

STATE of the RESOURCE

The Plan has as a principal focus the identification and facilitation of conservation action at a continental scale. Recommended actions are based on an examination of the state of waterbird populations and waterbird habitats, including associated issues and threats. They also pertain to inventory and monitoring programs, research, and communication, education and public awareness activities critical to conserving all waterbirds in the Americas.



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Parakeet Auklets

Population Status

Estimates of current population sizes and trends for colonial waterbirds occurring in the Plan area are provided in Appendix 1. [Data for solitary nesting waterbirds (marshbirds) will be presented in subsequent versions of the Plan.] These numbers and trends were derived from the best professional judgment of species experts and information from the literature. The time period used to estimate trends for most species was 1970 to present, and the precision and accuracy of this information vary widely.

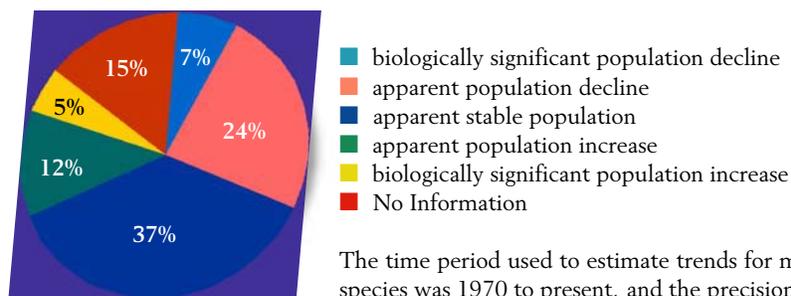
For such large, conspicuous, and in some cases economically important waterbirds, it is astounding how few and how poor are the available data on population status. Historical continental estimates are largely not available. Some significant attempts to estimate populations occurred during the 1970s and 1980s, but these efforts and some continuing monitoring programs were limited in geographic extent. Population estimates for approximately 20% of colonial species, including most species not breeding in the Plan area,

are not provided in Appendix 1 due to a lack of information.

For many species, population data derive from colony-based monitoring programs of varying intensity that estimated breeding pairs during the 1990s. Therefore, population estimates, in most cases, best reflect breeding populations. In cases where non-breeding individuals were also present at colony-sites, these estimates may approximate total populations in the Plan area. Total population and wintering population information are lacking for most species and most of the Plan area.

As shown in Figure 3, the estimates of population trend for 166 species of colonial waterbirds indicate that seven percent of species are showing a biologically significant population decline and another 24 percent show apparent declines. Importantly, up to 17 percent show population increases. Generally these increases are due to populations rebounding from previous reductions due to contaminants or hunting, or are related to increased availability of artificial food sources.

Figure 3. Estimated Population Trends for Colonial Waterbirds



The time period used to estimate trends for most species was 1970 to present, and the precision and accuracy of this information vary widely.

Information was insufficient to estimate trends for 15 percent of species.

Achieving the goal of sustainable continental populations of waterbirds requires better information on population status. Knowledge of population sizes is needed to assess conservation risk and population trends, and to determine the relative importance of defined geographic areas to the various species. Population trend information is important to assess the effectiveness of waterbird management prescriptions. Thus, a continent-wide, coordinated long-term program to monitor and evaluate population sizes and trends is essential.

Assessing population status is also a necessary preliminary step to setting population goals. However, the uncertainty of global and continental population information makes goal setting at the continental scale impossible at this stage. Population goals are of more value when associated with habitat goals, and this can best be accomplished at the regional scale.

Population Conservation Issues and Threats

Conservation of waterbirds in the Americas requires addressing a multitude of threats and other concerns, many of which are shared across the Plan area. Although the details of these issues are too long and complex to describe fully here, the following recommendations should be considered by those planning and implementing waterbird conservation to enable coherent and coordinated actions.

The demography of many waterbirds is such that adult mortality is the key determinant in population trends. Thus, whenever possible, threat management should be aimed at reducing adult mortality to levels associated with sustainable regional populations. However, in many cases the only management options available are at colony sites, and actions aimed at reducing juvenile mortality may be justified in absence of alternatives.

Conflicts with Fisheries

Great numbers of ocean-feeding seabirds are incidentally caught and killed by longlines, gillnets, and other gear used in fisheries around the world (an occurrence called incidental catch or bycatch). Beginning in the



Laysan Albatrosses

early 1990s, on-board observer programs have been used to collect data on the bycatch of specific species, and estimates of incidental take of seabirds have been calculated for some fisheries. To date, these efforts have focused on marine fisheries in the Pacific, such as in the Bering Sea, Gulf of Alaska, and Hawaiian waters; efforts in the Atlantic are underway. In general, the significance of fishery impacts on seabird populations at the colony-level has yet to be determined. Moreover, since 1999, changes in management of the Alaska and Hawaii fisheries are likely resulting in dramatically reduced bycatch levels.

Fisheries can also have indirect negative effects on waterbird populations. Fishing levels or food-web interactions can affect the availability of prey. Bycatch of forage fish as well as fisheries that target the same prey used by waterbirds may reduce the birds' food supplies. Trawling the sea bottom alters the habitat on which the prey of seabirds and coastal waterbirds depends. Some bird populations may experience "beneficial" impacts brought about by the presence of offal and fish waste as an additional food source; however, such benefits need to be evaluated in terms of possible negative impacts from increased likelihood of incidental take, or heightened competition or predation resulting from unnatural population increases of one species over another. Ultimately, fishery managers should be striving to implement practices that will decrease human impacts on waterbird populations, thus maintaining natural population cycles.

Seabirds and other colonial waterbirds are sometimes identified as having adverse effects on marine fisheries, but the existence of significant economic impacts has seldom been shown under scientific scrutiny. Similarly, impacts by waterbirds on inland fisheries are generally unsupported by good quantified data, despite perceptions to the contrary.

- ❖ The impact of fisheries on waterbirds should begin to be addressed in all fishery management policies and programs.
- ❖ Policies similar to the U.S. Fish and Wildlife Service waterbird bycatch policy—that waterbird bycatch in fisheries is to be eliminated—should be embraced by all fisheries management entities.
- ❖ Nations conducting longline fisheries or in whose waters longline fisheries operate, should develop and enact national plans of action for reducing bycatch of seabirds to levels that do not affect regional population size, distribution, or demography.
- ❖ Fishing nations should implement existing international agreements and enact new agreements that require conserving seabird populations as essential goals and outcomes of all fisheries programs.
- ❖ High seas fisheries should be brought under international regulation due to the potential of significant cumulative impacts to far-ranging seabirds.
- ❖ Bycatch reduction should be achieved through development and deployment of multifaceted mitigating measures, and outreach, education, and training programs within the affected fisheries and consumer groups.
- ❖ Effective data collection and monitoring programs should include regular reporting on mortality due to fisheries, and collection of data on the population status and trends of colonies and regional populations of affected species, thereby allowing for a better understanding of the quantitative impacts of fisheries.
- ❖ The take of targeted fish species or nontarget bycatch species eaten by waterbirds should not be permitted to reduce fish stocks to levels incapable of sustaining bird populations.
- ❖ Fishing operations that adversely affect sea bottom habitat that supports prey of seabirds and coastal waterbirds should be altered to reduce or eliminate the impact.
- ❖ Where legal, management involving deliberate killing of waterbirds to reduce impacts on fisheries should occur only on a case-by-case basis, and only if the

economic impacts are clearly proven and the control measures do not adversely affect the sustainability of regional bird populations. Given the preponderance of technical evidence that waterbird predation does not usually have significant economic effect, the burden of proof should be on demonstrating economic harm on a case-by-case basis; similarly the burden of proof in permitting control measures should be on demonstrating no adverse effect on regional sustainability of affected bird populations.

- ❖ Where possible, seabird and other waterbird conservation action should work in partnership with fishery industries and sport anglers to effect conservation action.

Aquaculture

Aquaculture provides artificially concentrated food supplies, such as crayfish, shrimp, catfish, tropical aquarium fish, juvenile trout and salmonids, baitfish, mussels, and oysters. In many areas, governments are encouraging the development of aquaculture activities. Aquaculture can affect the distribution and population size of waterbirds, even on a continental scale in that populations may shift to take advantage of new food sources. Efforts to control these birds now being used or proposed are the killing of adults and juveniles at aquaculture sites or in colonies and roosts and destroying eggs or young in colonies. The demand for control can be tremendous. For example, in the Southeastern U.S., 108,000 waterbirds were legally destroyed between 1987 and 1995. More are probably destroyed illegally, increasing the cumulative impact of aquaculture-related mortality. Over the long term, controls at aquaculture sites could prove unsustainable for some species. Alternative techniques for reducing real economic impact are available, including careful site-selection, barriers, bird-unfriendly pond construction, colony site translocation, and subsidies to compensate for losses.

- ❖ Whenever possible, waterbird conservationists should work in partnership with the aquaculture industry to find solutions to conflicts that assure regional sustainability of waterbird populations



Little Blue Heron

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Foraging wading birds

- and limit economic impacts on aquaculture facilities.
- ❖ As in the case of fishery conflicts, attempts to reduce local populations at aquaculture facilities should occur in specific, localized situations only if economic impacts are proven before action is undertaken and control measures are shown to not adversely affect the sustainability of regional bird populations. Again, the burden of proof should be on demonstrating significant economic harm on a case-by-case basis and on demonstrating that regional waterbird population sustainability will not be impaired. The local and regional effects of permitted controls must be monitored.
- ❖ Where legal, permitted take of waterbirds should occur only after considering the cumulative impact of all other management actions on waterbird population sustainability; cumulative management actions should not be allowed to adversely affect regional population sustainability.
- ❖ Regulations guarding against illegally destroying waterbirds at aquaculture sites should be enforced.

Abundant Species Conflicts

Waterbirds, especially colonial species, have the capacity for rapid population and range changes, especially in response to changes in food availability or release from other ecological constraints. There usually is inconclusive evidence as to why population changes have occurred, as several factors are usually in play. It has not been shown that any colonial waterbird is now unsustainably abundant across its entire range in the Plan area, although in local situations population abundance may now exceed historical norms. When some waterbird populations, particularly fish-eating species, become locally higher than in the immediate past, there is the potential for conflict with human activities. In such cases human factors, especially economic and social, can come to dominate management dialogue. Abundant species also have the potential to affect local vegetation, rare plants, or other birds. Thus, ecological factors, too, may be of concern, if proven.

Abundant waterbirds need to be managed within their social context. Real or imagined social impact may

require management of social perceptions, as much as the birds themselves, through disclosure of scientific findings and public education. Regulations regarding lethal control of birds vary with country. For example, killing of migratory birds is not legally allowed in some jurisdictions, whereas in others these actions may be allowed with specific permission.

- ❖ Scientific findings must form the basis of any management action on abundant waterbirds.
- ❖ Scientifically credible studies of the real economic or ecological impact of abundant waterbirds, as well as sociological studies of the perception of impact, are needed broadly across the different types of waterbird/human conflicts. Cases of apparent local abundance leading to human conflicts require individual evaluation by scientifically valid means.
- ❖ Conflicting technical interpretations within the scientific community need to be mediated.
- ❖ Alternative management actions that do not involve severe intervention should be developed.
- ❖ The demography of each abundant species should be thoroughly studied, modeled and understood in order to inform appropriate management actions, but also to refine modeling techniques and provide findings of value to other less abundant species that are more difficult to study.
- ❖ Perception of the public to abundance issues should be monitored and evaluated; social, not only biological factors, should be managed by agencies responsible for waterbirds.
- ❖ Education programs and other communication measures should be used to inform the public about management decisions, including decisions of no-action when economic or ecological impacts are low.
- ❖ Where legal, permitted take to reduce local waterbird populations should occur only on a case-by-case basis, should be local, and should adhere to the Plan's goals of assuring regional population health and sustainability. Given the preponderance of scientific findings that abundant waterbirds have limited economic impact, management action should only be undertaken after explicit demonstration of substantial

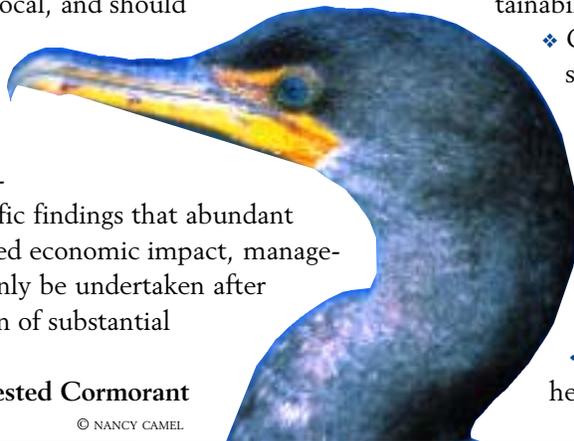
economic or ecological harm.

- ❖ Methods of culling or control should be carefully evaluated and relative to the impact on the regional population. Programs involving total colony removal or colony discouragement should be used only in very extraordinary circumstances and only when viable alternative colony or roost sites are successfully created and sustained over the long term.
- ❖ Where legal, permitted take of abundant waterbirds should factor the cumulative impact of all other deliberate management actions on the sustainability of the population, not only in the area of possible impact but within the population's entire wintering and breeding ranges. Waterbird mortality resulting from permitted take should not be allowed to adversely affect regional population sustainability.
- ❖ Any management action must be monitored sufficiently to detect any adverse population trend.
- ❖ Sustainable agriculture, which incorporates bird conservation as a goal, rather than a challenge, and which requires compensation and assistance programs, should be explored. For example, the development of new aquaculture facility designs and upgrades to existing facilities should be encouraged through public assistance programs.

“Nuisance” Congregation Sites

Waterbirds can establish roosts and colonies in close proximity to human habitation leading to economic and natural resource conflicts. Lacking evidence of health effects, aesthetic considerations tend to predominate in such conflicts. Management action, education and community engagement can sometimes turn nuisance sites into valued community resources. In rare situations when control is needed as a last option, actions should be mitigated and must not adversely affect sustainability of regional populations.

- ❖ Congregation sites used by waterbirds should not be eliminated because of aesthetic or cultural conflicts alone, but should be managed for educational, scientific, and conservation purposes. Urban sites especially should be developed as educational opportunities and used to enhance conservation of waterbirds.
- ❖ For demonstrable reasons of human health or natural resource protection, con-



Double-crested Cormorant

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gregation site management including elimination or alteration may be considered.

- ❖ Programs involving bird removal or colony discouragement should be used only in extraordinary circumstances and only where no adverse effect on the local or regional populations will occur and viable alternative sites are successfully created, used and sustained.
- ❖ Colony and roost sites should be protected not only during nesting season but also year-round, including when not being used by waterbirds; destruction should be discouraged except as part of a regional management plan for the species.



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Brown Pelicans

Hunting

Sport or food hunting and trapping of some species of waterbirds are legal activities in parts of the Plan area. In other countries, hunting of most waterbird species is illegal. Human-induced mortality of adult and subadult waterbirds has the greatest potential to depress populations; it may be possible in local cases to hunt eggs or young birds and not adversely affect population stability.

- ❖ Hunting policy should be based on the assumption that increased adult mortality has the potential to affect population status and trend, unless shown otherwise for specific populations.
- ❖ Hunting of adult or subadult waterbirds should be carefully regulated and monitored so as not to adversely affect regional populations.
- ❖ If egg and juvenile hunting is permitted for subsistence hunting, it should be allowed only if it is shown that such mortality does not impact regional population sustainability.
- ❖ Where legal hunting, including subsistence hunting, is permitted, continued monitoring and evaluation of impact is needed.

Disturbance

Disturbance can be due to human intrusion on the ground, water, or air. Examples of disturbance are kayaks and jet skis that allow close approach, low flying aircraft, pets and feral animals, off-road vehicles, and other outdoor activities. However, the ability to habituate to non-intrusive disturbance is common in waterbirds, and many waterbird colonies persist and thrive in highly populated areas. Research sometimes involves purposeful disturbance to waterbirds that includes nest disruption, capture, banding, marking, handling, attaching transmitters, extracting blood and so forth. These methods are necessary, but must be carried out with care and individually assessed as to their conservation impact.

- ❖ All accessible breeding and roost sites should be identified to the public, posted, protected, patrolled and anti-disturbance policies developed and implemented as needed.
- ❖ Additional research is needed on the appropriate buffer distances around colonies or breeding sites for various waterbird species and various types of sites.
- ❖ Depending on the colony or breeding site and circumstances, human intrusion (such as for research,

monitoring, environmental education) is not necessarily disruptive and may be beneficial in enhancing the birds' habituation to disturbance.

- ❖ Intrusive, disruptive disturbance should be tightly managed and monitored by agencies responsible for waterbirds at all sites where it occurs, especially to minimize disruption of nesting, lowered reproductive success, or abandonment of the breeding site.

Light Impacts

Lights in close proximity to colonies can affect nesting waterbirds. Squid fisheries using lights at night and lights on oil platforms at sea attract seabirds, such as storm-petrels and murrelets. The bright lights of coastal developments can disorient waterbirds.

- ❖ The effects of lights on waterbirds need to be better understood.
- ❖ Regulatory programs, to reduce the adverse effects of lights both on the water and on the shore need to be developed, implemented, and enforced.

Predators and Competitors

At many breeding sites—beaches, coastal islands, seabird islands, inland pothole regions, and even remote Alaskan islands—mammalian and avian predators kill nesting waterbirds, their eggs, and/or chicks. In many cases the presence or numbers of predators and the ease of accessibility to the sites are not natural. Sometimes it is only a few individuals that cause damage. Competition for nesting sites may occur between abundant or between increasing species and other nesting species.

- ❖ Where predation or competition type, level and effect is natural, demonstrably unaffected by human actions, and does not adversely affect sustainability of the affected population, predator control is not warranted; in cases when predation is demonstrably affected by humans, or the effect may critically impact a population, control may be acceptable.
- ❖ Lethal predator or competitor control should be considered only when convincing evidence exists that a particular predator is having demonstrable negative impact on nesting success of vulnerable waterbird species.
- ❖ Control of competition for nest sites should take into

consideration the regional and local sustainability and health of all waterbird species involved.

- ❖ Non-lethal control of native predators and competitors should be tried before lethal methods are employed.
- ❖ Methods that target offending individuals should be used in preference to more general removal programs.
- ❖ Relocation of predators should be used only when all impacts of such relocation are considered.



Great Egret

Invasive Species

Invasive species can be particularly detrimental to waterbird populations and habitat, especially on islands. Introduced predators can depress or even eliminate populations. Herbivores and exotic plants can degrade habitat quality or even eliminate use of sites by waterbirds. Insects, such as fire ants, can kill nesting waterbirds. Others serve as disease vectors.

- ❖ As a general policy, invasive exotic plants and animals should be eliminated from waterbird habitat.

Contamination and Eutrophication

Pesticides, fertilizers, metals, and industrial chemicals have added large nutrient and toxic burdens to freshwater and coastal estuaries and open oceans, and have affected waterbird individuals and populations.

- ❖ The effects of contaminants should be better under-



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stood, especially implications at the population level, contamination sources, pathways to the birds, sub-lethal effects and synergistic effects.

- ❖ Monitoring of contaminant loads and effects in waterbirds and maintenance of long-term data and tissue repositories are needed throughout the Americas.
- ❖ Changes in habitat due to water quality alterations should be avoided or reversed in important waterbird habitat.

Oil and Hazardous Materials

Oil is a major environmental threat to oceanic, coastal, and inland species, especially along major shipping transportation corridors. Oil may be released during

platform construction, drilling in wetlands and offshore, shipping and spillage, and chronic, low-level seepage from surface runoff or subsurface sources. Waterbirds are commonly injured by oil spills, chronic oil discharge in bilge water, and hazardous material releases. Birds affected annually can number in the hundreds of thousands in some areas. Injuries can lead directly to mortality or have indirect effects through habitat degradation, reduced reproductive success, or contaminated food supplies. As upper trophic level feeders, waterbirds rely on healthy aquatic environments to provide the food base necessary for reproduction, migration and general maintenance.

- ❖ Oil effects on waterbirds should be minimized through increased enforcement on shipping activities, safe operational procedures, spill clean up, and when effective, rehabilitation of oiled birds.
- ❖ Every effort to eliminate threats to waterbirds should be made in policies for offshore petroleum leasing and operations. Where threats to waterbirds cannot be eliminated, such threats should be mitigated.
- ❖ The effects of oiling on populations should be better understood.
- ❖ Death and morbidity of waterbirds from oiling should be monitored wherever they occur.
- ❖ The efficacy and approaches to rehabilitation of oiled waterbirds should be improved and implemented where effective.

Debris Ingestion and Entanglement

Waterbirds, especially seabirds, ingest materials and debris as a natural consequence of foraging. Ingesting plastics and other artificial flotsam can be detrimental. Waterbirds are caught in discarded fishing line, nets and other waste.

- ❖ Dumping of debris, used line, and nets should be prohibited and the prohibition enforced by all authorities.
- ❖ Existing debris posing a threat to waterbirds should be removed as possible.
- ❖ Widespread, internationally supported education campaigns should be developed and implemented to inform ocean industries, such as the cruise industry, of the need to eliminate ocean dumping of materials that result in seabird mortality.
- ❖ A specific international educational campaign should be targeted at the sport and commercial fishing industries in order to eliminate in-water disposal of

persistent fishing line, nets and traps.

- ❖ Non-persistent lines, nets and traps should be developed.
- ❖ Research on the use of lead sinkers and their effect on waterbird mortality rates should be undertaken and appropriate action considered.

Disease, Natural Toxins, and Parasites

Diseases, such as Newcastle's disease, avian cholera, algae poisoning, and likely West Nile Virus, affect waterbirds. Sometimes die-offs of unknown causes may occur, such as in the Salton Sea. Waterbirds may harbor human pathogens, such as tick-borne diseases.

- ❖ Habitat management should be undertaken in ways to avoid the occurrence of avian diseases.
- ❖ The human health effects of waterbird concentrations should be studied in particular situations.
- ❖ Human health issues should be resolved by assuring human avoidance of waterbird sites, rather than destruction of waterbird habitat.

Species Conservation Status

The conservation status of 166 species of seabirds and other colonial waterbirds utilizing habitats in the Plan area was assessed (see Table 2 and Appendix 1). Expert assessment of the conservation status of 44 solitary-nesting waterbirds will be presented in subsequent versions of the Plan.

In brief, the process for assigning colonial waterbirds to categories of conservation concern followed a protocol adapted from those used by Partners in Flight and the U.S. Shorebird Conservation Plan that considers vulnerability to population loss due to population trend, abundance, threats and distribution (See Appendix 2). The protocol for colonial species also accommodates the special conservation issues of species that aggregate during the breeding season and/or utilize extensive marine habitats. Over 150 ornithologists and wildlife managers contributed to the development of the Plan's conservation status assessment protocol and species



Royal Tern colony

Thick-billed Murre ➤ *Razorbill* ➤ *Black Guillemot* ➤ *Pigeon Guillemot* ➤ *Marbled Murrelet* ➤ *Kittlitz's Murrelet* ➤

TABLE 2. Conservation Status and Distribution of Colonial Waterbirds

CATEGORY OF CONSERVATION CONCERN ^a	DISTRIBUTION ^b				
	North America	Western Hemisphere	Northern Hemisphere	Cosmopolitan	Peripheral
Highly Imperiled	Ashy Storm-Petrel Newell's Shearwater Townsend's Shearwater	Black-capped Petrel Hawaiian Petrel	Black-footed Albatross	Audubon's Shearwater Band-rumped Storm-Petrel	Phoenix Petrel ^c Tahiti Petrel ^c Polynesian Storm-Petrel ^c
High Concern	Bermuda Petrel Black-vented Shearwater Brandt's Cormorant Craveri's Murrelet Kittlitz's Murrelet Least Storm-Petrel Xantus's Murrelet	Bare-throated Tiger-Heron ^d Black Skimmer Black Storm-Petrel Blue-footed Booby Blue-gray Noddy Christmas Shearwater Greater Shearwater ^c Jabiru Least Tern Little Blue Heron Magnificent Frigatebird Pink-footed Shearwater ^c Snail Kite Snowy Egret Tricolored Heron Wood Stork	Aleutian Tern Ancient Murrelet Laysan Albatross Marbled Murrelet Pelagic Cormorant Red-faced Cormorant Red-legged Kittiwake Ross's Gull Short-tailed Albatross ^c	Arctic Tern Bridled Tern Brown Booby Gull-billed Tern Masked Booby Red-billed Tropicbird Red-footed Booby Roseate Tern White-tailed Tropicbird	Herald Petrel ^c Little Gull Little Tern
Moderate Concern	American White Pelican California Gull Cassin's Auklet Forster's Tern Heermann's Gull Western Grebe Yellow-footed Gull	Anhinga Bonaparte's Gull ^d Brown Pelican Elegant Tern Franklin's Gull Gray-backed Tern Neotropic Cormorant Reddish Egret Roseate Spoonbill White Ibis Yellow-crowned Night-Heron ^d	Bonin Petrel Common Murre Crested Auklet Dovekie Great Skua ^c Horned Puffin Ivory Gull Least Auklet Northern Fulmar Pigeon Guillemot Razorbill Thayer's Gull Thick-billed Murre Tristram's Storm-Petrel Whiskered Auklet	Black-crowned Night-Heron Black Tern Black Noddy Bulwer's Petrel Cory's Shearwater ^{cd} Eared Grebe Great Cormorant Great Frigatebird Manx Shearwater Red-tailed Tropicbird Royal Tern Sooty Shearwater ^c Sooty Tern South Polar Skua ^c White Tern	Black-headed Gull Great Crested Tern Juan Fernandez Petrel ^c Lesser Black-backed Gull ^c
Low Concern	Clark's Grebe Green Heron Western Gull	White-faced Ibis	Glaucous-winged Gull Iceland Gull Parakeet Auklet Rhinoceros Auklet Tufted Puffin	Caspian Tern Common Tern Flesh-footed Shearwater ^c Glossy Ibis Greater Flamingo ^d Herring Gull Leach's Storm-Petrel Long-tailed Jaeger Parasitic Jaeger Pomarine Jaeger Sabine's Gull Wedge-rumped Storm-Petrel ^c Wedge-tailed Shearwater	White-necked Petrel ^c
Not Currently At Risk	Double-crested Cormorant Ring-billed Gull	Great Blue Heron Laughing Gull Northern Gannet	Atlantic Puffin Black Guillemot Black-legged Kittiwake Fork-tailed Storm-Petrel Glaucous Gull Great Black-backed Gull	Brown Noddy Cattle Egret Great Egret Mew Gull Sandwich Tern Wilson's Storm-Petrel ^c	Buller's Shearwater ^c Cook's Petrel ^c Short-tailed Shearwater ^c
Information Lacking		Agami Heron Boat-billed Heron Fasciated Tiger-Heron Green Ibis Rufescent Tiger-Heron Striated Heron			Capped Heron Cocoi Heron Kermadec Petrel ^c Lesser Frigatebird ^c Mottled Petrel ^c Nazca Booby ^c Scarlet Ibis Slaty-backed Gull Western Reef-Heron White-winged Petrel ^c

Xantus's Murrelet ➤ *Craveri's Murrelet* ➤ *Ancient Murrelet* ➤ *Cassin's Auklet* ➤ *Parakeet Auklet* ➤

Table 2 Footnotes

^a Categories of Conservation Concern are defined as:

Highly Imperiled: Species with significant population declines and either low populations or some other high risk factor.

High Concern: Species that are not Highly Imperiled. Populations known or thought to be declining and have some other known or potential threat as well.

Moderate Concern: Species that are not Highly Imperiled or High Concern. Populations are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; or c) relatively small with relatively restricted distributions.

Low Concern: Species that are not Highly Imperiled, High Concern or Moderate Concern. Populations are either a) stable with moderate threats and distributions; b) increasing but with known or potential threats and moderate to restricted distributions; or c) of moderate size with known or potential threats and moderate to restricted distributions.

Not Currently at Risk: all other species for which information was available.

Information Lacking: inadequate information available to assess risk.

^b Distribution categories are broadly defined as:

North America: Includes all species that breed and winter only in North America as defined in the Plan.

Western Hemisphere: Includes all species that breed and winter in North America and South America and associated oceanic regions.

Northern Hemisphere: Includes all species, except those included in the above categories, that breed and winter in the Northern Hemisphere and associated oceanic regions.

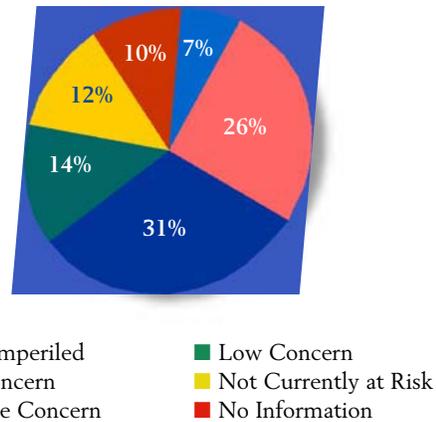
Cosmopolitan: Includes all species that breed and winter in most hemispheres including North America and associated oceanic regions.

Peripheral: Includes all species that occur largely outside of North America but with breeding and/or non-breeding ranges that overlap peripherally with North America and associated oceanic regions.

^c Species does not breed in the Plan area.

^d Species fits into a range of categories because of a missing factor score (see Appendix 1). Species is shown in the concern category of greatest vulnerability.

FIGURE 4: Conservation Status of Colonial Waterbird Species



information base. The full details of the methods and results may be found in a companion publication¹.

As a result of the conservation status assessment, species are classified in one of five categories indicating the level of conservation concern. The relative responsibility and importance of conservation planning efforts in the Plan area to global biodiversity vary by species. Thus, to make concern categories more meaningful, species are also categorized by distribution. Twenty-two species of waterbirds considered in the Plan are limited to the Plan area. The others included in the Plan range into South America or other continents of the Northern Hemisphere; some have worldwide distributions or occur largely outside of the Plan area. Taken together, the conservation concern and distribution categories allow prioritization of conservation strategies.

Figure 4 shows that of the 166 species of colonial waterbirds assessed in the Plan area, 7 percent are highly imperiled and another 26 percent are of high concern. Of greatest concern are many species of island-nesting seabirds with limited breeding distributions and whose populations have declined in part due to introduced predators. These species are particularly vulnerable, as they lay a single egg per breeding season, and may require five to eight months to incubate, hatch and raise their nestling to independence.

Genera of greatest concern include *Phoebastria* (albatrosses), *Oceanodroma* (storm-petrels), *Puffinus* (shearwaters), and *Pterodroma* (petrels). Also of concern are *Sula* (boobies), *Brachyramphus* and *Synthliboramphus* (murrelets), *Phaethon* (tropicbirds), *Phalacrocorax* (cormorants), *Egretta* (egrets), and *Sterna* (terns). Genera with most species of low or no current concern include *Larus* (gulls), *Plegadis* (ibises), *Fratercula* (puffins), *Ardea* (herons) and *Stercorarius* (jaegers).

Habitat Needs

The habitat needs of waterbirds include places to nest, feed, roost, or loaf (rest). By definition, these species depend on aquatic habitats for some portion of their lives.

Nesting habitat is critical. Colonial species gather together to nest, while the nests of solitary breeders are dispersed across suitable habitat. The placement of nests and nesting location varies with species, as does flexibility in the placement of nests. Normally, the location of nests provides relative isolation from predators, such as on islands, cliffs, swamps or summits (see Figure 5). More than half of colonial waterbirds require islands for colony-sites. Nearly three-quarters of seabirds and other colonial species are nest-site specialists with relatively inflexible habitat requirements. Nest-sites used by colonial waterbird species include trees/shrubs, open ground (e.g., grass, sand, tundra), marshes, burrows, crevices, and ledges (see Figure 6). Nesting activity may affect the qualities of a site over time. For example, the presence of a nesting colony may cause changes in a site's vegetation. Likewise, changes in vegetation may affect site suitability for nesting. Sand-nesting terns, for example, prefer nesting sites regularly reconfigured or swept free of vegetation by storms.

Waterbirds feed in nearly any and all aquatic habitats. The foraging habitat needs of each particular species,

FIGURE 5: Nesting Location of Colonial Waterbirds

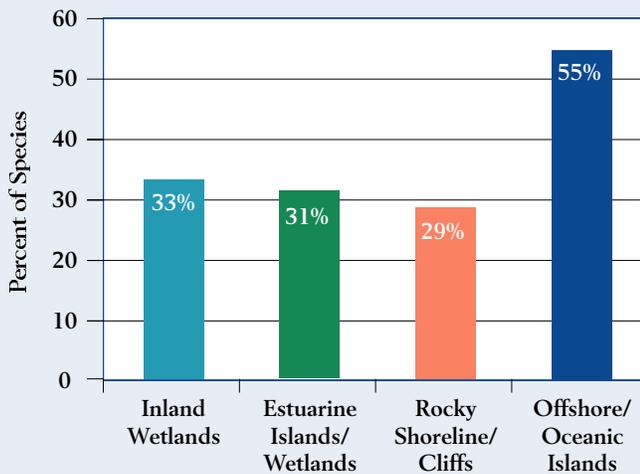


FIGURE 6: Nest Placement of Colonial Waterbirds

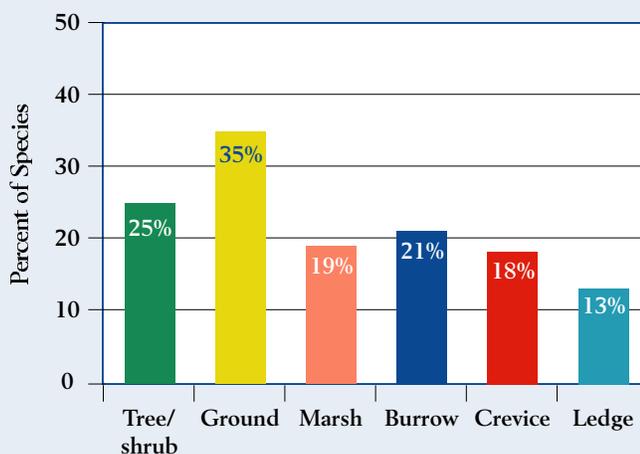
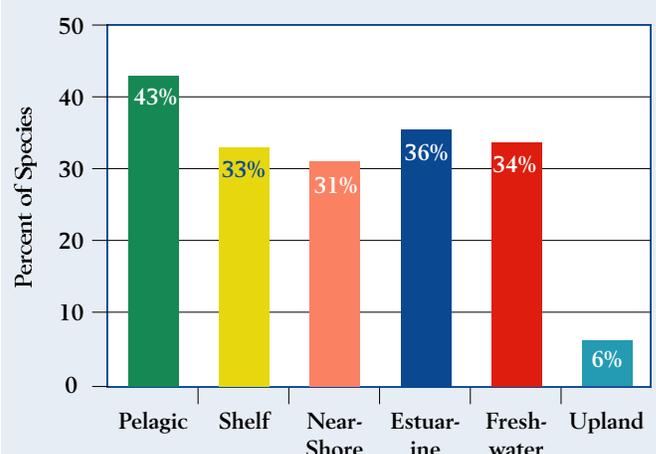


FIGURE 7: Foraging Habitats of Colonial Waterbirds



Tufted Puffin ↗ Snail Kite ↗ Least Grebe ↗ Pied-billed Grebe ↗ Red-necked Grebe ↗ Horned Grebe ↗ Eared Grebe

however, can be quite specific. Foraging habitats for colonial species are shown in Figure 7. Nearly half forage in offshore marine habitats including shelf waters or open ocean. Over 100 species utilize freshwater and estuarine wetlands. Sixty percent use more than one aquatic habitat. Waterbirds nest within commuting distance of feeding sites. Some species, including some marshbirds, may feed only in territories around their nest. Colonial waterbirds flying to feeding sites may travel short distances (Black Guillemots tend to feed within one to four kilometers) or undertake long commutes (herons may feed 20-30 kilometers away, while some petrels and albatrosses fly hundreds of kilometers to feed). Because commuting distances to foraging grounds from nesting areas differ between species, the amount and quality of habitat required throughout the nesting season vary.



Great Blue Heron

© WALKER GOLDER

Assessing habitat use and requirements is a necessary preliminary step to establishing habitat goals that can translate into actual habitat acreage on the ground. However, goal setting at the continental scale is not possible at this stage. Habitat goals must first be established at regional and local scales, and then extrapolated to the continental scale. Habitat goals will be established on a regional basis as part of regional waterbird planning efforts.

Habitat Conservation Issues and Threats

It is because of the diversity of habitat needs among waterbirds that conservation action should emphasize protection and management of all available aquatic habitats. Those sites and areas found to be of particular importance to waterbirds, already subject and conducive to active management, or containing vulnerable species should be the highest priorities.

Nesting Habitat Concerns

Where the availability of nesting habitat is a limiting factor to populations, protection and usually management of this habitat are essential to sustaining healthy populations. Nesting habitat can be destroyed by a

range of activities, including but not limited to drainage, forestry practices, agriculture, aquaculture, pollution, disturbance, and development for residential or industrial purposes. In the case of colonial nesters, a surprising number of breeding sites are on artificial habitat, such as spoil islands, dikes, bridges and causeways, fill, even rooftops, and these sites often require management or maintenance to remain useful to waterbirds.

Colonies may change character over time due to vegetation death or succession, often caused by the birds themselves.

❖ As a management tool, active and potential colony sites and nesting habitats should be inventoried in each country and region. A matrix of used and potentially used breeding sites should be maintained across each regional landscape and used for site

and regional planning to assure sufficient breeding habitat availability.

- ❖ Public and private agency managers responsible for waterbird conservation should maintain or enhance the quality of important or selected breeding sites using manipulations, as needed and appropriate, such as vegetation or substrate alterations or predator control, including the control of other waterbirds on a case-by-case basis. The results of management actions at breeding sites should be monitored, and actions revised as appropriate.
- ❖ The need for alternative breeding sites should be determined on a regional basis, and where appropriate, habitat or sites should be established or re-established. The importance of human-made nesting sites to waterbirds within a region should not be underestimated. In most areas such sites need to be protected and managed.

Commercial interests can adversely affect waterbirds' breeding sites. Guano mining at islands in Mexico and in Latin America, for example, can adversely affect seabirds.

- ❖ The effects on colonial waterbirds of guano mining and other industries need to be understood in each



© WALKER COLDER

White Ibises in flight over Battery Island Sanctuary

case and the activity should be wisely managed for sustainability of waterbird populations.

Availability of foraging habitats is also vital to the reproductive efforts of waterbirds.

- ❖ Conservation planning for nesting habitat must also include associated foraging habitat.
- ❖ Feeding sites and the distances traveled to reach them must be understood for each species, and a network of feeding situations secured and managed.

Non-Nesting Habitat Concerns

Seabirds and other colonial waterbirds often congregate throughout the year. In non-nesting seasons, they gather at roosts and loafing areas. These sites require both protection and management to maintain their value to waterbirds.

- ❖ Roost and loafing sites should be inventoried and monitored on a regional basis, and those that are used over a number of years may merit consideration for acquisition.
- ❖ Disturbance to roost and loafing sites should be minimized using all available management tools.

Wintering, migrating, and other non-nesting habitats are critical to the long-term conservation of waterbirds. Presently, there is little information on habitat needs outside of the breeding season for many species, particularly during migration.

- ❖ Waterbird conservation strategies should establish monitoring programs during the non-breeding season, targeting habitat use away from the nesting sites. Information from these programs will assist in identifying, preserving, and managing habitats that provide suitable sites for migrating, foraging, roosting, as well as breeding waterbirds.
- ❖ Because habitat used by migrating water birds is poorly understood, surveys and inventories of migration habitat use should be undertaken.

Reduction in Habitat Quality

Aquatic habitats, wetlands especially, are subject to significant physical and chemical modifications from water management, dredging, ditching, siltation, runoff, and introduction of

invasive plant species—modifications that destroy or degrade habitat for waterbirds. Remaining natural wetlands need to be preserved, protected, and actively managed to retain their ecological functions. The needs of waterbirds should be integrated into strategies for all wetland management and mitigation programs.

- ❖ Since waterbird use of wetlands is variable by nature, regulators permitting wetland changes should evaluate waterbird use on a case-by-case basis on time scales spanning both annual and multi-year hydrologic cycles.
- ❖ In the U.S., Canada, and Mexico, wetland conservation projects funded under the North American Wetland Conservation Act should include consideration of waterbirds, and rules for wetland projects should be further refined to support waterbird conservation.
- ❖ Farm programs, such as the U.S. Wetland Reserve Program, should be used to benefit waterbirds.

Throughout the Americas, one of the most common issues relating to wetland alteration is water management. Management of natural and artificial wetlands for purposes of water supply, flood control, vegetation management, fish production or even management of

other aquatic birds can affect suitability for waterbirds.

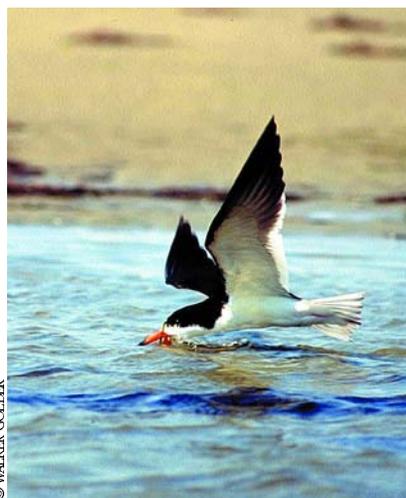
- ❖ Waterbird conservation should be an explicit goal of water managers, whatever their other principal goals. For example, allocation of water supplies should include conservation allocation that is of benefit to waterbirds.

Human-created aquatic habitats, such as islands, reservoirs, dammed rivers, artificial wetlands, rice fields, and aquaculture facilities provide important habitat for waterbirds. At some sites, such as man-made islands and peninsulas adjacent to Canadian cities on the Great Lakes, aquaculture facilities in Louisiana, and reservoirs in the western and southeastern U.S., waterbird populations have become dependent on artificial habitats. On the other hand, artificial wetlands—now created widely for mitigation—have seldom proven to be as productive as natural wetlands.

- ❖ The role of artificial habitats in the sustainability of waterbirds should be understood in different landscapes.
- ❖ The success of wetland mitigation programs should be assessed and reported to assure meeting of management goals for waterbirds.
- ❖ Where they support waterbirds, artificial habitats should be managed appropriately. Where needed, subsidies should be provided to continue management practices that benefit waterbirds.

Coastal zone policies and practices associated with land-use and development, coastal protection, water quality, dredging, resource extraction including sport and commercial fisheries, and disturbance can significantly affect the ability of coasts and intertidal waters to sustain waterbirds.

- ❖ Coastal zone management policies should include sustainability of waterbird populations as a goal, including conservation of feeding, nesting, and roosting sites for resident, migratory and wintering waterbirds. This requires that the effects of policies be understood and that a commitment to sustainable waterbird populations underlie all actions taken by government, industry and citizens.



Black Skimmer

Open, sandy beach habitats are particularly subject to disturbance. Nesting, foraging, and loafing waterbirds may be adversely impacted by bathers, runners and walkers, off-road vehicles, and anglers on beaches.

- ❖ Beach sites used by waterbirds need to be identified and managed by responsible authorities. Management might include site protection, appropriate sand and vegetation manipulations, closures and enforcement, predator control, and monitoring.

Dredging along the coasts, such as for ship and boat channels, can be used to create and enhance nesting and roosting sites for waterbirds. Beach restoration projects can similarly benefit nesting birds, or can adversely impact their habitat, including from contaminated sediment.

- ❖ Maintenance, establishment, and enhancement of waterbird habitat using dredged materials need to be explicitly treated as a priority by all agencies conducting dredging projects in order to enhance benefits to waterbirds while avoiding conflicts with other users.
- ❖ Planning for beach replenishment and dredge disposal operations should be coordinated at a regional level and be consistent with wetland protection and enhancement efforts nationally and regionally.
- ❖ Created sites require continued management, and this should be the primary responsibility of the organization creating the habitat.

The location and design of potentially attractive facilities such as airports, landfills, municipal wastewater wetlands, can be critical to future bird-human interactions, including health and safety issues.

- ❖ Plans for such facilities should be designed to minimize or eliminate human conflicts and impacts to regional waterbird populations.

Climate Change

Sea level is rising along mainland and island coastal areas. Climate change also affects rainfall patterns and resulting wetland hydrology in interior areas. These changes affect habitat availability and ultimately the seasonal timing of nesting and migration.

- ❖ Conservation planning needs to take into consideration the long-term inevitability of climate change in establishing reserves, and securing nesting and feeding sites that will function under future conditions.
- ❖ The effects of climate change on normal ocean cycles and sea ice formation need to be determined or better understood.

Key Sites for Waterbirds

Waterbird populations may come to depend on specific areas and sites for their stability. Coloniality or congregatory behavior—gathering in colonies, roosts and feeding areas—result in discrete sites supporting sizable portions of local or wider populations at some time during the year. Waterbirds are also localized by specialized habitat requirements for nesting and/or for feeding, resulting in these habitats and sites being critically important for population health and sustainability.

A variety of site classification systems already exist throughout the Plan area, some of which already confer protection to birds, for example, Migratory Birds Sanctuaries and National Wildlife Areas in Canada, National Wildlife Refuges or Marine Protected Areas in the U.S. or lands in the National System of Protected Areas (Sistema Nacional de Áreas Protegidas) in Mexico. Other systems identify sites in order to engender management attention or serve as candidates for protected areas. These sites and areas need to be recognized for all species and at all scales, and such sites need to be managed in a way to protect their value for waterbirds.

The Important Bird Areas (IBAs) initiative is a good example of a program that recognizes and supports sites of importance for all birds. Waterbird conservation

planners should focus on ensuring that IBA programs are well developed in the Plan area and assist in the protection and management of sites that are identified as important to waterbirds. The IBA program is detailed below.

Important Bird Areas Program

Program Structure

Sites are identified as IBAs through the application of criteria based on numbers and types of birds. The IBA identification process provides a data-driven means for cataloging the most important sites for birds, prioritizing projects, and allocating limited resources. The IBA program engages a variety of partners, such as citizens, landowners, and public and private organizations, throughout the process. In addition to identification, the process might include monitoring, habitat restoration, site stewardship, advocacy, and fundraising. The identification of an IBA is therefore a starting point for site-based conservation efforts.

The IBA program was initiated by BirdLife International in Europe in the 1980s, and is supported by partners around the world. BirdLife International has partners for much of the Plan area. In Canada, BirdLife's partners include Bird Studies Canada and the Canadian Nature Federation. BirdLife International's partner in the U.S. is the National Audubon Society. American Bird Conservancy has also developed a list of IBAs, some of which are important for waterbirds. In Mexico,

CIPAMEX is the BirdLife International partner. [In Mexico and other Spanish-speaking countries, IBAs are known as Áreas de Importancia para la Conservación de las Aves (AICAs).] In the Caribbean and Central America, BirdLife International partners are active in a



© PETER LATOURETTE

Pied-billed Grebe

number of nations and projects to identify IBAs are underway.

Criteria

Based on the criteria developed by BirdLife International, an IBA must maintain and support one or more of the following: species of concern (e.g., threatened and endangered species); restricted-range species (vulnerable because they are not widely distributed); species that are vulnerable because their populations are concentrated in one general habitat type or biome; or individual species or groups of similar species that are vulnerable because they occur at high densities due to their congregative behavior. While all criteria apply to waterbirds, some are particularly important for species that inherently congregate in specific habitats and sites.

To further establish priorities for conservation efforts, sites identified as IBAs are classified with regard to their overall significance in a hierarchical fashion—global, continental, national, and state/provincial. Global significance is determined by internationally consistent criteria set forth by BirdLife International. Sub-global criteria are structured by the partner organiza-



Horned Puffins

tion to be most appropriate for the particular planning region.

IBAs and the Plan

The IBA programs existing within the Plan area will be used to inform the Plan and as a vehicle for implementing site-based conservation. These programs are at different stages of development. The IBA program in Canada has essentially concluded much of its identification activities at the global and national level, and is

focusing on site management and protection. In the U.S., the National Audubon Society has agreed to support the Plan by identifying waterbird IBAs. Mexico has indicated that their primary National Bird Conservation Strategy in Mexico focuses on the AICA program. BirdLife International and its national partners are identifying and facilitating conservation at IBAs in Central America and the Caribbean.

Other Key Sites

The IBA Program, as described in the previous section, utilizes a strict set of criteria to identify sites. Waterbird conservation at the regional or local level requires identification and management of sites that, while not qualifying as IBAs, are critical to local populations. These sites might be recognized based on factors such as social or educational value, intrinsic aesthetic value, economic value (ecotourism), or simply professional judgment. If desirable, conservation planners and managers are encouraged to target such sites for conservation activities. In some instances, a state or provincial program might also identify these sites as IBAs through the application of their own criteria.

Criteria for IBAs of Global Significance

- ❖ The site regularly holds significant numbers of a species that is a globally threatened species or a species of global conservation concern.
- ❖ The site supports significant populations of an endemic or restricted-range species.
- ❖ The site is known or thought to hold a significant assemblage of the species whose distributions are largely or wholly confined to one biome.
- ❖ The site supports >1% of a biogeographic population of a waterbird species, or > 1% of the global population of a seabird or the site supports, on a regular basis, >20,000 waterbirds or >10,000 pairs of seabirds of one or more species.

Links to IBA Programs:

Canada: www.bsc-eoc.org, www.cnf.ca

U.S.: www.audubon.org/bird/iba

Mexico: www.iztacala.unam.mx/cipamex

In the Americas: www.birdlife.net

Inventory and Monitoring

Monitoring waterbird populations and habitats across the continent is required to determine conservation status, detect population trends, assess health of habitats, and indicate whether environmental changes and management prescriptions are affecting waterbirds. Populations of some waterbirds have been counted for decades and for some groups of birds in specific locations, considerable long-term information is available. However, most waterbirds, if monitored at all, have been surveyed by various parties using different methodologies over multiple scales, resulting in data sets that are very difficult to compare.

In many cases, data are lacking altogether. Especially in Mexico, the Caribbean, Central America, and northern Canada, limited information is available concerning use of sites for nesting, roosting, and feeding. Information on waterbird populations using migration hot spots and key wintering areas is lacking for all of North America, Central America and the Caribbean. Information on seabird by-catch associated with commercial fisheries is needed. Monitoring cryptic waterbird species requires special development. This lack of information hinders our abilities to manage and evaluate populations throughout their ranges. Our ability to refine waterbird conservation planning and evaluate management



Least Tern

actions at multiple geographic scales is dependent on a coordinated continental system of inventory and monitoring programs and a centrally managed repository for waterbird data.

Central to creating this system and repository is the establishment of an alliance in which participants agree to use comparable techniques and contribute their data. The National Bird Population Data Center at U.S. Geological Survey, Patuxent Wildlife Research Center (USGS Patuxent), through their Waterbird Monitoring Partnership, is working to accommodate groups collecting waterbird data throughout the continent by centralizing the storage of and access to waterbird monitoring data. Centralized storage and access will allow the Waterbird initiative to identify gaps in survey information, assess how well conservation strategies are working, test key assumptions, and implement adaptive management prescriptions. The goals of the Waterbird Monitoring Partnership include centralizing data storage and management, developing standardized census methods, developing statistically valid and logistically feasible waterbird sampling schemes tied to hypothesis-driven monitoring programs, developing standardized models for analyses of waterbird data, and identifying and filling in gaps in continental waterbird monitoring programs.

Centralized Data Storage and Access

The National Bird Population Data Center has already developed a data repository to archive data on waterbirds throughout their ranges, regardless of survey locality or survey method. This centralized database is publicly accessible and allows managers to submit and retrieve data over the World Wide Web (www.mp2-pwrc.usgs.gov/cwb/). Ultimately, it will be linked to other databases covering specific bird groups or regions of the Plan area, such as the Pacific Seabird Database and data collected by the International Waterbird Census of Wetlands International.

Standard Methodologies

Large scale monitoring programs must use techniques that permit population and habitat data collected in different locations and across multiple geographic or temporal scales to be

compared and combined. A specific need is the ability to sample at large scales using various methods and still meet trend detection goals. Setting up and testing monitoring methods and then evaluating their precision and power to detect trends are crucial for effective conservation.

USGS Patuxent, through the Waterbird Monitoring Partnership, will work with all waterbird partners to develop a manual of recommended standardized population monitoring methodologies having sufficiently low bias to be useful in trend analysis. To assist with integrating bird

conservation across the continent at other geographic scales, every effort must be made to develop spatially explicit criteria for use in a common GIS-based system. The Waterbird Monitoring Partnership will help to create an *a priori* sampling design to provide sufficient coverage during the breeding and non-breeding seasons, allow merging of data among surveys, and allow statistical inferences to be made.

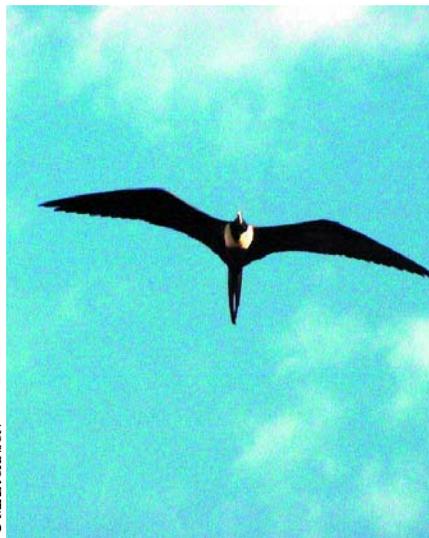
Monitoring Goal

The monitoring goal of the Plan is to be able to detect greater than 50% change over 10 years or 3 generations. This goal mirrors one proposed by the World Conservation Union in their criteria for identification of species at risk.

Filling the Gaps

With a data repository and standard methodologies in place, partners will be able to identify gaps in current population survey efforts and coordinate an integrated network of statistically valid, bias controlled, long-term, waterbird population monitoring programs throughout the Plan area.

Monitoring programs should track populations of waterbirds at the regional scale as well as the continental scale. In particular, basic inventories of waterbird colony sites and nesting habitats in Mexico, Central America, and the Caribbean nations should be conducted. Determining relative abundance and species composition is the first step in identifying IBAs and



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Magnificent Frigatebird

establishing other programs in these areas.

The Waterbird Monitoring Partnership will address the paucity of information on waterbird habitat needs outside of the breeding season by developing nonbreeding surveys that focus on important wintering habitats, including pelagic foraging areas for seabirds. One critical task of the Waterbird Monitoring Partnership is to establish a mid-winter census (to include shorebirds and waterfowl as well as waterbirds) linked to the International Waterbird Census being conducted by Wetlands Inter-

national for the RAMSAR Bureau in Europe, Africa, Asia, and South America. For many countries, lack of resources dictate that censuses include as many species as can be accommodated by a census technique. The Waterbird Monitoring Partnership will work with other bird initiatives to implement a mid-winter waterbird census incorporating all waterbirds. If such a census is successfully implemented in North America, Central America, and the Caribbean, global population estimates will be available for all waterbirds.

There is a need for demographic information (e.g. reproductive success, adult mortality) on particular populations and for particular species. Comprehensive monitoring programs should include a demographic component. The Waterbird Monitoring Partnership will help partners develop sampling frameworks, and within these frameworks, identify particular sites for collecting demographic data.

Habitats, as well as populations, have to be monitored, thus waterbird monitoring efforts should include a habitat component. Habitat data and analyses must be robust enough to allow correlation with population trends at many scales. Where the potential exists, integration with existing habitat monitoring programs or those developed for other bird groups will be pursued. Monitoring programs focusing on other aspects of waterbird biology or on environmental factors, for example contaminants and disease, should be included in monitoring schemes as appropriate.

Scientific Information Needs

Conservation of waterbirds in the Americas requires a sound scientific basis. Much is known about the conservation biology of waterbirds, but much remains to be understood. Below is an evaluation of the priority research needs for waterbird conservation. Many of these needs are discussed elsewhere in the Plan; they are repeated here to encourage recognition by the research community.

Species, Populations, and Habitat Information

Understanding genetic and demographic population structure is essential to formulating proper conservation schemes. For example, priorities depend on knowing whether particular subspecies or genetically identifiable populations are threatened, or distinguishing which populations are sources or sinks. Additional study, through banding and modeling, is needed to further waterbird population biology.

Comparative population trend analyses from different geographical regions will provide important insights into the relative effect of human-induced perturbations. Once a threshold for action is determined, assessments of trend significance can guide the management of these effects.

The degree to which populations show high fidelity to certain sites for breeding, during migration, or in winter is an important knowledge gap in conservation planning at present. Research into the key features that provide consistently high habitat quality is also needed.

Management-oriented Research

Additional information is needed on the population effects of several key threats and concerns. Research should be conducted on all of the following topics to ameliorate related negative impacts:

- ❖ Importance of hunting as a source of mortality to waterbirds
- ❖ Role of commercial fisheries in seabird mortality
- ❖ Importance of aquaculture facilities as a food base for waterbirds where natural habitat displacement has occurred
- ❖ Population-level significance of killing waterbirds near aquaculture facilities
- ❖ Methods to reduce the real and apparent impacts of certain waterbirds in urban and suburban landscapes

- ❖ Better predator control and eradication methods at colony sites
- ❖ Impact of different types of human disturbance, including researchers, on nesting success in colonies
- ❖ Determining population level effects of contaminants including oil on waterbirds at the population level
- ❖ How manipulations of habitats, including wetland creation and restoration, marsh management, irrigation modification, impoundment management, increase attractiveness to waterbirds
- ❖ Adaptive resource management approaches to restore nesting habitat for rare or declining species.

Ecosystem and Large-scale Issues

The role that waterbirds play in their respective ecosystems—in energy and nutrient flow, or in affecting prey species dynamics, for example—is little known in most situations. In particular, information is lacking on how habitat and energy needs change for long distance migrants, as they move among high, mid and low latitudes, and the degree to which fish populations are coupled to waterbird populations remains largely unknown.

Research is needed on the effects of global weather changes. Major changes in ocean regimes occur in short cycles that are somewhat predictable in frequency as well as on longer (multidecadal) scales. Aquatic prey availability is correlated with these changes, and evidence is beginning to emerge that population changes of some seabirds may be associated with these regime shifts. Better understanding is needed of the role of

Banding is an essential tool in the study of waterbird populations and demography. Band returns give insight on population demography and distribution, thus research and monitoring using banded waterbirds should be encouraged. Banding training modules need to be developed, and training and certification of those banding waterbirds must be initiated. Band quality should be improved and saltwater-resistant bands need to become available. Banding data repositories must be redesigned to deal with long-lived waterbirds that are re-banded numerous times during their life. Many historic databases exist which must be conserved. The use of radio and satellite telemetry should also be increased.

cyclical oceanic changes in seabird sustainability.

Changing weather patterns can be expected to influence habitat use by coastal species (e.g., shifts due to rising sea levels), but the vulnerabilities of other habitats in the Plan area have not been studied in detail. For example, it is not known precisely how changes in rainfall and temperature patterns might affect waterbirds in interior wetlands.

Based on the data that do exist, conservation of all waterbirds must take into account the need for populations to accommodate long-term cycles and large-scale changes.



© JEFF HATFIELD

American Bittern

Communication, Education, and Public Awareness

The dissemination of information is an essential component of waterbird conservation. Waterbirds live in a world increasingly dominated by humans. For many and perhaps most species, their survival can be assured only with public awareness of their existence and public support for measures that protect them and their habitats.

Fortunately, many waterbirds, due to their visibility and beauty, can easily garner positive public attention and support. It also allows them to serve as effective teaching tools. Congregatory behavior can further enhance these advantages. For example, colony and roost sites may be excellent venues for education and advocacy programs, such as colony adoption programs and interpretive displays at viewing points. The publicity enjoyed by many waterbirds allows them to serve as ambassadors for all aquatic birds.

A public in support of waterbirds and properly informed on conservation issues represents a huge reservoir of potential supporters, volunteers and advocates. They can assist with monitoring of colonies and roosting areas to assess populations and prevent disturbance; work with local parks, refuges, and agencies to improve management of colonies and wetland habitats; and seek adoption of appropriate legislation at every level to better protect waterbirds and their habitats. With the dissemination of scientifically valid informa-

tion, perhaps adverse public perception of a few abundant fish-eating species could be reversed. Waterbird conservation should become part of the citizenry's environmental consciousness, and community-based organizations, committed to waterbird conservation are essential. In addition to the general public, natural resource decision makers and educators are particularly important audiences for waterbird conservation information.

An abundance of environmental outreach programs already exists. Therefore, a waterbird conservation communication program should involve the development and fostering of partnerships in order to incorporate waterbird conservation into existing programs as well as develop new, targeted projects. A Waterbird Communication and Outreach Coordinator—most likely an individual associated with an NGO—should be designated to facilitate information sharing and oversee the formation and implementation of waterbird education and public awareness activities.

Education and awareness activities may take a variety of forms and provide a diversity of experiences. The steps in development of any outreach program are:

- ❖ Identify priority target audiences, recognizing that priority audiences will differ in various regions, especially in different countries.
- ❖ Determine critical messages.
- ❖ Identify sources of information.
- ❖ Develop strategies for reaching priority audiences, especially using existing programs.
- ❖ Develop or identify model education and outreach materials to incorporate into local programs.
- ❖ Develop information and dialogue exchange mechanisms, especially on the Internet.
- ❖ Evaluate results and adapt approaches as necessary.

In general, emphasis should be on local programs where individuals have the opportunity to have their lives changed by personal experiences with waterbirds.

¹ Parsons et al., in prep. *North American Conservation Assessment for Waterbirds, A Waterbird Conservation for the Americas Report.*

40 Ideas for Waterbird Conservation Outreach Projects

- 1 Internet based chat rooms for information sharing and interaction between waterbird educators
- 2 Partnerships and communication networks, such as sister-site programs, among important waterbird areas
- 3 Internet accessible repository of technical information and educational resource material
- 4 Training workshops for waterbird education specialists and waterbird managers
- 5 Graduate studies and research in waterbird conservation
- 6 Boat tours around seabird nesting islands led by trained interpretive naturalists
- 7 In-class school outreach sessions with hands-on activities
- 8 Classroom and public field trips to waterbird nesting habitats
- 9 Placement of spotting scopes in observation blinds at appropriate nesting colonies or installed at mainland vantage points near waterbird areas
- 10 Guided public tours at selected waterbird colonies on boardwalks or beaches
- 11 Adopt-a-Colony and Adopt-a-Wetland projects
- 12 Adopt-a-Waterbird programs (individual birds)
- 13 Internet real time video cameras focused on nest sites
- 14 Internet-based curricula associated with video cameras
- 15 Waterbird web pages or colony web pages
- 16 Waterbird festivals or special “waterbird days” to celebrate the return of migrants or the nesting season
- 17 Teacher workshops to teach hands-on activities
- 18 Dramatic presentations about waterbirds using costumes or puppets
- 19 Town meetings to role play values about waterbirds
- 20 Roadside signs about waterbirds at pullouts or other vantage points near colonies
- 21 Kiosks about waterbirds near viewing areas
- 22 Audio components to kiosks playing waterbird sounds at viewing sites
- 23 Waterbird Centers- theme-oriented nature centers that celebrate waterbird biology and conservation
- 24 Books, brochures and video productions featuring local waterbirds
- 25 Postcards
- 26 Calendars
- 27 Other waterbird merchandise (shopping bags, t-shirts, jewelry etc.) with informational hangtags
- 28 Posters and other signs to educate anglers about recycling fishing line, overhead casting and cleaning up baited hooks and lures
- 29 Birding trails booklets featuring waterbird sites
- 30 Volunteer programs (e.g., Earthwatch) that connect serious birders with researchers
- 31 Internships for biology college students with researchers
- 32 Workshops on waterbird management for agencies, IBA managers, and others with responsibility for waterbirds.
- 33 Workshops for fishing party boat operators to provide instruction on removal of hooks from accidentally snagged birds, and to reemphasize the importance of proper disposal of fishing line and nets.
- 34 Beach cleanups to collect plastics, especially cigarette lighters, crumbly Styrofoam and six-pack holders
- 35 Training for beached bird surveys and oiled bird rescues
- 36 Identification and labeling of storm drains that lead to wetlands
- 37 Decoration of building walls and fences with murals celebrating local waterbirds
- 38 Larger than life, free-standing statues or other artwork of local waterbirds for parks and public places
- 39 Help in identifying, protecting and teaching about a local IBA or key site for waterbirds
- 40 Campaigns against the release of balloons that can settle in aquatic habitats and choke wildlife