecting breeding ecology and survival of Northern Eiders at East Bay, Southampton Island, Nunavut. These include predation, diseases, weather, ice conditions, contaminants, parasitology, nest site selection, and body condition of hens.
2. Establish other research studies at a few other major nesting areas in Ungava Bay and the low eastern Canadian Arctic, perhaps in Frobisher Bay or along the south coast of Baffin Island where, (a) a study would be logistically feasible, (b) some baseline data already exist, and (c) where significant proportions of the Northern Common Eider ducks nest.
3. Initiate a study of winter ecology in southwest Greenland. Compare diet, survival, habitat use, and body condition across years, in different habitats, and among other Arctic eider populations.

Habitat Requirements: During nesting, molting, brood rearing, and at over-wintering sites, Northern Common Eiders are vulnerable to disturbance and potentially, food shortages. Climate change projections may make the Arctic more accessible to shipping. Large concentrations of eiders may exist for several weeks at a single location, and these sites must be identified with the long-term view of formal marine habitat protection under the Oceans Act and the revised Canadian Wildlife Act. Research methods include boat-based and aerial surveys, and satellite telemetry. The latter technique has great potential, particularly in the Canadian Arctic and Greenland, where constrained logistics and extreme weather conditions often prohibit surveys.

1. Identify key molting, brood-rearing, and wintering areas in Arctic and eastern Canada, and west Greenland. Quantify the key environmental and habitat factors that influence habitat selection and annual variation in habitat use.
2. Identify key nesting areas in Northern Canada and west Greenland. Quantify key environmental and habitat factors that influence nest site selection, colony size, and annual variation in habitat use (e.g. island size, proximity to a mainland, and frequency of Polar Bear predation).
3. Characterize, in terms of number of birds and habitat characteristics, the staging area located with satellite telemetry at the northern tip of Labrador.

4. Keep abreast of any plans for expanding shipping in the Arctic and assess risks to eiders along shipping routes.

Harvest Assessment: Northern Common Eiders are known to be heavily harvested throughout their range, particularly in Greenland in winter where annual harvest estimates often exceed 100,000 birds. Despite this, our understanding of the influence of harvest on population dynamics remains poor. A fairly intense harvest of eiderdown occurs in Ungava Bay and is developing along both sides of Hudson Straight.

1. Continue to monitor the subsistence and sport harvests of Northern Common Eider in Nunavut, Nunavik, Newfoundland, Labrador, and west Greenland, and improve harvest estimates in eastern Canada.
2. Assess sources and degree of bias in harvest reporting from each area, and establish correction factors to refine harvest estimates.
3. Assess crippling loss of eiders under various harvest scenarios (e.g. shot over pack ice, solid ice, from shore over open water, from boats etc.). Given their large size, fast flight, and often dense flocks, crippling loss is likely an important parameter in harvest assessment. Approximately 26% of Northern Eiders breeding in Hudson Strait and Foxe Basin carry imbedded shot.
4. Determine what proportion of Common Eiders harvested in Greenland breed in Canada.
5. Implement a monitoring program to document levels of eiderdown harvest and development guidelines for sustainable down harvesting and distribute this information widely in Nunavut and Northern Quebec.

Parasites, Disease, Contaminants: There are few data on the levels of contaminants, parasites and disease in Northern Common Eiders. Severe outbreaks of Avian Cholera have occurred in Northern Eiders. These outbreaks were restricted to breeding colonies and have caused substantial mortality of adult females and loss of production.

1. Compare levels of contaminants in recently collected Northern Common Eiders to museum specimens to determine if levels have increased over the past century.
2. Compare levels of contaminants found in Northern Common Eiders to other North American and eider populations. A recent pan-Arctic comparison suggests that the Northern Common Eider carries higher metal concentrations (e.g. cadmium) than either the Hudson Bay or Pacific subspecies, and among the highest concentrations of any sea duck. The effect of these levels on reproduction and survival are not known, and require further study.
3. Initiate studies that examine the geographic scope and population impact of avian cholera on the Northern Eider
4. A reporting network should be developed to detect and document extant of Avian Cholera outbreaks. Studies need to be initiated to determine the impact of these mortality events on population dynamics of Northern Eiders.

Common Eider, American Race

(Somateria mollissima dresseri)

Population Size and Trends: The annual breeding population in the mid-1980s was estimated to be 71,000 pairs (Québec=34%, Nova Scotia=11%, New Brunswick=10%, Newfoundland=5%, and Maine=40%). Estimates of the breeding population are based on uncoordinated surveys between jurisdictions, using different techniques conducted over the last 25 years. Published information in 2000 indicated numbers of *S. m. dresseri* were stable or increasing from 1972-1997. The recent trend is less clear as reports from the southern portion of their range (Nova Scotia, Québec Estuary, and Maine) suggest local declines, while trends along the northern portion of their range (Gulf of St. Lawrence, Newfoundland and Labrador) suggest increases. Little information exists on the size of the non-breeding and sub-adult component of the population.

1. Develop and implement a coordinated, standardized breeding population survey throughout its range.
2. Conduct surveys to determine the status and location of non-breeding and sub-adult eiders.
3. Determine key molting locations and assess feasibility of conducting molting surveys for *dresseri*.
4. Conduct regular winter surveys to obtain information on the size of the population.

Population Definition/Delineation: This subspecies breeds from central Labrador to Massachusetts and winters from Newfoundland south to Rhode Island. Hunter band returns indicate that eiders breeding across the range of *S. m. dresseri* may use common molting and wintering areas. Because of this, the present approach to manage this subspecies as one population unit seems appropriate. The extent of the breeding range of *S. m. dresseri* is well known, but not the delineation of sub-populations. A genetic analysis of breeding populations in different geographic areas has not been conducted, although some blood samples have been taken. Limited satellite telemetry may yield insights into population structuring.

1. Determine affiliations between breeding, molting and wintering areas.
2. Assess population genetic characteristics of breeding populations in different geographic areas of the race's range.
3. Coordinate management actions among jurisdictions.

Population Dynamics: Measures of nesting and hatching success have been well-studied for this subspecies throughout its range. However, with the exception of survival estimates of adult females and several localized studies on duckling survival, there have been, until recently, few estimates of several key population parameters. This subspecies experiences irregular epizootic events that cause large die-offs of females and affect annual productivity, and are harvested by sport and subsistence hunters. Understanding the interaction between epizootic events and harvest on population dynamics is a key management issue for *S. m. dresseri*. Recent (2002-2007) studies in Quebec, Newfoundland, and Maine will address several information gaps.

1. Summarize available information on productivity and its geographic variability.

2. Determine reproductive success for this race in all major nesting areas.
3. Continue mark-recapture studies of adult female survival at multiple locations to determine current survival rates.
4. Estimate the survival rate of other age-sex cohorts of the population.
5. Estimate breeding propensity (percentage of hens attempting to breed in a given year).
6. Estimate duckling survival from hatch through fledging and its geographic variability.
7. Estimate recruitment by marking older (2-6 weeks) ducklings in declining vs. stable populations, if possible.
8. Conduct regular winter surveys to obtain information on the size of the population.
9. Develop a population model to guide harvest regulations and management decisions and hunting on eider numbers.

Population Ecology: Breeding ecology is the most studied aspect of population ecology for this race. Additional localized studies have examined the birds on wintering areas. Important parameters necessary for their management have been largely neglected. Critical gaps remain in knowledge of ecology/life history of the population.

1. Study the molting ecology of adult males (timing, habitat selection, site fidelity, behavior).
2. Study the molting ecology of adult females with and without young.
3. Study the ecology of sub-adults.
4. Study the ecology of wintering birds and its geographic variability.
5. Quantify the impact of predation on eider productivity and evaluate the need to control predators (avian and mammalian) on the most important colonies.

Habitat Requirements: With the exception of nesting, knowledge of other important eider habitat requirements is rudimentary or largely unknown. Because they nest in colonies, they are quite susceptible to disturbance during the incubation period and it is the only sea duck to spend its entire life cycle in salt waters. They are also closely associated with mussel beds.

1. Identify and protect major nesting islands during the nesting period.
2. Delineate and characterize brood-rearing habitat used by females with broods by geographic area.
3. Identify and characterize the habitats used by non-breeders and sub-adults.
4. Locate and characterize important molting and wintering sites and evaluate the needs and possibility of protecting some sites to ensure the long-term viability of eider populations.
5. Quantify winter habitat use in relation to foods, tides and ice conditions.
6. Locate and characterize important molting and wintering sites and evaluate the needs and possibility of protecting some sites to ensure the long-term viability of eider populations.

Harvest Assessment: The Common Eider is an important game bird in the North-western Atlantic especially in parts of Québec, Newfoundland, Nova Scotia, Massachusetts, and Maine. Harvest and parts collection surveys for this race were improved in the U.S. with implementation of the Harvest Information Program in 2001. These data should be adequate to estimate harvests (total, sex, age) and model population effects of regulatory changes. However, similar improvements to the Canadian harvest survey have not been implemented and accuracy of the Canadian harvest estimates is questionable. Across the northern portion of their wintering range *S. m. dresseri* are sympatric with *S. m. borealis*, which makes it difficult to apportion harvest between the sub-species.

1. Evaluate current surveys for adequacy at estimating harvest rates.
2. Improve harvest estimates in Canada.
3. Conduct periodic evaluations of sub-specific composition of the harvest,
4. Model the population to determine the effect of various harvest rates.
5. Determine if current harvest strategies are appropriate to maintain acceptable harvest rates.
6. Ensure that consumptive use of eiders is sustainable.

Parasites, Diseases, and Contaminants: *S. m. dresseri* experiences irregular outbreaks of avian cholera across the southern portion of their range. These epizootic events can result in die offs of large numbers of breeding females and affect annual production.

1. Sample birds for contaminants, diseases and parasites.
2. Evaluate the effect of diseases (particularly avian cholera) and parasites.

King Eider

(Somateria spectabilis)

Population Size and Trends: Aerial surveys that provide indices of breeding population size are currently operational in northern Alaska. Similar surveys in western and central arctic Canada are in development through a cooperative effort by the Sea Duck Joint Venture and Arctic Goose Joint Venture. The aerial surveys indicate King Eiders have declined in number since the early 1990's in parts of western arctic Canada, but remained stable in central arctic Canada and northern Alaska. Counts at Point Barrow, Alaska during spring migration indicate that overall, the western arctic population has been stable since the mid 1990's. There is no up-to-date information on the population status of King Eiders nesting in eastern arctic Canada. However, surveys of King Eiders molting off central west Greenland suggest present numbers are only half of what they were in the 1950's. Roughly 400,000 King Eiders nest in western arctic Canada and northern Alaska. An additional 100,000 or more of the eiders that winter in the Bering Sea and North Pacific nest in Russia. There is no reliable estimate of the number of King Eiders nesting in eastern arctic Canada.

1. Continue breeding population surveys timed specifically for eiders on the Alaska arctic coastal plain, as a means of monitoring population trends in Alaska.
2. Continue to develop waterfowl breeding population surveys for western and central arctic Canada in cooperation with Arctic Goose Joint Venture, as a means of monitoring population trends of King Eiders in Canada.
3. Repeat eider count at Point Barrow during spring migration every 5-10 years.
4. Determine whether the migratory pathway of eiders past Point Barrow varies among years, to assess whether the spring migration counts are a valid means of measuring population size and trends.
5. Survey molting or wintering birds in western and southern Greenland. Although interpretation of surveys would be confounded because it is unknown whether birds come from Canada or Greenland, these surveys may be the most efficient means of monitoring population trends of Atlantic King Eiders.

Population Definition/Delineation: Satellite telemetry, banding and stable isotope studies in Alaska and Canada indicate that over much of the breeding range there are two distinct populations of King Eiders wintering in two geographically distinct areas. However, in at least one location in central arctic Canada (i.e. Queen Maud Migratory Bird Sanctuary), the breeding range of eiders that winter west of the continent overlaps with that of eiders wintering to the east. Not only is there overlap, but also some females within the area of overlap switch wintering areas among years (stable isotope analysis indicated about 20% of the females likely switched wintering areas between two years). Furthermore, a recent genetics study indicates that there is no genetic distinction between King Eiders wintering in the Atlantic versus those wintering in the Bering Sea and North Pacific. Although not genetically distinct, it may still be best to manage King Eiders in arctic Canada as two populations. To do that, more information is needed on location and extent of overlap of the two breeding ranges in arctic Canada.

1. Continue using satellite telemetry, banding and stable isotopes to determine affiliations between breeding, molting and wintering areas of King Eiders with a focus on definition of the area of overlap of eastern and western populations on the breeding gournds.

Population Dynamics: Until a recent and ongoing study at Karrak Lake, in central arctic Canada, very little information was available on productivity, survival and recruitment. Detailed studies of breeding biology and estimates of vital rates are needed at several other sites throughout the breeding range.

1. Determine breeding propensity, reproductive success, recruitment and age-specific survival of King Eiders in several nesting areas (to obtain variation between eastern and western population, dispersed versus colonial nesters, etc).
2. Once key population parameters have been obtained, develop a population model for King Eiders.
3. Investigate feasibility of using regular winter surveys to determine age and sex ratios in populations.
4. Investigate feasibility of using fall migration counts at Barrow, Alaska as an index of annual productivity of the Pacific-wintering population.

Population Ecology: It is difficult to decipher the cause of the recent population decline, partly because of a poor understanding of natural factors limiting the survival and productivity of King Eiders. There have been only a few localized studies of nesting ecology, and very little is known about factors affecting the survival of King Eiders at sea during molt, winter and migration. Failure of open water to form in the Beaufort Sea during spring migration has caused the death of up to 100,000 King Eiders. It is not known whether this also occurs on wintering areas.

1. Study nesting ecology of King Eiders at several locations across the arctic.
2. Study winter ecology (could compare survival of King Eiders in polynia in the northern Bering Sea to their survival in areas south of the ice-edge).
3. Determine important factors (weather, predators, food, etc.) affecting survival and fitness of the species throughout its range during the molting period.
4. Study feeding ecology on spring staging areas in Chukchi Sea and in southeastern Beaufort Sea to assess importance of area as an energy source for survival and productivity.

Habitat requirements: Recent satellite telemetry has contributed information on at-sea locations of King Eiders during migration, molt and winter, thus providing new information on habitat requirements at a broad scale. Knowledge of habitat requirements particularly on wintering and spring staging areas, when habitat might be limited due to ice cover, could result in a better understanding of factors controlling population trends. Offshore oil and gas development in the Beaufort Sea could degrade habitat used for staging during spring and molt/fall migration. An understanding of habitat requirements while in the Beaufort Sea will improve our ability to predict the impact of offshore oil and gas activity on eiders. More information on habitat requirements could also enhance our ability to predict the effect of climate change on King Eiders.

1. Identify and quantify characteristics of habitats used for staging in the Beaufort Sea during spring and molt/fall migration.
2. Characterize habitats at molting and wintering sites.
3. Collect data on King Eider food habits on nesting, brood-rearing, molting and wintering areas. These data will be useful in evaluating other information including contaminant loads and population trends.
4. Quantify the characteristics of habitat used for nesting and brood-rearing.

Harvest Assessment: An estimated 20,000 King Eider (less than 5%) are harvested annually in Alaska and western arctic Canada. The take is primarily by subsistence hunters (>97% of harvest), with few taken by sport hunters. These figures do not include the unknown harvest along the Russian coast where a substantial proportion of North American breeding King Eiders molt and winter, nor do estimates include losses due to crippling or unretrieved birds. Eiders that nest in eastern arctic Canada are hunted there by both subsistence hunters and sport hunters. An additional 10,000 to 20,000 King Eiders are harvested by commercial and subsistence hunters in Greenland during the molt. It is unknown whether harvest levels in either the east or west are sustainable.

1. Update and improve estimates of King Eider harvest in Alaska and Canada.
2. Determine the level of harvest of North American breeding populations of King Eiders in both Russia and Greenland.
3. Determine harvest composition (i.e. adults, immatures, or juveniles; males or females) and seasonal timing of harvests. Model the populations (eastern separately from western) to determine the impact of various harvest levels on eider population size.

Parasites, Disease, Contaminants: There is general concern about contamination of benthic foods in northern areas. Some data has been obtained on levels of trace elements in King Eiders. Selenium and zinc levels tend to be high in King Eiders in the western arctic, while cadmium levels are high in the eastern arctic. However, no evidence has been found to suggest that trace elements are affecting the health of King Eiders. Little is known about parasites and disease in King Eiders. Even less is known about the effects these factors have on reproduction and survival of the King Eider.

1. Examine exposure to avian cholera, avian influenza and other communicable diseases.
2. Determine prevalence and effects of parasite loads.
3. Determine physiological effects of selenium, cadmium and other contaminants on King Eiders.
4. Opportunistically sample King Eiders for contaminants, disease and parasites.

Spectacled Eider

(Somateria fischeri)

Population Size and Trends: All Spectacled Eider breeding populations were listed as threatened on May 10, 1993 because of documented population declines. The Yukon-Kuskokwim Delta population declined by >90% between the 1970s and early 1990s. Anecdotal information indicated that populations in the other two primary breeding areas, the Russian and Alaskan Arctic Coastal Plains, also declined, along with the much smaller breeding population on St. Lawrence Island in the Bering Sea. Annual aerial surveys for breeding population trend have been developed for the two North American breeding subpopulations. A ground-based nest survey is used in conjunction with aerial survey indices to provide an annual estimate of the Yukon-Kuskokwim Delta population; recent estimates are about 9,400 breeding birds with a slightly increasing population trend. A fixed-wing survey is flown annually to estimate numbers on Alaska's Arctic Coastal Plain; an estimated 13,000 birds breed there with a stable population trend. A single aerial survey, conducted over a 4-year period, provided a population index for the Arctic Russia breeding population. Winter surveys of the only known wintering area of this species (presumed to represent the world population) provided a total species estimate of about 363,000 in 1996-1997.

1. Continue the *Yukon-Kuskokwim Delta Nest Plot Survey* and *Aerial Breeding Pair Survey* used together to provide a nest population estimate.
2. Repeat the survey of the wintering area (last conducted in 1998).
3. Continue the *Arctic Coastal Plain Survey*.
4. Conduct periodic breeding pair surveys of Russia breeding habitats.

Population Definition/Delineation: Genetic analysis indicates the presence of 3 distinct breeding subpopulations: Yukon-Kuskokwim Delta, Alaska Arctic coastal plain, and Russia.

1. Determine whether Ledyard Bay is a staging and molting area for North Slope or Arctic Russia breeding populations.

Population Dynamics: Current survival data are derived from site-specific studies of the Yukon-Kuskokwim Delta breeding population and may not be representative of the entire region. Similar information is not available for the North Slope of Alaska or Russia.

1. Capture and mark adult female Spectacled Eiders nesting on Kigigak Island, Yukon Delta NWR to estimate annual survival.
2. Evaluate the feasibility and efficacy of predator (fox, gull) control on the Yukon Kuskokwim Delta where gulls may be affecting Spectacled Eiders.
3. Monitor productivity and recruitment of Spectacled Eiders on Kigigak Island, Yukon Delta NWR.
4. Estimate annual survival of Spectacled Eiders on the North Slope.
5. Conduct productivity and survival study of Spectacled Eiders in Arctic Russia comparable to the study conducted at Kigigak Island, Yukon- Kuskokwim Delta.

Population Ecology: Locations of major breeding, staging, molting and wintering areas are believed to be known. Ecological characteristics of breeding areas in Alaska have been characterized, but ecological relationships of eiders to molting and wintering areas are less studied or unknown.

1. Evaluate the feasibility and efficacy of fox control on the Yukon Kuskokwim Delta where foxes may be affecting Spectacled Eiders.
2. Explore hypothesis that sub-adults winter separately from adults.
3. Investigate competition with walrus in Ledyard Bay.
4. Evaluate factors affecting duckling growth and survival
5. Determine cause and population effects of egg inviability
6. Examine effects of pond salinity on Spectacled Eiders (especially ducklings)

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Habitat requirements: Locations of major breeding, staging, molting and wintering areas are believed to be known. Physical characteristics of breeding areas in Alaska have been characterized, but characteristics of molting and wintering areas are less studied or unknown. Critical habitat for molting Spectacled Eiders was designated in Norton Sound and Ledyard Bay in 2001, and nesting and wintering habitat in other areas. Recent offshore oil and gas lease sales in the Chukchi Sea warrant further investigation of the potential impacts to eiders in that area. Climate change is resulting in reduction in ice cover during winter and an increase in storm frequency and saltwater infusion into coastal breeding habitats.

1. Characterize locations and use of marine habitats, especially in the Chukchi Sea.
2. Evaluate and reduce impacts from oil and gas activities on Spectacled Eiders in the Chukchi Sea, particularly in Critical Habitat in Ledyard Bay.
3. Evaluate and predict effects of environmental change in marine habitats and breeding areas on Spectacled Eiders.
4. Continue education program on the effects of ATVs on Spectacled Eider breeding habitats on the Yukon Delta National Wildlife Refuge.
5. Develop technique and identify information needs for evaluating cumulative effects of human development on Spectacled Eiders.

Harvest Assessment: Hunting of Spectacled Eiders is illegal, although a few are taken illegally, or incidentally by subsistence hunters.. Subsistence harvest surveys are conducted annually for the western Alaska breeding population. Attempts are being made to initiate harvest surveys of the North Slope breeding population. No reliable survey data are available for Russia.

1. Increase education efforts across the range of the Spectacled Eider to eliminate take.
2. Develop a subsistence harvest monitoring program with the appropriate evaluation instrument to reliably quantify the take of Spectacled Eiders throughout their range.
3. Evaluate and reduce impacts of commercial fishing on Spectacled Eiders in the Bering Sea, particularly in Critical Habitat south of St. Lawrence Island.

4. In concert with education efforts, increase law enforcement across the range of the Spectacled Eider to eliminate take.

Parasites, Disease, Contaminants: Lethal and sublethal levels of lead poisoning from ingested lead shot have been documented for the Yukon-Kuskokwim Delta breeding population. Heavy metal concentrations (e.g., cadmium), have been found above background levels in Spectacled Eiders. Spectacled Eiders have proven to be susceptible to aspergillosis in captivity.

1. Continue education to eliminate the use of lead shot for waterfowl in the range of the Spectacled Eider.
2. Continue monitoring Spectacled Eider blood lead levels in areas where information is lacking, such as the North Slope and Russia, and monitor lead levels periodically throughout the range of the eider.
3. Continue studies to increase understanding of the incidence and impact of diseases on eiders.
4. Monitor the use of lead shot by checking hunters and local stores for availability of lead shot.
5. Determine physiological effects of selenium, cadmium and other contaminants

Steller's Eider

(Polysticta stelleri)

Population Size and Trends: In Russia, the Steller's Eider is considered rare and recorded in the Red Book, although an extensive survey of the Russian Far East indicated over 100,000 birds in the Pacific population. A smaller Atlantic population from western Siberia numbers 30-50,000. The Alaska breeding population is listed as a threatened species in 1997 under authority of the Endangered Species Act based on a substantial decrease in the species range and vulnerability of the remaining Alaska breeding population to extirpation. Steller's Eiders have essentially disappeared as a breeding species from the Yukon-Kuskokwim Delta where they were once numerous. The breeding population on the Arctic Coastal Plain is highly variable, with highest densities around the Barrow area. Although several hundred probably occur there in most years, there is little reliable quantitative information available to assess trends. A spring aerial survey provides an annual index to population size of birds migrating northward in coastal habitats in southwest Alaska.

1. Continue intensive aerial surveys near Barrow.
2. Continue standardized ground-based breeding pair surveys at Barrow.
3. Continue spring Pacific population aerial survey.
4. Explore possibility of counting birds in the ice leads of the Chukchi Sea in spring before they arrive on the North Slope.
5. Develop visibility correction factor for aerial surveys of Steller's Eiders on the breeding grounds.

Population Definition/Delineation: There are two geographical populations of Steller's Eiders with separate breeding and winter distributions. The Atlantic population nests in western Siberia and winters in the Barents and Baltic Seas. Most of the Pacific breeding population inhabits the maritime tundra of northeast Siberia, and a smaller population breeds at low densities across the Arctic Coastal Plain of Alaska. The Pacific population winters primarily in Alaska in the Bering Sea, although specific wintering areas of the threatened Alaska breeding population are less certain. Genetic analyses of the disparate breeding populations in Russia and North America have not been conducted. A captive flock of Steller's Eiders has been established at the Alaska Sea Life Center (ASLC).

1. Maintain captive flocks, develop techniques for artificial propagation, and investigate development of a second captive flock.
2. Develop a plan for re-introduction, including fully establishing a known-geographic origin flock of Steller's Eiders At ASLC.
3. Opportunistically collect eggs on the Yukon-Kuskokwim Delta and North Slope to establish a flock of known-geographic origin Steller's Eiders at ASLC.
4. Conduct satellite telemetry study to link breeding, molting, wintering and staging areas.
5. Continue studies at Kuskokwim Shoals to understand how eiders using Kuskokwim Shoals relate to the listed population.

6. Acquire more genetic samples opportunistically from Russia and Alaska.

Population Dynamics: Nest success is highly variable and greatly influenced by predators on the Alaska North Slope, but there are few other quantitative data on the reproductive biology of Steller's Eiders. Fledging success and duckling and juvenile survival are unknown. A mark-recapture study, conducted at key molting sites on the Alaska Peninsula, showed that adult males had lower annual survival than adult females, and that annual survival decreased between 1975-1981 and 1991-1997. The banding program has continued at Izembek NWR to estimate annual survival.

1. Continue nest and brood monitoring at Barrow.
2. Update and evaluate Population Viability Analysis with the most recent survey and demographic data.
3. Determine female breeding area fidelity by capturing, marking and re-sighting hens at Barrow.
4. Refine, implement and evaluate field techniques for enhancing egg survival with artificial incubation.
5. Continue Izembek adult survival monitoring and further evaluate analytical and study design.
6. Determine post hatch-fledging survival.

Population Ecology: Studies of nesting ecology in Alaska have demonstrated high annual variation in nesting propensity, and that nesting is positively related to high lemming numbers (probably related to prey-switching by predators). Breeding and at-sea habitats have not been characterized. Foods and foraging ecology of molting birds have been examined, but there are no comparable data available for breeding birds. Predator control in the Barrow area has resulted in increases in nest success.

1. Continue fox and raven control near Barrow.
2. Implement jaeger control (egg removal or adult removal as necessary) under certain circumstances near Barrow.
3. Confirm identity of predator species causing egg/young loss.
4. Monitor changes in distribution and abundance of predators at Barrow.
5. Reduce availability of anthropogenic food sources to nest predators of Steller's Eiders at Barrow.
6. Develop techniques for diet assessment.
7. Determine the number and causes of infertile and inviable eggs in the Barrow breeding population.

Habitat requirements: Breeding, molting and winter habitat needs of Steller's Eiders are not well studied, although the locations of many key areas have been documented. Critical habitat for the Alaska breeding population has been designated at breeding areas of the Yukon-

Kuskokwim Delta, and several molting and staging areas along the Alaska Peninsula and nearshore waters of western Alaska.

1. Identify and protect important non-breeding habitats of the listed population, especially in the Chukchi Sea.
2. Continue education at Barrow, including Eider Journey, Barrow Bird and Cultural Camp, Migratory Bird Calendar contest and North Slope Outreach Team meetings for Barrow residents to reduce disturbance of nests and ducklings.

Harvest Assessment: There is no legal harvest of Steller's Eiders in Alaska. A few are taken incidentally and illegally by subsistence hunters. There are no reliable comprehensive estimates of harvest in Russia.

1. Increase law enforcement and education efforts including village visits and eider identification tools across the range of the Steller's Eider to eliminate take.
2. Gather and summarize information on harvest levels in Alaska.
3. Assess harvest levels in Russia.

Parasites, Disease, Contaminants: Little is known about parasites, disease, and contaminants in Steller's Eider. Recent studies have identified lead poisoning as an important source of mortality for breeding Spectacled Eiders on the Yukon-Kuskokwim Delta where Steller's Eiders historically and currently nest in reduced densities. High levels of lead have also been found in breeding Steller's Eiders on the Alaska Arctic Coastal Plain. Elevated levels of hydrocarbons have been found at isolated sites in Alaska associated with fish processing and industrial activities.

1. Work toward the prohibition of the use of lead shot on the Yukon-Kuskokwim Delta (all seasons, all quarries).
2. Continue education, including non-toxic shot clinics and village visits to eliminate the use of lead shot for waterfowl across the range of the Steller's Eider.
3. Continue education, including non-toxic shot clinics and village visits in Alaska, and law enforcement to eliminate the use of lead shot for waterfowl hunting and eliminate harvest of Steller's Eiders across their range.
4. Continue studies on prevalence and effects of disease and causes of mortality.
5. Screen/monitor for lead exposure throughout the range of the listed population.
6. Determine physiological effects of selenium, cadmium and other contaminants.
7. Opportunistically sample birds for avian influenza where adequate samples can be obtained.

Harlequin Duck, Western Population

(Histrionicus histrionicus)

Population Size and Trends: There is no reliable index of population size or trend for Harlequin Ducks in western North America. Numbers of breeding birds have been estimated in some small portions of their range over the short term. Single or short-term winter indices are available for a few areas. Winter survey efforts have been most consistent in Prince William Sound, Alaska (since 1989), southern British Columbia; and Puget Sound, Washington.

1. Establish a comprehensive survey program to annually estimate the number of Harlequin Ducks on all major wintering areas in the west, in conjunction with surveys to estimate age ratios
2. Establish monitoring surveys in selected key breeding areas to detect changes in bird densities at local or regional scales.

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Population Definition/Delineation: Preliminary studies suggest some genetic differences between Eastern and Western populations and among breeding areas in western North America. Also, direct measures of movement (banding, telemetry) indicate low degrees of exchange at all stages of the annual cycle.

1. More completely describe the degree of genetic similarity/difference between breeding birds from Rocky Mountain/Pacific Northwest component and the Alaska/Bering Sea component.
2. Investigate genetic relationships of breeding birds in northeastern Russia to those in North America.
3. Expand marking studies (banding, satellite and VHF radios) to strengthen knowledge of connections between breeding birds and their molting and wintering grounds across the geographic range.

Population Dynamics: There has been substantial progress on describing basic parameters of population dynamics in western North America. Focused work on the British Columbia Coast and in Alaska (related to the *Exxon Valdez* Oil Spill) has accumulated information on productivity, survival rates of young and adults, and age structure of the population. In other parts of the range, similar information has not been gathered.

1. Expand studies of productivity factors in representative ecological regions across the breeding range (e.g. Rocky Mountain, interior subarctic, Pacific Coast, Bering Sea river basins).
2. Expand studies of seasonal and annual survival rates of juveniles, subadults and adults.
3. Expand studies of sex ratios and age ratios (productivity indices) for major wintering areas.
4. Expand studies of immigration, emigration, and dispersal rates among wintering areas.
5. Increase development of population models that integrate productivity, survival, and harvest components to assess the importance of factors affecting population growth.

Population Ecology: Breeding season ecology of western Harlequin Ducks is only known from a few areas and over relatively short periods of study. Little is known of the effects of regional climate, weather, food availability, and brood-rearing requirements. Ecological requirements at traditional molting and wintering areas have been described most extensively in British Columbia and to a lesser degree in Prince William Sound, Alaska. In other parts of the winter range, however, ecological data are scarce.

1. Expand studies of physical, climatic, and trophic factors affecting breeding stream/nest site selection in representative ecoregions.
2. Expand studies of brood-rearing ecology and factors that influence fledging success.
3. Continue studies of ecological characteristics that contribute to survival during molt and winter, especially in significant wintering areas where ecological work is lacking.

Habitat requirements: Western Harlequin Ducks use a wide variety of riverine and coastal breeding habitats throughout their range, but few of these habitats have been adequately described. In recent years, substantial progress has been made in describing characteristics of major molting and wintering areas in British Columbia and southcentral Alaska; work is needed in other parts of the winter range.

1. Characterize (biotic and abiotic) features of interior and coastal rivers used by Harlequin Ducks throughout their breeding range.
2. Expand identification and description of additional molting and wintering sites.

Harvest Assessment: Harlequin Ducks are harvested at moderate to low levels during subsistence hunting (mostly winter) in Alaska and Canada. They are also included in general duck bag limits or under restricted limits in all jurisdictions in western North America. Quantification of harvest and harvest composition is poorly known from local and national surveys.

1. Expand harvest surveys to accurately estimate subsistence harvests.
2. Improve regional and national harvest surveys to obtain adequate samples of sea duck hunters and estimate regional harvests of Harlequin Ducks.
3. Expand and improve parts collections surveys and explore other methods to reliably estimate sex and age composition of Harlequin Ducks in harvests.

Parasites, Disease, Contaminants: The recent expansion of work on Harlequin Ducks, including capture and handling of more birds, has modestly improved information on parasite loads, susceptibility to diseases, and risk of mortality from these factors. There is some local information on exposure of Harlequin Ducks to petroleum and metals contaminants, but little information on specific physiological impacts or health effects from these agents.

1. Continue opportunistic assays of parasites, diseases, and contaminants in birds throughout their range, particularly on major wintering areas.
2. Investigate cases of significant contaminant exposure (e.g. mine waste, oil spills) to document health effects in the wild.

3. Expand laboratory studies to determine effects of specific contaminants and exposure levels on physiological functions, reproduction and survival. Particular emphasis should be given to crude oil, heavy metals, and compounds that accumulate in invertebrate foods.

Harlequin Duck, Eastern Population

(Histrionicus histrionicus)

Population Size and Trends: Information on the size and trend of the eastern seaboard wintering population needs to be refined. Little is known of the size and trends of the Greenland wintering population.

1. Establish a monitoring program and determine the size and trend of the eastern seaboard wintering population, including Greenland birds.

Population Definition/Delineation: There seem to be two populations in eastern North America, one that winters on the eastern seaboard and one that winters in Greenland. Preliminary genetic studies support this division, but better genetic studies are needed to establish the degree of genetic differentiation of the two populations.

1. Determine the breeding boundaries between birds wintering Greenland and along the eastern seaboard.
2. Complete a comprehensive genetic analysis of the various populations of Harlequin Ducks.
3. Determine affiliations of birds among breeding, molting and wintering areas; locate breeding areas of birds wintering in Nova Scotia and in Newfoundland

Population Dynamics: Basic population parameters are needed for the two eastern populations. There are no reliable data on survival rates of young and adults. The mechanisms of selection of molting areas and even wintering areas are not known.

1. Conduct studies of survival rates of adults and young.
2. Study reproductive success on various rivers and across years.
3. Obtain more accurate sex and age ratios for the various wintering areas (Maine, Nova Scotia, Newfoundland and other peripheral wintering areas).

Population Ecology: Breeding ecology of the two eastern populations is poorly documented. Little is known of the effects of weather, food availability and spring runoff on reproductive success.

1. Study factors affecting reproductive success.
2. Study dispersal behavior of young.

Habitat Requirements: Rivers important for breeding remain to be located and characterized. Few staging areas have been identified and well characterized to date.

1. Identify and characterize rivers that are heavily used by Harlequin Ducks and evaluate the impact of recreational activities on these streams, if any.
2. Identify and characterize spring staging areas.
3. Identify and characterize molting sites.

4. Identify and characterize important wintering sites.
5. Examine the possibility of establishing Marine Protected Areas at the most important molting and wintering areas.

Harvest Assessment: Hunting is not currently allowed by law. However, the amount of illegal hunting and subsistence harvest is poorly documented.

1. Estimate the level of illegal or accidental subsistence harvest in Canada and Greenland.
2. Educate local people living near major staging, molting and wintering areas about the status of the species to reduce accidental harvest.

Parasites, Disease, Contaminants: There is some information on body parasites, but no information on the levels of contaminants in the eastern populations.

1. Determine the level of contaminants in birds at major wintering sites.
2. Determine the level of contaminants in birds from Greenland
3. Compare contaminants levels in males and females.

(See also the Harlequin Duck Eastern Population Management Plan, produced by Canadian Wildlife Service at: http://www.sararegistry.gc.ca/plans/showDocument_e.cfm?id=1276)

Black Scoter

(Melanitta nigra)

Population Size and Trends: Recent satellite telemetry studies suggest that the western and eastern breeding and wintering populations are allopatric and should be surveyed independently. On the west coast, a survey to provide relatively precise estimates of the Pacific breeding population was developed from 2004 to 2006. The visibility-corrected estimate of Pacific breeding population from 2004 to 2005 was 108,100 Black Scoter (SE = 13,300). Total population, including non-breeding birds, may approach 200,000. Compared to similar surveys flown 15 to 7 years ago, the population has declined with an average annual change at -3.1%. The less intensive Waterfowl Breeding Population and Habitat Survey suggests a decline of about 50% over much of the same area from 1956 to 2006.

In eastern North America, the total population probably numbers 200-300,000 birds, but there is little reliable information available to assess trends. Surveys of molting birds along the western James Bay coast of Ontario indicate that about 140,000 Black Scoters molt there, nearly all males. Migration counts at Avalon, NJ and Point LePreau, NB from 1995 to 2004 produced average (probably minimum) counts of 142,000 and 127,000, respectively.

1. Continue the breeding survey of Pacific Black Scoters.
2. Determine breeding distribution and develop surveys to provide reliable population estimates in eastern North America.
3. Develop or refine techniques to estimate detection rates during aerial surveys.
4. Develop protocol for identifying scoters to species during aerial breeding surveys.

Population Definition and Delineation: There appear to be two geographic populations of Black Scoters that are separated by their breeding and wintering distribution; satellite telemetry of birds on both coasts has not revealed any interchange between Atlantic and Pacific Black Scoter populations, although the sample size from the east coast is particularly small. The breeding range for Black Scoters wintering on the Atlantic coast extends farther west into the boreal forest than previously believed. Genetics and stable isotope analyses may provide further insights into population definition.

1. Determine the breeding and molting areas of ducks associated with various wintering areas range-wide, with emphasis on the eastern population
2. Determine the migration corridors used between breeding, molting and wintering areas.
3. Determine seasonal movements of non-breeding Black Scoters.
4. Collect tissue samples necessary for genetic analyses for Black Scoters.
5. Collect tissue and food samples necessary for stable isotope analyses to help determine seasonal habitat use at a broad geographic scale.

Population Dynamics: There are few data available on population dynamics for this species. Only one breeding population, on the Yukon-Kuskokwim Delta, Alaska, has been studied from

2001 to 2004, in which more than 100 nests were monitored and basic nesting ecology was studied.

1. Determine age-specific survival rates of ducks from various breeding areas.
2. Determine factors affecting the reproductive rates and variation in those rates for ducks from different breeding areas.
3. Determine the age structure of breeding populations.
4. Develop a demographic model for the species.

Population Ecology: Breeding, molting, migration, and wintering ecology needs to be better documented. Only one study of nesting ecology, in Alaska, has been done to date. Few data have been collected on food habits and feeding ecology in breeding and wintering areas, and additional studies are needed.

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the wintering period.
3. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the molting period.

Harvest Assessment: The sport harvest is low in comparison with apparent overall population levels, but appears to be increasing in the Atlantic flyway. From 1999-2006, the estimated continental sport harvest averaged 14,700 birds, of which 88% were shot in the Atlantic flyway. The level and composition of subsistence harvest is poorly documented, both in Alaska and eastern Canada. In the Pacific flyway, most harvest is subsistence, estimated at about 7000 birds in Alaska, but the accuracy of this estimate is questionable due to variation in reporting rates and failure to account for losses due to crippling and unretrieved birds.

1. Assess and improve the surveys for sport harvest for this species
2. Improve subsistence harvest estimates for Alaska and Canada.
3. Determine age and sex composition of the Alaska subsistence harvest.

Habitat Requirements: Breeding, molting and winter habitat needs are not well documented on either the Pacific or Atlantic coasts. However, based on satellite telemetry and surveys, the locations of several key seasonal areas have been documented.

1. Characterize the breeding habitat in Alaska and Canada, and identify the factors responsible for their selection.
2. Characterize the molting habitat in Alaska and Canada, and identify the factors responsible for their selection.
3. Characterize the wintering habitat in Alaska and Canada, and identify the factors responsible for their selection.

4. Characterize spring and fall staging habitats, and identify the factors responsible for their selection.
5. Determine the level of philopatry to breeding areas and annual fidelity to molting and wintering habitats.

Parasites, Disease, and Contaminants: Little is known about parasites, disease, and contaminants in the Black Scoter.

1. Screen Black Scoters for diseases and parasites on both the breeding and wintering areas.
2. Determine contaminant levels, especially lead, on both the breeding and wintering areas.
3. Expand laboratory studies to determine effects of specific contaminants and exposure levels on physiological functions, reproduction and survival. Particular emphasis should be given to crude oil, heavy metals, and compounds that accumulate in invertebrate foods.

Surf Scoter

(Melanitta perspicillata)

Population Size and Trends: The continental population seems to number in the hundreds of thousands for this species, but there is little quantitative information available to assess population size and trends. Numbers of Surf Scoters breeding in western Canada and perhaps Alaska appear to be declining. Similarly, the population wintering in the Atlantic Flyway appears to be declining. Eastern and western populations likely can be monitored separately as they appear to have distinct wintering areas that are subject to different harvest pressures.

1. Inventory and monitor numbers of breeding Surf Scoters in the western and eastern populations.
2. Inventory and monitor numbers of wintering Surf Scoters on the east and west coasts.
3. Develop or refine techniques to estimate detection rates during aerial surveys.

Population Definition and Delineation: Surf Scoters breed throughout the boreal forest, but appear to have higher densities in western Canada, Alaska, Ontario and Québec. Based on available evidence from telemetry and banding studies, it is likely that the population can be divided into eastern and western subpopulations with very low rates of dispersal between them. Information on molt areas, migration corridors and winter areas associated with breeding populations is increasing but is still incomplete for both the eastern and western populations.

1. Determine relative densities of Surf Scoters throughout their breeding range.
2. Describe the linkages, including migration corridors, between specific breeding areas, molt and winter areas using satellite telemetry, with emphasis on birds wintering in the Atlantic.
3. Determine seasonal movements of non-breeding Surf Scoters originating from specific breeding areas.
4. Conduct genetic analyses to better discriminate Surf Scoter populations or management units throughout the continent.

Population Dynamics: There are few data on the population dynamics of this species.

1. Determine factors affecting the reproductive success of birds from breeding areas throughout its range (e.g., food, predators, weather, etc.).
2. Determine variation in survival rates for birds from specific wintering areas.
3. Determine the age (eg., juvenile male to adult male) and sex ratios for specific wintering areas.
4. Examine continental scale annual variation in recruitment based on age ratios on wintering areas.
5. Develop a demographic model for the species.

Population Ecology: Few studies of nesting ecology have been done to date. In addition, breeding, molting, migration, and wintering ecology needs to be better documented for all age classes. The impact of Surf Scoters on the food resources is unknown. Recent studies suggest that the wintering behavior of Surf Scoters differs between clam and mussel habitats but studies are needed at molting and staging sites.

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the molting period.
3. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the wintering period.
4. Determine the level of annual fidelity to breeding, molting and wintering habitats.

Habitat Requirements: Breeding, molting and winter habitat needs are not well documented, although the location of many key areas has been documented. There is some indication that segregation occurs according to age and pairing status in wintering habitats; this needs to be better quantified. In some areas, Surf Scoters breed at relatively high densities on islands in large lakes and also may occur in high numbers in localized breeding areas. Because they feed on shellfish, identification and protection of important feeding sites is important.

1. Describe associations between bird densities, movement patterns, foraging rates, etc. and specific marine habitat features and diets on the Atlantic and Pacific Coasts.
2. Determine species - habitat associations (i.e., relationships between bird densities, movement patterns, foraging rates, etc. and specific habitat features) during the molting period throughout the species range.
3. Determine specific habitat features/conditions necessary for successful breeding throughout the species range.
4. Assess spatial and temporal variation in diets throughout the range of this species.

Harvest Assessment: The sport harvest is still poorly documented and needs to be better quantified. From 1999-2006, and average of 29,500 birds were harvested continentally, of which 87% occurred in the Atlantic flyway. Although sport harvest is more important on the east coast, it is growing in some parts of the west, such as Washington State. The level and composition of subsistence harvest is poorly documented, both in Alaska and northern Canada.

1. Assess and improve the surveys of sport and illegal harvest for this species.
2. Quantify subsistence harvest levels for Alaska and Canada.

Parasites, Disease, and Contaminants: Little is known about parasites, disease, and contaminants in Surf Scoters.

1. Screen Surf Scoters for diseases and parasites on both the breeding and wintering areas.
2. Determine levels of contaminants, especially lead, on both the breeding and wintering areas.

White-winged Scoter

(Melanitta fusca deglandi)

Population Size and Trends: There is little quantitative information available to assess population size and trends. Numbers of White-winged Scoters breeding in western Canada and Alaska appear to be declining, as suggested by declines in total scoter numbers where White-winged Scoters predominate. Similarly, populations wintering in the Atlantic Flyway seem to be declining. Trends for birds wintering in the Pacific Flyway are uncertain over the entire range, but localized surveys (Puget Sound, San Francisco Bay) suggest significant declines.

1. Develop population estimates and monitoring surveys for the eastern and western wintering populations.
2. Develop standardized surveys to estimate numbers and trends of breeding White-winged Scoters in eastern and western North America.
3. Develop protocol for identifying scoters to species during aerial surveys on breeding grounds.

Population Definition and Delineation: White-winged Scoters breed throughout the boreal forest, but appear to have larger nesting populations in western Canada, Alaska and Québec. Small and declining breeding populations occur in the mid-continent prairie region.

1. Determine linkages among populations at specific breeding, molting, staging and wintering areas.
2. Determine migration corridors and timing of migration between breeding, molting and wintering areas.
3. Determine seasonal movements of non-breeding White-winged Scoters affiliated with various breeding areas.
4. Assess the presence of subpopulations, as well as geographic variation in demography, migratory patterns and winter site fidelity, through a combination of surveys, intensive studies of breeding biology from several areas, isotopic and genetic analyses, long-term banding and satellite telemetry.

Population Dynamics: There are few data on demographic rates for this species, and those available come from small populations at the southern edge of their breeding range in the mid-continent prairies. Studies are currently underway in boreal breeding areas.

1. Estimate seasonal and annual survival rates of birds from different populations, or subpopulations, should they exist.
2. Determine recruitment rates from across the breeding range.
3. Determine the age structure of populations at various breeding and wintering sites.
4. Develop a demographic model for the species.

Population Ecology: Studies of nesting ecology have been done in eastern and western Canada, but larger studies are needed. In addition, breeding, molting, migration, and wintering ecology needs to be better documented. Data have been collected on food habits and feeding ecology in breeding and wintering areas, but additional studies are needed.

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the molting period.
3. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the wintering period.
4. Determine the level of annual fidelity to breeding, molting and wintering habitats.

Harvest Assessment: Current harvest surveys in the United States and Canada do not adequately estimate harvest. From 1999-2006, the estimated continental sport harvest averaged 10,500 birds, of which 72% were shot in the Atlantic flyway. Estimates of subsistence harvest exist for some areas, but are of questionable accuracy.

1. Critically evaluate estimation methods and improve estimates of sport and illegal harvest.
2. Improve subsistence harvest estimates for Alaska and Canada.
3. Determine sustainability of current harvest rates.

Habitat Requirements: Breeding, molting and winter habitat needs are not well documented, although the locations of many key areas have been documented via satellite telemetry and surveys. In some areas, White-winged Scoters breed at relatively high densities on islands in large lakes and also may occur in high numbers in localized breeding areas. Because they feed on shellfish, identification and protection of important feeding sites is important.

1. Describe associations between bird densities, movement patterns, foraging rates, etc. and specific marine habitat features and diets on the Atlantic and Pacific Coasts.
2. Determine species - habitat associations (i.e., relationships between bird densities, movement patterns, foraging rates, etc. and specific habitat features) during the molting period throughout the species range.
3. Determine specific habitat features/conditions necessary for successful breeding throughout the species range.
4. Assess spatial and temporal variation in diets throughout the range of this species.

Parasites, Disease, and Contaminants: Little is known about prevalence or effects of parasites, disease, and contaminants.

1. Screen birds for diseases, parasites, and contaminants on breeding and wintering areas.
2. Determine the relationship between diseases, parasites, and contaminants with nutritional condition, physiological function, behavior, and vital rates.

3. Assess population-level impacts of disease-, parasite-, and contaminant-induced morbidity and mortality.

Long-tailed Duck

(Clangula hyemalis)

Population Size and Trends: The North American population may number between one and two million birds, but survey coverage is incomplete and there is little information to reliably quantify population size and trends. The North American Breeding Populations Survey indicates substantial declines from the 1950's to early 1990's, but stable population over the past 15 years. This survey does not cover the majority of Long-tailed Duck breeding range in Canada and Alaska. Through a cooperative effort by SDJV and AGJV, aerial surveys are being developed to obtain indices of breeding population size in western and central arctic Canada.

1. Continue to develop waterfowl breeding population surveys for arctic Canada in cooperation with Arctic Goose Joint Venture, as a means of monitoring population trends of Long-tailed Ducks in Canada.
2. Initiate and expand winter sea duck surveys into areas of known concentrations to sample a greater proportion of the population (e.g., Chesapeake Bay, Nantucket Island Shoals, Great Lakes, Gulf of St. Lawrence, and Pacific Coast).

Population Definition and Delineation: Satellite telemetry studies suggest considerable interchange among breeding, molting, and wintering populations throughout North America, although sample sizes are small.

1. Compare genetic material of Long-tailed Ducks that winter on the Atlantic and Pacific Coasts, and on the Great Lakes, to determine whether there is more than one distinct population in North America.
2. Determine affiliations between breeding, molting and wintering areas (satellite telemetry, banding, stable isotopes).
3. Determine migration corridors between breeding and wintering areas (satellite telemetry).

Population Dynamics: There are few data on population dynamics for this species. The most important limiting factors are unknown.

1. Estimate survival rates of birds from various breeding areas.
2. Collect productivity data for breeding areas.
3. Determine the age structure of birds from various breeding areas.
4. Once necessary demographic parameters have been estimated, develop a demographic model for the species.

Population Ecology: A few studies of nesting ecology have been done, but larger studies over a broader geographic area are needed. Breeding, molting, migration, and wintering ecology need to be better documented. Data have been collected on food habits and feeding ecology in breeding and wintering areas. The effects and magnitude of fishing net entanglement mortality is unknown.

1. Quantify reproductive life history for Long-tailed Duck in various breeding areas.
2. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
3. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the molting period.
4. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the wintering period.
5. Estimate incidental take from gill nets, particularly on the east coast.
6. More information is needed to better understand how hunting affects temporal distribution at finer scales and how that affects bird fitness.

Harvest Assessment: The sport harvest appears to be low in comparison with apparent overall population levels. From 1999-2006, the estimated continental sport harvest averaged 22,700 birds, of which 84% were shot in the Atlantic flyway. Subsistence harvest is incompletely documented throughout its range. At present, estimates of sport and subsistence harvests are poor.

1. Assess and improve the surveys of sport harvest for this species.
2. Continue and expand surveys of subsistence harvest in Alaska and Canada.

Habitat Requirements: Breeding, molting and winter habitat needs are not well documented, although the locations of some key areas have been documented.

1. Characterize breeding habitats and identify the factors responsible for their selection.
2. Characterize molting habitats and identify the factors responsible for their selection.
3. Characterize wintering habitats and identify the factors responsible for their selection.
4. Determine the role wind turbine complexes (especially in Nantucket Sound) will have on this species in regard to potential loss of habitat and/or direct mortality.

Parasites, Disease, and Contaminants: Little is known about parasites, disease, and contaminants. Large numbers of Long-tailed Ducks have died in cholera outbreaks in Chesapeake Bay. Long-tailed Ducks carried the highest heavy metals burden of all sea ducks tested in Québec.

1. Screen Long-tailed Ducks for diseases and parasites on breeding and wintering areas.
2. Determine contaminant levels, especially lead, on breeding and wintering areas.

3 Expand laboratory studies to determine effects of specific contaminants and exposure levels on physiological functions, reproduction and survival. Particular emphasis should be given to crude oil, heavy metals, and compounds that accumulate in invertebrate foods.

4. Opportunistically sample birds for avian influenza where adequate samples can be obtained.

Bufflehead

(Bucephala albeola)

Population Size and Trends: An estimated one million birds are present in the traditional Waterfowl Breeding Population and Habitat Survey area ("mid-continent" strata). Additionally, British Columbia may have about 160,000 breeding birds and about 50,000 birds occur in the eastern survey areas not covered by the WBPHS. Considering additional unsurveyed areas, the continental population probably numbers about 1.4 million birds. The majority of Bufflehead breed in western North America, with highest densities in northern Alberta. Long-term surveys indicate that Bufflehead are increasing in most areas, with the possible exception of the U.S. prairies. Wintering populations are not consistently or adequately surveyed.

1. Improve estimates of abundance in the eastern survey areas of the U.S. and Canada.
2. Improve estimates of abundance in British Columbia.

Population Definition/Delineation: Limited band recovery data indicate that birds breeding west of the Rockies migrate to Pacific wintering areas, whereas most birds breeding further east migrate to eastern or southern wintering areas. There is some evidence that molting areas for males and females are different. The identification of molt sites is a potentially important concern at the population level should habitat degradation or disturbance lead to reduced use or abandonment of these sites. Bufflehead are too small to enable tracking with implantable satellite radios currently available, thus other methods of determining linkages may warrant investigation.

1. Determine if any exchange occurs between birds wintering on Atlantic and Pacific Coasts.
2. Determine linkages among breeding, wintering, and molting sites throughout range.
3. Summarize band recovery data for North America.

Population Dynamics: Little is known about reproductive and survival rates for local breeding populations although some research has been done in British Columbia. Recruitment rates are essentially unknown; one reason is because juvenile or sub-adult plumages are quite variable making it difficult to determine known age classes for both sexes.

1. Quantify reproductive and survival rates for local populations.

Population Ecology: In addition to an assessment of recruitment rates in winter, information on individual movements across seasons and across years would be useful to understand habitat use patterns and population requirements. For management purposes, information on sex and age differences in distribution patterns is needed.

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the molting period.

3. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the wintering period.

Habitat requirements: Bufflehead are cavity-nesting ducks and logging activities reduce the availability of suitable nest sites for breeding. This could be especially important in the boreal zone where forest regeneration rates are slower than locations further south. Riparian buffer strips around breeding ponds are essential to maintaining local Bufflehead populations. Breeding populations across the prairies are also threatened by agricultural expansion, which reduces cottonwoods and aspens available for nest sites. Wintering populations are vulnerable to petroleum spills on the coast. We know virtually nothing about the biotic and abiotic features of known molting sites, where birds often concentrate in large numbers and are susceptible to disturbance.

1. Characterize staging, molting and wintering sites.
2. Describe characteristics of natural cavity nesting sites.

Harvest Assessment: From 1999-2006, the estimated continental sport harvest averaged 183,000 birds, of which half were shot in the mid-continent areas, with another 31% in the Atlantic flyway. About 90% of sport harvest occurs in the U.S. Harvest rates are apparently higher in the Atlantic and Mississippi flyways than in the Pacific or Central. Subsistence harvest is small.

1. Accurately estimate annual harvest rates.

Parasites, Disease, Contaminants: Little is known.

1. Opportunistically sample birds for frequency and effects of parasites and disease.
2. Determine contaminant levels, particularly oceanic sources of pollution, at wintering sites.

Common Goldeneye

(Bucephala clangula)

Population Size and Trends: The Waterfowl Breeding Population and Habitat Survey indicates stable populations throughout surveyed areas of North America. However, goldeneye are not differentiated to species during this survey, which may compound interpretation of trends, particularly in western North America where Common and Barrow's breeding ranges overlap. In Eastern Canada, quite good size and trend data come from the Eastern Breeding Waterfowl Survey (CWS in Ontario, Québec and the Atlantic Provinces): breeding population estimate was of 112,900 pairs in 2003 and the 1990-2003 trend shows a statistically significant increase of 3.0% per year. Audubon Christmas Bird Count data suggest stable to increasing Common Goldeneye populations on wintering areas. The population has been crudely estimated at 1.25 million birds based on partial counts during the breeding season.

1. Improve population monitoring techniques (geographic coverage, survey timing, estimate detection rates), particularly in its western range, as needed to manage this species more effectively.
2. Determine species composition in breeding and wintering areas where Barrow's and Common Goldeneyes overlap in western North America.

Population Definition and Delineation: Common Goldeneye breed across forested areas of Alaska, across the wooded parts of northern Canada to the Maritime Provinces, and south to northern Washington, northern North Dakota, northern New York state and Maine. Goldeneye winter from the southern limits of its breeding range to the Gulf States. Banding data show a general pattern of eastern breeding birds wintering on the Atlantic coast or Great Lakes, and western breeding birds wintering on the Pacific coast or western states, with an overlap area in the western Rocky mountain provinces.

1. Better survey techniques on breeding and wintering areas would help to understand the possible factors impacting this species on the breeding grounds of western North America.
2. Radio telemetry should be considered to delineate more accurately the breeding and molting areas and links to wintering areas.
3. Comprehensive genetic analyses should be completed to examine relationships among North American populations.

Population Dynamics: Most studies of breeding biology have focused on populations nesting in nest boxes. There is insufficient information to build population models.

1. Breeding biology studies of birds using natural cavities for nesting are needed.
2. Estimate survival rates for all age and sex classes throughout range.

Population Ecology: Increased acidification of wetlands has been considered a favorable factor to the survival of broods, due to a decrease of fish as a competitor for invertebrate foods. On eastern wintering areas, especially Chesapeake Bay, there is some concern that hunting guides are putting greater pressure on sea ducks.

1. More information is needed to better understand how hunting affects temporal distribution at finer scales and how that affects bird fitness.
2. Better understand how climate change and associated changes in forest composition and distribution will affect goldeneyes.
3. Better understand the ecology of sub-adult birds from fledging to first breeding.
4. Estimate incidental take from gill nets, particularly on the east coast.

Habitat Requirements: Loss of mature forests is one of the most important factors affecting Common Goldeneyes. The species prefers fishless lakes and there is information to indicate that Common Goldeneyes have benefited from acidification (i.e., acid rain) through the decline of fish competitors and subsequent increase in invertebrate prey populations.

1. More research is needed to clarify the role of acid precipitation and the resultant fish reduction in regard to goldeneye food habits.
2. Evaluate the use of nest boxes as a potential means to establish new populations or to bolster numbers in areas where logging has reduced availability of suitable nesting trees.

Harvest Assessment: From 1999-2006, the estimated continental sport harvest averaged 95,000 birds; about half were shot in Mississippi and Central flyways, and the remainder split equally between the Atlantic and Pacific flyways. Harvest of Common Goldeneye in the Canada portion of the Atlantic Flyway during the period 1975-2006 declined precipitously. Harvest of Common Goldeneye in the U.S. portion of the Atlantic and Mississippi Flyways has also declined during the same period.

1. Continue to improve estimates of harvest in both the U.S. and Canada.
2. More information is needed to better understand the role that hunting plays in population regulation.

Parasites, Disease and Contaminants: Numerous habitat quality issues dealing with pollution have been implicated as being deleterious to goldeneye populations, although there are few data on specific causes or effects. There is some evidence of an inverse relationship between trace element concentrations and body condition. Elevated levels of organochlorine pollutants have been found in some eastern wintering populations.

1. Determine trace element concentrations in wintering populations throughout their range.
2. Evaluate relationships between trace element concentrations and measures of physiological condition.

Barrow's Goldeneye, Western Population

(Bucephala islandica)

Population Size and Trends: Population size and trends are uncertain at best. The western population has been crudely estimated at 200,000-250,000 birds. Long-term surveys have been conducted in selected breeding areas of the B.C. interior but this information has yet to be extrapolated into a breeding population estimate. The situation is similar for wintering populations, where only a handful of (inconsistent) surveys have been conducted at wintering sites (eg., Baynes Sound and Stanley Park in BC, Prince William Sound and southeast Alaska). The assessment of trends in the BC breeding population is confounded by the fact that Riske Creek (one of the key survey areas supporting a relatively high density of birds) has been subjected to a variety of population manipulations (e.g., numbers of breeding birds have been either artificially increased by deploying nest boxes 4-5 different times over the last 25 years or decreased by a collection program (e.g., 100 females were shot in one year for research purposes)). Audubon Christmas Bird Count data suggest stable or increasing numbers along the coast in winter, but this survey is not rigorous enough to detect relatively small changes, especially for sub-populations.

1. Develop standardized surveys to estimate abundance levels and population trends across the breeding range.
2. Develop standardized surveys to estimate abundance levels and population trends across the wintering range.

Population Definition/Delineation: Breeding and wintering ranges of western Barrow's Goldeneyes are fairly well described, although its breeding range and relative densities in Alaska are less well known. However, the linkages between these (i.e., the breeding origin of birds from specific winter sites and vice versa) are poorly known. This hampers conservation efforts, as there is no measure of appropriate management units, nor any way to consider geographic limits to cross-seasonal effects. Molting adult males are suspected to concentrate in large groups after they leave the breeding grounds. One of the best known molt sites, Old Crow Flats in the Yukon, supports thousands of males in late summer. A recent satellite telemetry project in south-central B.C. indicates that most males migrate north to molt. Preliminary analyses of these data indicate that: 1) most males disperse over a large geographic area, from northern Alberta and central Northwest Territories, 2) some lakes consistently support a large number of marked birds across years (e.g., 3-5 tagged birds per year molted on Cardinal Lake in northern Alberta in 2006 and 2007), and 3) birds with transmitters that lasted > 2 years (n=2) show the same migration patterns and use the same molt/winter sites across years. Preliminary surveys suggest that females molt in small groups away from breeding areas but the geographic extent of this molt is unknown. The identification of molt sites is a potentially important concern at the population level should habitat degradation or disturbance lead to reduced use or abandonment of these sites. Currently, the best way to determine the linkage between breeding/wintering grounds and key molting sites is through the use of satellite telemetry.

1. Determine affiliations between breeding, molting, staging, and wintering areas throughout the species range.

2. Quantify rates of dispersal within and between annual cycle stages to determine the degree of connectivity among potential subpopulations.

Population Dynamics: Little is known about reproductive and survival rates for local breeding or wintering populations, which limits any understanding of basic demographic properties underlying population dynamics. Dispersal patterns of different age and sex classes (especially HY birds) from breeding areas to the coast are not well understood. Studies of reproductive ecology and natal return rates are underway at Riske Creek, B.C., but similar work should be conducted at important breeding sites in northern B.C., Yukon, and Alaska for comparative purposes. Recruitment rates are being assessed in selected wintering areas of B.C. by recording plumage differences between sub-adult and adult males.

1. Quantify reproductive, survival, and natal return rates for local breeding populations throughout the species range.
2. Quantify winter survival rates for all age and sex classes throughout the non-breeding range.
3. Measure annual recruitment rates using winter age ratio surveys over a large scale; this should be done at a variety of selected areas in B.C. and Alaska.
4. Quantify dispersal patterns from different breeding sites to winter areas (using satellite telemetry).
5. Develop models describing population dynamics based on demographic data, as above.

Population Ecology: Information on individual (all age and sex classes) movements and habitat use patterns within and across seasons and across years is needed to understand population requirements (see also population definition/delineation section above). Currently, the best way to describe movements and habitat use over a broad geographic range is through the use of satellite transmitters. VHF transmitters and survey data are more suitable for smaller areas/sites. Little is known about foraging ecology (e.g., prey selection) and how it differs by age, sex class, and season. Prey selection studies require intensive collections of birds and sampling of food items in their immediate environment.

1. Study the reproductive, wintering, and molt ecology of different age and sex classes across entire range.
2. Investigate movements and habitat affiliations of the different age and sex classes.
3. Investigate seasonal prey preferences of the different age and sex classes.

Habitat requirements: Goldeneye nest in cavities primarily excavated by Pileated Woodpeckers in old, large-diameter trees adjacent to productive ponds. The physical characteristics of these trees, ponds and surrounding habitat have been documented for the Riske Creek area to help develop logging guidelines and land-use plans for interior forests. However, these kinds of data should be collected for other types of forests throughout the breeding range, in particular the boreal forests in northern B.C., Alberta, and Alaska. Little is known about the biotic and abiotic features attracting goldeneye to important molting and wintering sites. Such data for important molting sites (e.g., Old Crow Flats YK, Cardinal lake AB) are critical because birds often concentrate in large numbers and are therefore vulnerable to disturbance,

contaminant spills, etc. Finally, habitat features of wintering areas have rarely been described; goldeneye specialize on mussel prey so food availability presumably influences winter distributions. However, the limiting role of food and the importance of other habitat attributes during winter are not clear.

1. Describe the characteristics of natural cavities used for nesting throughout breeding range.
2. Describe the biotic and abiotic characteristics of important staging, molting and wintering sites of all age and sex classes.

Harvest Assessment: From 1999-2006, the estimated continental sport harvest averaged 5,700 birds, about 90% of that occurred in the Pacific flyway. Subsistence harvest is insignificant.

1. Accurately estimate annual harvest rates and trends in those rates for different parts of the range.

Parasites, Disease, Contaminants: In winter, these birds forage primarily on bivalves which are known to concentrate heavy metals and organochlorine pollutants. Contaminant levels in birds and their foods need to be determined, especially in areas adjacent to human and industrial development, to help predict what effect these may have on survival and reproduction rates. Virtually nothing is known about parasite loads and diseases of goldeneye throughout the annual cycle.

1. Sample birds throughout the range and determine levels of known contaminants, parasites and disease.
2. Determine toxicity and sublethal effects of contaminants.

Barrow's Goldeneye, Eastern Population

(Bucephala islandica)

Population Size and Trends: The eastern population of Barrow's Goldeneye was listed in Canada as a species of Special Concern in 2000 and as state-threatened in Maine in 2007. Information on population size suggests only about 2,000 adult breeding females in the population. It is imperative to closely monitor that population as it could easily be up listed to Threatened in Canada. Wintering Barrow's Goldeneye are monitored roughly every three years by helicopter in Quebec and most important wintering areas in New Brunswick.

1. Develop standardized census methodologies for monitoring wintering populations and refine existing techniques.
2. Develop standardized census methodologies for monitoring breeding populations.
3. Develop annual measures of productivity on important wintering areas (i.e. age ratios).

Population Definition/Delineation: The winter range of the eastern population is fairly well known. However, links to breeding areas have only been established for the birds wintering in the St. Lawrence estuary. Whether birds wintering in Québec, along the Gulf of St. Lawrence, the Maritimes and the eastern U.S. breed in the same area is unknown. Preliminary genetic studies are not conclusive and more detailed studies are needed. The general breeding area has been identified, but the exact boundaries, especially in the north, have yet to be determined.

1. Characterize the genetic and morphologic structure of the three major populations of Barrow's Goldeneye.
2. Determine the northern boundary of the Québec/Labrador breeding area.
3. Determine affiliations among breeding, molting, and wintering areas for birds wintering along the Gulf of St. Lawrence (Québec), in the Maritimes and the U.S.

Population Dynamics: Little is known of the dynamics of the eastern population of Barrow's Goldeneye. The breeding area was just discovered in 1998 and to date there has been only one preliminary study on nest box use.

1. Determine the reproductive success of the population, both hatching and fledging success.
2. Determine the survival rate of various age-sex cohorts of the population.
3. Conduct regular winter surveys to provide information on age and sex ratios in the population.

Population Ecology: Little is known of the ecology of the eastern population of Barrow's Goldeneye. Studies are limited. Recent work indicates that natural nest sites are located in large decaying snags, for which availability is probably greatly affected by substantial logging pressure in breeding habitats. The feeding ecology of pairs and broods has not been documented on the breeding areas. Growth rates of ducklings and the factors affecting them are unknown. Although some molting sites of males are known, the location of female molting sites is still unknown.

1. Study the breeding ecology of the eastern population.
2. Study the molting ecology of adult males and females.
3. Study the ecology of sub-adults.

Habitat requirements: Little is known about the breeding and especially molting habitat requirements of the eastern population. More information is available on the winter habitat requirements, but much remains to be learned about the use of the wintering habitat in relation to tide and ice conditions, and of preferred foods.

1. Determine the types of lakes preferred by breeding pairs and by broods.
2. Determine and characterize the natural cavities used for breeding.
3. Determine the impact of the forest industry on breeding habitat attributes.
4. Characterize molting sites of adult males.
5. Locate and characterize molting sites of adult females.
6. Quantify winter habitat use in relation to tides, ice and other environmental variables.

Harvest Assessment: Important areas where wintering and staging birds concentrate have been partly closed to hunting in Canada, and other important areas are still hunted. Harvest was curtailed in Maine beginning in 2007. Harvest still occurs outside closed areas. Because current levels of harvest are probably low and widely dispersed, waterfowl harvest surveys in Canada and the U. S. do not provide accurate estimates of the number of Barrow's taken annually. The total number harvested in recent years is probably a few hundred.

1. Design a special survey to adequately estimate harvest levels.
2. Model the population to determine the impact of various harvest levels.
3. Determine if current restrictive measures are efficient in reducing harvest.

Parasites, Disease, Contaminants: Little is known about the level of contaminants in the population. However, an important portion of the population winters in heavily contaminated areas (Baie-Comeau, Québec and Dalhousie, New Brunswick).

1. Determine the level of contaminants in birds wintering in heavily contaminated areas.

Hooded Merganser

(Lophodytes cucullatus)

Population Size and Trends: There are no reliable data on population size or trend of Hooded Mergansers. In Eastern Canada, good size and trend data come from the Eastern Breeding Waterfowl Survey (CWS in Ontario, Québec and the Atlantic Provinces): breeding population estimate was of 75,700 pairs in 2003 and the 1990-2003 trend shows a statistically significant increase of 4.3% per year. The species prefers wooded habitats where detection is difficult from fixed-wing aircraft, but reasonable from helicopter. Data from most traditional breeding pair and winter waterfowl surveys combine all merganser species, confounding interpretation of species-specific population estimates and trends. A rough estimate is 400,000-600,000 birds in the eastern part of the continent and less than 100,000 in the west, with a increasing trends in population size. Audubon Christmas Bird Count data also indicate increasing populations.

1. Obtain reliable estimates of population size and density in major breeding areas, particularly in western North America.
2. Monitor trends in this species from breeding and wintering surveys.

Population Definition/Delineation: Although the breeding distribution of Hooded Mergansers is disjunct, with eastern and western segments, these two geographical areas are connected by juvenile dispersal and some adult emigration based on banding and genetic analysis conducted by the U.S. Geological Survey, Alaska Science Center. Band recovery data suggest that juvenile birds may migrate long distances following fledging. Birds banded in the Atlantic, Mississippi, and Pacific Flyways winter in their respective and adjacent flyways.

1. Determine location of important breeding, molting and wintering areas.

Population Dynamics: There are no data on population dynamics parameters of Hooded Mergansers nesting in natural cavities. Limited data from nest box studies in the mid-western U.S. and Ontario are insufficient to describe productivity and survival patterns for the species. Sources of natural mortality are poorly known.

1. Estimate reproductive parameters in major breeding areas, especially from natural cavities.
2. Determine survival rates of males, females, and young across the breeding range.
3. Obtain better estimates of age and sex ratios.
4. Evaluate the use of nest boxes as a potential means to establish new populations or to bolster numbers in areas where logging has reduced availability of suitable nesting trees.

Population Ecology: Relatively few studies have been done on the breeding and wintering ecology of Hooded Mergansers. Logging removes natural cavities and affects breeding success. Competition may occur with other cavity-nesting species. The effects of trophic relationships and competition in northern habitats are unknown. In southern breeding areas, annual changes in floodplain habitats may affect use and productivity by Hooded Mergansers.

1. Characterize breeding areas and nest site availability across the range.

2. Describe food habits, foraging behavior, and factors related to prey availability.
3. Describe habitat use and ecological relationships during winter.

Habitat Requirements: Habitat use patterns during nesting and brood-rearing appear to be very diverse, but are known only from a few local studies. Little is known about characteristics of habitats used during migration. Only general patterns of habitat use are known for wintering areas. The effects of habitat alteration, such as acid rain, logging, and floodplain modification are unknown.

1. Describe specific characteristics of breeding and nesting habitats across the range.
2. Identify important characteristics of habitats used during migration and winter.
3. Assess the impacts of logging on breeding density and productivity.
4. Identify important molting areas, and determine whether males and females use the same areas.

Harvest Assessment: Hooded Mergansers are not heavily hunted, although they are commonly taken with other ducks, especially in forested and riverine habitats. Harvest, measured by national surveys in Canada and the United States, totals about 100,000 birds continentally, mostly from the Mississippi and Atlantic flyways. If these estimates are accurate, then population estimates are likely higher than noted above, considering that the population is increasing continentally despite this level of harvest. There is little information on harvest rates or effects on the population.

1. Evaluate the reliability of current surveys to estimate harvest.
2. Continue to improve estimates of harvest rates.
3. Estimate incidental take from gill nets, particularly on the east coast.

Parasites, Disease, Contaminants: As carnivorous predators, Hooded Mergansers are exposed to contaminants in the food chain and may serve as indicator species in regions where water quality is poor. They may also be affected by acid rain in the east. The occurrence and effects of parasites and disease in the species are poorly known.

1. Determine contaminant levels in various parts of their breeding and wintering range.
2. Assess the nature and effects of disease and parasites.

Common Merganser

(Mergus merganser)

Population Size and Trends: Size and trends of populations in North America are not reliably known because most aerial surveys do not differentiate between Red-breasted and Common Mergansers, and because large portions of their range are not surveyed. However, the Eastern Breeding Waterfowl Survey (CWS in Ontario, Québec and the Atlantic Provinces) gives a good breeding population estimate for the area, with 87,400 pairs in 2003, and the 1990-2003 trend shows stable population. Aerial surveys and Christmas Bird Counts suggest the species may exceed one million birds in North America. Continentally, trends for combined merganser species are clearly positive.

1. Obtain more reliable estimates of population size.
2. Determine breeding densities on major rivers.

Population Definition/Delineation: Initial genetic data suggests that population delineation exists across North America. Substantial genetic differences are present between samples from Alaska/British Columbia and more southerly areas of North America (Pacific Northwest US and the Atlantic provinces of Canada). Additional genetic analyses are examining linkages between these breeding and various wintering locations across North America. Broad scale patterns in movements are based on fairly small samples of banded birds. No data are available on the location of major staging areas and on the number of birds using these areas.

1. Continue to determine location of major breeding, molting, and wintering areas and continue to determine linkages among specific breeding, molting, staging and wintering areas.
2. Continue to examine possible morphometric and genetic differences between birds of different breeding and wintering areas.
3. Refine biological and/or genetic relationships between eastern and western wintering populations with additional breeding samples from the interior boreal forest of Canada (coastal areas of Canada and the United States are fairly well represented by current collections)
4. Investigate associations between eastern Russia and North American populations.
5. Determine major migration routes and staging areas.

Population Dynamics: Little is known about the factors contributing to population regulation of Common Mergansers in North America.

1. Measure reproductive success in major breeding areas, especially on major river systems.
2. Determine survival rates of males, females and young.
3. Quantify the impact of brood amalgamation on duckling survival.
4. Obtain better estimates of age and sex ratios.
5. Determine reproductive success in nest boxes and assess their potential to counteract reduction in nest sites due to logging.

Population Ecology: Relatively few studies have been done on the breeding and wintering ecology of Common Mergansers. The species preys on fish and is often in apparent conflict with fisheries management initiatives.

1. Characterize breeding locations and identify areas of concentration.
2. Quantify the impact of Common Mergansers on fish populations.
3. Determine the impact of disturbance (rafting, fishing) on brood survival.
4. Investigate ecology of sub-adult birds.

Habitat requirements: Common Mergansers are cavity nesters and typically breed along rivers and along coastal areas where trees are large enough to provide cavities. Much remains to be learned about habitat requirements of mergansers, especially during molting and winter.

1. Identify and characterize important breeding streams and lakes.
2. Identify and characterize important molting sites on both fresh and salt water.
3. Identify and characterize important wintering sites.
4. Determine impact of logging and subsequent loss of nest cavities.

Harvest Assessment: An estimated 40,000-50,000 birds are harvested continentally through sport and subsistence harvest. Although not heavily hunted, Common Mergansers may be important locally. About half the estimated sport harvest of 27,000 birds occurs in the Atlantic flyway and the other half split between the Pacific and mid-continent flyways. Common Mergansers are fish eaters, often seen as undesirable on fish streams, where both legal and illegal control occurs on some streams. They may be vulnerable to gill net fisheries.

1. Improve harvest surveys.
2. Estimate magnitude of legal (permitted) harvest for depredation purposes.
3. Estimate magnitude of illegal shooting.
4. Evaluate magnitude of incidental take by gill net fisheries.

Parasites, Disease, Contaminants: As a predator, they are vulnerable to contaminants as a result of biomagnification. Thus, they are a good bioindicator for fish-bearing streams and lakes. In some local areas, concentrations of mercury in mergansers are a source of concern for human health and for the reproductive success of the birds themselves. In heavily fished rivers, lead poisoning from ingestion of fishing sinkers has also been identified as a source of mortality.

1. Determine contaminant levels in various parts of their breeding and wintering range.
2. Determine the impact of contaminants on reproductive success.

Red-breasted Merganser

(Mergus serrator)

Population Size and Trends: Size and trends of populations in North America are not reliably known because aerial surveys do not differentiate between Red-breasted and Common Mergansers, and because large portions of their range are not surveyed. Also, this is a late-breeding species, which implies that most of the regular waterfowl surveys occur too early to provide adequate estimates of population size. For example, in the St. Lawrence estuary, they initiate their nests well after the Common Eiders have hatched. The North American population probably numbers about 300,000 to 400,000.

1. Obtain more reliable estimates of population size in major wintering areas.
2. Determine optimal time for surveys of breeding birds.
3. Obtain more reliable estimates of population size in important breeding areas.
4. Evaluate the potential of surveys at key molting sites as a tool to monitor trends.

Population Definition/Delineation: Little is known about the various populations, but initial genetic data suggest little if any population differentiation across North American breeding areas. Red-breasted Mergansers breed and winter along the Atlantic, Pacific and Arctic coastlines as well as inland. It is not known whether there are subpopulations. It is possible that some of the birds wintering in Greenland breed in Canada, as do Harlequin Ducks and King Eiders.

1. Determine relationships between breeding and wintering areas.
2. Continue analysis on whether there are morphometric and genetic differences between east and west coast birds, between birds breeding in the north versus the south and between Canadian and Greenland birds.
3. Determine whether birds breeding in salt waters differ from those breeding on fresh waters.

Population Dynamics: Little is known about the dynamics of Red-breasted Merganser populations. Only one study has been done on reproductive success in North America, in Lake Michigan. Reproductive success in salt waters and in the north is unknown.

1. Measure reproductive success in different settings, especially in salt and brackish waters.
2. Determine survival rates of males, females and young in different breeding areas.
3. Obtain better estimates of age and sex ratios in various staging and wintering areas.
4. Determine survival rates of sub-adults.

Population Ecology: Only a few studies have been done on the breeding and wintering ecology of the species. Brood amalgamation is frequent in this species. The causes and function of this behavior are unknown, but it likely affects survival of young. There is a need for a few

comprehensive breeding biology studies in North America. Winter diet is not well known for most wintering areas.

1. Characterize breeding locations and identify areas of concentrations.
2. Identify major factors affecting reproductive success.
3. Quantify relationships between fish ecology and merganser feeding ecology.
4. Evaluate the impact of Red-breasted Mergansers on streams intensively managed for sport fishing.
5. Determine the ecology of molting mergansers.
6. Compare breeding ecology of coastal and inland breeding birds.
7. Quantify the diet of mergansers throughout the yearly cycle.
8. Evaluate the effect of disturbance (Rafting, canoeing, fishing) on important breeding streams for brood survival and identify ways to reduce it.

Habitat requirements: Knowledge of habitat requirements of Red-breasted Mergansers is still incomplete in several areas. Because of its low importance as a game bird, little information is available on this species. It is also one of the latest species to breed in the spring, so conventional surveys often do not adequately cover this species.

1. Characterize important breeding areas.
2. Identify and characterize important molting sites.
3. Identify and characterize important wintering sites.

Harvest Assessment: Mergansers constitute only a small proportion of waterfowl killed annually. From 1999-2006, the estimated continental sport harvest averaged 19,400 birds, of which 72% were shot in the Atlantic flyway and 22% from the Mississippi and Central flyways. Few data are available on subsistence harvests and illegal shooting. Vulnerability of the species to gill nets is also poorly known.

1. Improve harvest surveys.
2. Determine levels of subsistence harvest.
3. Determine whether gill net fisheries are an important cause of mortality.
4. Determine the level and extent of illegal shooting in fisheries management areas.

Parasites, Disease, Contaminants: Few data are available on this species. Most contaminant studies have been done in the Great Lakes. Because they are fish-eating birds high in the food chain, they are one of the most vulnerable sea ducks to contaminants. This also makes them an excellent indicator species for certain contaminants.

1. Determine contaminant levels in various parts of their breeding, molting and wintering ranges.
2. Determine parasite loads in various populations.

APPENDIX C – PROJECTS FUNDED OR ENDORSED BY THE SEA DUCK JOINT VENTURE SINCE 2001

Project summary reports are available for most projects at
http://seaduckjv.org/ssna.html

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
1	Seasonal Distribution of White-winged and Surf Scoters Wintering in Alaska.	Alaska Department of Fish and Game	2001	2001 2002
2	Identification of Beaufort Sea Duck Migration Corridor	CWS Prairie and Northern	2001	2001 2002 2003 2004 2008
3	Population Demography of Surf Scoters Wintering in the Strait of Georgia	CWS, Simon Fraser University	2001	
4	Movements and Habitat Use of Sea Ducks in the Atlantic Flyway	USGS Patuxent WRC	2001	2001 2002 2003 2004
5	Local Survival, Patterns of Philopatry and determination of Staging and Breeding Areas of Harlequin Ducks wintering in Maine and Maritimes	Coastal Maine Biological Research	2002	
6	Identifying Migration Routes and Wintering Areas of Common Eiders Breeding in Nunavut	CWS	2002	2002 2003
7	Ecology of Breeding Long-tailed Ducks on the Yukon-Kuskokwim Delta	USGS Alaska Science Center	2002	2002 2003
8	Spatial Population Genetic Structure of White-winged Scoters	USGS Alaska Science Center	2002	
9	Viruses in Long-tailed Ducks Molting in the Beaufort Sea	USGS National Wildlife Health Center	2002	
10	Breeding Habitat of Barrow's Goldeneye in Eastern Canada	CWS Quebec	2002	
11	Long Term Population Study of Harlequin Ducks in British Columbia	CWS, Simon Fraser University	2002	
12	Coastal Molting Locations of Scoters and Eiders in Easterm North America	CWS Quebec	2001	2001

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
13	Sea Duck Population Declines in British Columbia and the Role of Contaminants	CWS Pacific and Yukon	2002	
14	Survival and Recruitment of Common Eiders (*Somateria mollissima dresseri*) in the Gulf of Maine	USGS Patuxent WRC	2002	
15	Evaluating Effects of the Shellfish Industry on Scoter Populations in Coastal British Columbia	CWS Pacific and Yukon	2002	
16	East Coast Common Eider Initiative	Ducks Unlimited Canada	2002	2005 2006 2007 2008
19	White-winged Scoter Breeding Biology on Yukon Flats, Alaska	University of Alaska	2002	2004
20	Scoter Breeding Biology in the Mackenzie Delta	Ducks Unlimited Canada	2002	2003 2004 2005
21	Black Scoter Telemetry on Yukon-Kuskokwim Delta – pilot study	USGS Alaska Science Center	2002	2002
23	Identification of Beaufort Sea Duck Habitats	USGS Alaska Science Center	2002	2002 2003
24	Importance of the Alaskan Beaufort Sea to King Eiders	University of Alaska	2002	
25	Breeding Biology and Habitat Use of King Eiders on the Coastal Plain of Northern Alaska	University of Alaska	2002	2003
26	Population Delineation, Winter/Spring Habitat Use and Migration Ecology of White-winged Scoters and Surf Scoters Wintering in British Columbia	CWS, Simon Fraser University	2002	2002 2003 2004
27	Evaluation of Selenium Exposure in Common Eiders (Somateria mollissima): Effects on Organ Systems and Physiologic Changes	USGS National Wildlife Health Center	2003	2003
28	Determination of Breeding Areas, Migration Routes, and Local Movements Associated with Surf and White-winged Scoters Wintering in the Inner Marine Waters of Washington State	Washington Dept of Fish and Wildlife	2003	2003 2004 2005

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
29	Ecology of Common Eider Ducks Wintering in Association with Sea Ice, Belcher Islands, Nunavut	CWS Prairie and Northern	2003	2003
30	The Effect of Hunting and Avian Cholera on the St. Lawrence Estuary Common Eiders	University Quebec at Montreal	2003	2004 2005 2006 2007
31	Migration and Condition of Long-tailed Duck Wintering in Eastern Canada	CWS Ontario	2003	2003
32	Incubation Constancy and Breeding Philopatry in Surf Scoters	CWS Quebec	2003	
34	Effects of Nutrients on the Physiology, Energetics, and Behavior of Captive Sea Ducks Relative to Sea Duck Feeding Ecology in Chesapeake Bay	USGS San Francisco Bay	2003	
35	Wintering Ground Effects on Vital Rates of White-winged Scoters (Melanitta fusca) at Redberry Lake, Saskatchewan	University of Saskatchewan	2003	2004
36	Duckling Survival, Habitat Use, and Incubation Rates in Common Goldeneyes (Bucephala clangula) in the Chena River State Recreation Area	University of Alaska	2003	
37	Food Resources Available to Sea Ducks on Migration at the Restigouche River in New Brunswick, Canada and Potential Contaminant Problems	USGS Patuxent WRC	2003	
38	Assessment of the Pacific Black Scoter Population: Population Size, Distribution, and Links among Populations: An Integrated Approach	USFWS Region 7	2004	2004 2005 2006
39	Surveys of King Eiders, Long-tailed Ducks and Other Migratory Birds in the Central and Western Canadian Arctic	CWS Prairie and Northern	2004	2004 2005
40	Winter Population Delineation of White-winged and Black Scoters along the Pacific Coast using Genetic Techniques	USGS Alaska Science Center	2004	2004
41	Survival and Reproduction of Pacific Common Eiders on the Yukon-Kuskokwim Delta, Alaska	University of Alaska	2004	2004

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
42	Comparative Reproductive Strategies Between Long-tailed Ducks and King Eiders at Karrak Lake, Nunavut: use of energy reserves during the nesting season	University of Saskatchewan	2004	2004 2005
43	Factors Involved in Population Dynamics and Delineation of North American Mergansers	USGS Alaska Science Center	2004	2004 2005 2006
44	Winter Habitat Use and Selection of the Barrow's Goldeneye Eastern Population along the St. Lawrence River Estuary, Quebec, Canada	University Quebec Rimouski	2004	2004 2005 2006
45	Tracing Sources of Nutrients and Energy for Clutch Formation by White-winged Scoters	Simon Fraser University	2005	2005
46	Population Structure and Annual Survival Estimation of Female Black Scoters using Genetic Tagging	USGS Alaska Science Center	2004	2004
47	Cross-Seasonal Resource Use and Selenium Levels in Boreal Breeding White-winged Scoters	University of Saskatchewan	2004	2005
48	Development of a Sub-adult Plumage Identification Guide and Mid-winter Demographic Survey Protocol for Sea Ducks	CWS, Simon Fraser University	2004	
49	Demography and Moult ecology of Scoters in Eastern North America	CWS Atlantic	2004	2005 2006 2007
51	Habitat Use by Breeding and Post-breeding Red-breasted Mergansers in the Gulf of St. Lawrence	McGill University	2004	2006
53	Optimum Use of Outreach Products to Aid Management and Research Activities of Sea Ducks in Eastern North America	USGS Patuxent WRC	2004	
54	Monitoring Sea Duck Numbers and Distribution in Relation to Existing and Proposed Aquaculture Sites in Atlantic Canada and Reducing Interactions Between the Aquaculture Industry and Sea Ducks	CWS Atlantic	2004	
55	Monitoring Atlantic Flyway Black Scoters	CWS Atlantic	2005	2005

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
56	Evaluation of Methods for Estimating Population Abundance and Mapping Distribution of Wintering Scoters and other Sea Birds	USFWS Region 9	2005	2005
57	Estimating Distribution and Abundance of Wintering Sea Ducks in Nantucket Sound	Mass Audubon	2005	2005 2006
58	Population Dynamics of Pacific Common Eiders Nesting in the Aleutian Islands, Alaska	USGS, Alaska Science Center	2005	
59	Factors Influencing Survival and Recruitment of Pacific Common Eiders Nesting at Kigigak Island, Yukon Delta National Wildlife Refuge, Alaska	USFWS Yukon Delta NWR	2005	
60	GIS Analysis of Winter Habitat Use by Surf Scoters and White-winged Scoters	Simon Fraser University	2005	2005
62	The Value of Herring Spawn vs. Alternative Prey to Surf and White-winged Scoters in the Puget Sound-Georgia Basin	University Wyoming	2005	2005
63	Population Delineation, Winter/spring Habitat Use and Migration Ecology of Surf Scoters (*Melanitta perspicillata*) from Baja Mexico	USGS Alaska, Simon Fraser University	2005	2005 2006 2007 2008
64	Determining Mercury Exposure and its effects through Biomarker Assays to Breeding Surf Scoters in Southern Quebec	BioDiversity Research Institute	2005	
65	Spring Migration of Surf Scoters Along the Pacific Coast: Important Habitats and Energetic Implications	Simon Fraser University	2005	2005 2006 2007
66	Susceptibility of Common Eiders to West Nile Virus: A Model for Endangered and Threatened Eiders	USGS, National Wildlife Health Center	2005	
67	Wintering Common Eider Survey of Eastern North America	CWS Atlantic	2006	
68	Ecology, Population Dynamics and Traditional Use of the Common Eider (Somateria mollissima borealis) in the Northern Coastal Waters of Nunavik	CWS	2005	
69	Aerial Survey of Wintering Sea Ducks in Northern British Columbia	USFWS	2005	2005

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
70	Timing and Location of Acquisition of Nutrients and Energy for Clutch Formation by Black Scoters	Simon Fraser University	2005	
71	Ecological and Behavioral Monitoring of American Common Eiders (*Somateria mollissima dresseri*) over the Annual Cycle	U. Quebec Rimouski	2006	2006 2007 2008
72	Seasonal Habitat Requirements of Surf and White-winged Scoters in Puget Sound	University Wyoming	2006	2006
73	Development of Methodology for Monitoring Surf Scoters during Fall Staging in the St. Lawrence estuary	CWS Quebec	2006	
74	Accuracy and Precision of New (2002) Implanted Satellite Transmitters and Long Term Effects on Eiders	University of Alaska	2006	
75	Breeding Distribution and Habitat Use of Scoters in the Northern Boreal Forest: A Coordinated Approach Linking Wintering and Breeding Populations	USGS, San Francisco Bay	2006	
76	Determining Contaminant Availability and Expanding Current Abundance Assessments in an Eastern Population of Breeding Harlequin Ducks	BioDiversity Research Institute	2006	
77	Factors Influencing the Breeding Ecology of Surf Scoters at Lake Malbaie, Quebec	CWS Quebec	2006	
78	Delineation of Surf Scoter Habitat in Chesapeake Bay, Maryland	USGS, Patuxent WRC	2006	2006
79	Temporal and Geographic Distribution of the Aleutian Islands Pacfic Common Eider	USGS, Alaska Science Center	2006	2006 2008
80	Surveys of Common Eiders and Other Migratory Birds in the Bathurst Inlet area of Nunavut	CWS Prairie and Northern	2006	2006 2007 2008
81	Development of Sea Duck Population Estimates from Geo-referenced Aerial Surveys Conducted in Washington State and British Columbia	Washington Dept Fish and Wildlife	2006	2006
82	James Bay Black Scoter Survey	CWS Ontario	2006	2006 2008

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
83	Great Lakes winter sea duck survey	CWS Ontario	2006	2006 2007 2008
84	Winter Survey of Common Eiders on the Atlantic Coast of Canada	CWS Atlantic	2006	
85	Barrow's Goldeneye Telemetry Study in British Columbia	CWS Pacific and Yukon	2006	2008
86	Distributions of Sea Ducks in Southeast Alaska: Geographic Patterns and Relationships to Coastal Habitats	USGS, Alaska Science Center	2007	2007 2008
87	Molt Ecology of White-winged Scoters in the St. Lawrence estuary	CWS Quebec	2007	2007
88	Testing the Demographic Independence' of Molting Groups of Common Mergansers on the Kodiak National Wildlife Refuge, Alaska	USGS, Alaska Science Center	2007	2007
89	Foraging Values of *Mulinia lateralis* and *Ischadium recurvum*: the Impacts on Surf Scoters Wintering in the Chesapeake Bay	USGS, Patuxent WRC	2007	2007
90	Effects of Implanted Transmitters with Percutaneous Antennae on Breeding and Foraging Behavior of Captive Sea Ducks Used as Surrogates for Wild Sea Ducks	USGS, Patuxent WRC	2007	2007 2008
91	Movements of Common Eiders Breeding along the North Shore of the Gulf of St. Lawrence: Relationships Between Breeding, Molting and Wintering sites	CWS Quebec	2007	2007
92	Diet of Surf Scoters Molting in Eastern North America	Dalhousie University, NS	2007	2007
93	Spring Body Condition and Breeding Propensity of Surf Scoters along the Pacific Coast	USGS, San Fran Bay	2007	2007
94	Inorganic Contaminant Concentrations and Body Condition of Common Goldeneye Wintering on the Great Salt Lake, Utah	Utah State University	2007	2007
95	Lake Ontario January Sea Duck Survey	Long Point Waterfowl & Wetlands Research Fund	2007	2007
96	Pacific Black Scoter Breeding Survey	USFWS Alaska	2007	2007 2008

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
97	Avalon New Jersey Sea Watch: Evaluating Techniques and Assumptions	NJ Audubon	2007	2007 2008
98	Waterfowl Breeding Population Survey for Central and Western Arctic Canada	USFWS and CWS	2007	2007 2008
99	Feeding Ecology of Wintering Long-tailed Ducks *Clangula hyemalis* on Nantucket Shoals	CSI/CUNY	2007	
100	Development of an Alternative Method to Reduce Gull Predation on Common Eider Broods	U. Quebec at Montreal	2007	
101	Effects of Competitive Dominance of an Exotic Crab, *Carcinus maenas*, over the Native Crab, *Hemigrapsus oregonensis*, on Nutrient and Energy Acquisition by Harlequin Ducks Wintering along the West Coast	USGS Patuxent	2007	
102	Delineating Breeding Populations and Tracking Night-time Movements of Long-tailed Ducks Wintering in Nantucket Sound	Massachusetts Audubon Society	2007	
103	Pt. Lepreau, New Brunswick Sea Duck Migration Monitoring	Saint John Naturalists' Club, Inc.	2008	2008
104	Distribution, Habitat Characteristics, Prey Abundance and Diet of Surf Scoters and Long-tailed Ducks in Polyhaline Wintering Habitats in the Mid-Atlantic region	College of William and Mary	2008	2008
105	Examining the Iimpact of Avian Cholera on the Population Dynamics of a Long-lived Sea Duck, the Northern Eider	Environment Canada	2008	2008
106	Comparative Demography of Three Cavity Nesting Sea Ducks: Bufflehead and Common and Barrow's Goldeneyes	USGS Alaska Science Center	2008	2008
107	Molting Ecology of Surf and White-winged Scoters in Southeast Alaska	USGS Alaska Science Center	2008	2008
108	Population Delineation and Wintering Ecology of Surf Scoters in Southeast Alaska	Simon Fraser University	2008	2008
109	Atlantic Coast Sea Duck Survey	USFWS	2008	2008

SDJV Project #	Title	Lead agency(s) or Organization(s)	Year Endorsed	Years funded by SDJV
110	Sea Duck Abundance, Habitat Associations and Productivity in the Hudson Bay Lowland	Ontario MNR	2008	
111	Establishing a Mercury Exposure Profile for Wintering Harlequin Ducks	Biodiversity Research Intstitute	2008	
112	Location and Characterization of Sea Duck Molting Sites in Ungava Bay, Nunavik, Québec	CWS Quebec	2008	
113	Survival and Molt Chronology of Common Eider Males in the St. Lawrence Estuary	Univ Quebec Montreal	2008	

APPENDIX D – "PRIORITIES" MATRIX FROM THE SDJV STRATEGIC PLAN FOR 2001-2006

POPULATION	COEI				KIEI	SPEI	STEI	HARD		BLSC	SUSC	WWSC	LODU	BUFF	COGO	BAGO		HOME	COME	RBME
INFORMATION NEED	P	H	N	A				W	E							W	E			
Population Definition/ Delineation	H	M	H	L	H	L	M	M	H	H	H	H	H	H	H	M	M	H	M	M
Population Size & Trend	H	M	H	M	H	M	H	M	H	H	H	H	H	M	M	H	H	H	M	M
Population Dynamics	H	H	H	H	H	M	H	M	H	H	H	H	H	M	M	M	H	L	H	H
Population Ecology	M	H	M	L	M	H	H	M	H	M	M	M	M	M	M	M	M	L	M	M
Habitat Requirements	M	M	M	M	M	H	M	H	M	M	M	M	M	L	M	L	H	M	M	M
Harvest Assessment	M	H	H	H	H	M	M	L	L	M	M	M	M	L	M	L	M	M	M	M
Disease/Contaminants	L	L	L	L	L	M	L	L	L	L	M	M	M	L	L	L	M	L	M	M

Because of differences in accepted taxonomy or marked differences in breeding and/or winter range, some species are subdivided into populations:

Common Eider races: Pacific, Hudson Bay, Northern, American
Harlequin Duck: Western, Eastern
Barrow's Goldeneye: Western, Eastern

Species names and abbreviations:

Common Eider	COEI	*Somateria mollissima*	Long-tailed Duck	LODU	*Clangula hyemalis*
King Eider	KIEI	*Somateria spectabilis*	Bufflehead	BUFF	*Bucephala albeola*
Spectacled Eider	SPEI	*Somateria fischeri*	Common Goldeneye	COGO	*Bucephala clangula*
Steller's Eider	STEI	*Polysticta stelleri*	Barrow's Goldeneye	BAGO	*Bucephala islandica*
Harlequin Duck	HARD	*Histrionicus histrionicus*	Hooded Merganser	HOME	*Lophodytes cucullatus*
Black Scoter	BLSC	*Melanitta nigra americana*	Common Merganser	COME	*Mergus merganser*
Surf Scoter	SUSC	*Melanitta perspicillata*	Red-breasted Merganser	RBME	*Mergus serrator*
White-winged Scoter	WWSC	*Melanitta fusca deglandi*			

APPENDIX E. LETTER FROM NAWMP ASSESSMENT STEERING COMMITTEE TO SEA DUCK JOINT VENTURE STAFF

North American Waterfowl Management Plan
Plan nord-américain de gestion de la sauvagine
Plan de Manejo de Aves Acuáticas de Norteamérica

ASSESSMENT STEERING COMMITTEE
February 23, 2007

Mr. Tim Bowman, Coordinator (US)
Mr. Keith McAloney, Coordinator (Canada)
Mr. Bob Blohm Acting Management Board Co-Chair (US)
Mr. Doug Bliss, Management Board Co-Chair (Canada)
Sea Duck Joint Venture

Dear Sirs:

As the review team that conducted the Sea Duck JV interviews in Toronto on September 28-29, 2005, we want to say we were very impressed with your presentations and preparation for our visit. Your team showed great energy, enthusiasm, and innovation and your efforts are greatly appreciated.

We thank you for your patience as we developed this feedback for your Joint Venture. It has taken longer than anticipated to get to this point as we focused first on finishing the final Assessment Report for the Plan Committee.

The following comments are offered as objective observations and constructive suggestions. We hope that they will assist you and your partners to improve upon the good work you have done in the past and contribute to a renewed sense of common purpose. Attached please find Characterization Matrices for both the Habitat and Species JVs, which summarize the Assessment Steering Committee's views of the status of the JVs in various developmental categories at the time of their interviews. As you consider these matrices we also encourage you to review Appendix F from the Assessment Report (attached) for ideas from your peers on how to address future needs. We hope that you will find these independent perspectives helpful as you advance your work on behalf of the Plan.

General Impressions

We found the SDJV to be well prepared. Your JV had invested a lot of time in preparing for the assessment and you were well represented by key technical staff that were very knowledgeable on their subject matter. Good biology and science was evident throughout the presentations and the follow-up question and answer sessions. For a relatively new JV, the SDJV appears to have come a long way in a very short period of time and has accomplished much with modest funding and resources.

Your JV representatives appeared to be highly motivated, focused, and seem to work well together. “Turf” issues do not appear to be a problem for this JV. Most technical committee members contribute fully by reviewing planning documents and ranking research proposals. This partnership seems very strong.

Your communication products are very good, especially the website which contains a wealth of relevant information on sea ducks and the activities of the JV.

We view SDJV science as cutting edge, e.g., satellite tracking, building genetic databases. You are on the frontier breaking into new areas of waterfowl conservation science. Your research program (call for proposals, evaluation and ranking proposals) is very good.

Your presentation clearly showed strong geographical connections to countries that are currently not signatories to the North American Waterfowl Management Plan, especially Greenland and Russia. At some future date it might be prudent for the Plan Committee to consider making better connections to these countries to help further waterfowl conservation in North America.

You sought peer review outside of the immediate sphere of your JV partners for some of your planning and implementation documents. Your JV is to be commended for doing this and we encourage you to continue peer review where appropriate.

Concerns:

The SDJV coordinators often feel they can not justify their attendance at meetings of JV coordinators, where agenda items are often related exclusively to habitat JVs. So far, the nexus between your JV and habitat JVs has been weak, although that may improve with your growing emphasis on monitoring distribution and abundance of sea ducks.

Communication and coordination connections between your JV and the NSST appear to be weak and poorly defined. In addition, your connections to coastal JVs are not uniformly strong and well developed.

Funding support for your JV seems to be somewhat inconsistent. It seems to us that your JV should be receiving support from both the U.S. and Canada through respective federal appropriations.

In discussing assessment question 2A, it was stated that there are no clear, quantified NAWMP continental population goals for sea ducks and that it is doubtful these numbers will be available for the 2009 Plan update. Your JV feels its job is to develop estimates and trends for these populations but defining continental population goals should be done by someone else, perhaps the NSST, the Plan Committee, or the Flyways. This is a gap that needs to be addressed by the NAWMP Community.

Proposed new wind turbine farms and aquaculture facilities in coastal areas pose significant potential threats to sea ducks in many areas. These issues warrant close monitoring as they unfold.

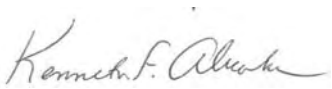
Recommendations:

We offer the following recommendations for your consideration:

- JVs with a coastal component (Pacific Coast, San Francisco Bay, Upper Mississippi Valley/Great Lakes, Atlantic Coast, and Eastern Habitat) should be encouraged to send representatives to Sea Duck Symposiums as they occur, to increase awareness of sea ducks in general and to strengthen connections between the SDJV and habitat JVs.
- Species JVs should be encouraged to attend all meetings of JV Coordinators to strengthen connections, improve lines of communication, and to explore areas of mutual concern/interest.
- The Upper Mississippi River /Great Lakes Region JV or the Eastern Habitat JV may have a role to play in monitoring wintering sea duck populations (particularly long-tailed ducks) on the Great Lakes. These needs/priorities need to be explored and discussed between the respective JVs and their partners.

In closing we thank you for your cooperation in this NAWMP assessment process. More importantly, however, we thank you and your partners for their dedication and hard work on behalf of the waterfowl of North America. You are doing good work in a professional manner and you are to be commended for that. It was a pleasure to share in your work and to be on your review team.

Sincerely yours,



Dr. Ken Abraham

Mr. Lorne Colpitts

Dr. Eric Reed