



# **Intermountain West Waterbird Conservation Plan**

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(All of the information provided in this partnership-based plan is not necessarily endorsed by the  
U.S. Fish and Wildlife Service)

**Note:** Because of the complexity of the region covered by this plan (11 states and 4 Bird Conservation Regions [BCRs]) there are likely some errors in the data reported here and additional information which should be considered in future versions of this plan. If you notice errors or omissions or have ideas or comments, please send them to Gary Ivey (ivey@oregonvos.net), so they can be captured in future updates.

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Cover Photo by Don Paul

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# EXECUTIVE SUMMARY

This Intermountain West Waterbird Conservation Plan (IWWCP) is one of several regional step-down plans designed to implement the North American Waterbird Conservation Plan (NAWCP, Kushlan et al. 2002, [www.waterbirdconservation.org](http://www.waterbirdconservation.org)). As defined by these hierarchical plans, waterbirds are wetland-dependent species including both colonial breeders (e.g., gulls, terns, most grebes, cormorants, herons, egrets, ibis and pelicans), and solitary nesting marshbirds (e.g., cranes, rails, coots, bitterns and loons). Shorebirds and waterfowl are covered by other bird conservation initiatives and, thus, are excluded from this plan. Bird families represented here include: Gruidae, Rallidae, Laridae, Podicipedidae, Phalacrocoracidae, Ardeidae, Threskiornithidae, Pelecanidae, and Gaviidae. The goal of the IWWCP is to maintain healthy populations, distributions, and habitats of waterbirds throughout the Intermountain West region. The regional planning area includes the U.S. portions of 11 western states and four Bird Conservation Regions that are defined as geographic regions with similar habitat conditions delineated to facilitate bird conservation efforts (U.S. NABCI Committee 2000a).

This IWWCP was developed with the assistance of the Intermountain West Waterbird Working Group (hereafter, Group). This group is an informal association of biologists, wildlife managers, and interested citizens who provided input on the status and conservation needs of waterbirds and waterbird habitat throughout the planning process. The plan is intended to fill knowledge gaps and facilitate coordinated waterbird conservation efforts among the many public and private partners associated with all-bird conservation in the Intermountain West region. Included are a description of waterbird populations and habitats; a review of threats and management issues; the development of population and habitat objectives for priority species and habitats; monitoring and research recommendations; and conservation strategies for management, monitoring, and outreach.

The Intermountain West's dispersed high mountain lakes, large terminal hyper-saline lakes, marshes, playas, rivers, streams, riparian zones, and fresh

and brackish wetlands host about 40 waterbird species, including many or most of the world's California Gulls, Eared Grebes, White-faced Ibises, and American White Pelicans. Breeding and migrant waterbird species are ranked and prioritized for the Intermountain West region based on modified national NAWCP rankings (colonial species) and national, state, and Partners In Flight (PIF) listings (marshbirds) in each of the four Bird Conservation Regions within the planning area. No waterbirds in the Intermountain West merited a ranking of highly imperiled at this regional scale. Eleven waterbirds are identified as species of high concern in one or more of the four Bird Conservation Regions within the planning area: Yellow Rail, Franklin's Gull, Black Tern, Eared Grebe, Western Grebe, Clark's Grebe, Snowy Egret, American White Pelican, Common Loon, American Bittern, and certain managed populations of the Greater and Lesser Sandhill Crane. An additional 10 species were identified as species of moderate conservation concern. For the purpose of this plan, waterbirds ranked as high or moderate conservation concern are considered priorities for conservation action in the Intermountain West region. Brief species profiles summarize the status and conservation needs of each of these 21 priority waterbirds.

Waterbirds using this region are highly adaptable to constantly changing wetland conditions and depend on a regional-scale association of wetlands to meet their habitat and forage requirements during various stages of their annual life cycle. The competing demands for water in support of human uses such as agriculture, development, and recreation pose the greatest threats to regional waterbird populations. Contaminants (e.g., mercury, DDT and its breakdown products) are also a significant threat to the region's waterbirds. Because of the West's feast-or-famine water regime, the IWWCP stresses the necessity of conserving a network of high-quality wetland habitats with secure water sources in order to provide options for waterbirds during drought and flood cycles. Based on the review of waterbird populations, habitats, threats, and issues, the following are some of the key conservation actions identified in the plan:

- Develop and implement a monitoring strategy to acquire sufficient information about the population dynamics; population trends; breeding, migration, and staging requirements; and habitat preferences of the region's waterbirds to make knowledgeable management recommendations.
- Preserve and enhance sufficient high-quality habitat to support healthy populations in the region. Specific strategies are recommended for nine critically important waterbird sites.
- Inform the public, decision-makers, and land managers about the importance of the region to waterbirds and about the biology, trends, and management of these species.
- Ensure that coordinated conservation efforts (regional, national, and international) are in place to address the key conservation priorities of waterbirds.
- Develop partnerships to facilitate coordinated waterbird conservation, including funding and implementation of management strategies.

Success of the activities outlined in this plan will be measured by both habitat and species monitoring. These include a monitoring strategy for focal species and important habitats, and identification of monitoring and research needed to develop population size and trend data for inadequately monitored species.

In the spirit of all-bird conservation, this plan is intended to facilitate waterbird conservation through on-the-ground projects and the incorporation of waterbird population and habitat objectives into joint venture projects, land use planning documents, and the conservation efforts of a diverse array of partners found throughout the Intermountain West region. Analogous regional waterbird plans are under development for states and Bird Conservation Regions adjacent to the Intermountain West, and the Canadian Wildlife Service has developed a Waterbird Conservation Plan for the Pacific and Yukon Regions (Gebauer 2003). The Intermountain West Waterbird Working Group and many public and private conservation partners will strive to integrate and coordinate waterbird conservation efforts with those underway in adjacent areas in the United States and Canada.

# INTRODUCTION

Waterbirds are a diverse group of species dependent on aquatic habitats to complete portions of their life cycles. Defined here, the group encompasses cranes, rails, coots, gulls, terns, grebes, cormorants, herons, egrets, bitterns, ibises, pelicans, loons, and others; essentially, all aquatic bird species except waterfowl (i.e., ducks, geese, and swans) and shorebirds (e.g., sandpipers and plovers). It is often helpful to categorize waterbirds by their social behaviors. Many are colonial breeders, a strategy that increases population vulnerability by concentrating populations in a limited area. Of the solitary-nesting species, many are very secretive in their habits and, therefore, their population status is unknown. Threats to waterbirds and their habitats have stimulated a significant response by those concerned with their conservation.

In the arid Intermountain West, waterbirds rely on wetlands that are susceptible to natural cycles of droughts and floods, and are very dynamic in nature as precipitation patterns shift from wet to dry extremes. Many of the area's wetland systems have a low gradient bottom, which causes shorelines to be transitory through seasons and weather cycles. This condition induces intermittent waterbird nesting and use because of extreme changes in habitats. Emergent wetland habitat develops during periodic shoreline stability and provides nesting habitat for waterbirds. Nesting colonies generally persist until the emergent wetlands become desiccated or are deeply flooded as water levels fluctuate. Droughts strand emergent nesting cover and allow access by mammalian predators. Droughts also reduce the availability of food by limiting moist feeding areas. Conversely, floods inundate emergent nesting areas and nests, and sometimes kill stands of emergent vegetation, eliminating suitable nesting habitat. Although feeding areas are generally bountiful during flood cycles, suitable nesting habitat is typically scarce. Because of this shifting of water levels and habitats, individual wetlands are not consistently reliable as habitat for waterbirds. Local population variations and nesting colony abandonment reflect this instability. Many waterbird species are nomadic, apparently compensating for diverse wetland dynamics by moving among wetlands at a regional scale within

and between years (e.g., Ryder 1967, Ivey et al. 1988, Henny and Herron 1989). Consequently, a large and widely distributed, diverse wetland base within the Intermountain West landscape is needed to maintain healthy waterbird populations (Haig et al. 1998).

The North American Waterbird Conservation Plan (NAWCP) is the product of the Waterbird Conservation for the Americas Initiative, an independent partnership of individuals and institutions having interest and responsibility for conservation of waterbirds and their habitats in the Americas (Kushlan et al. 2002, [www.waterbirdconservation.org](http://www.waterbirdconservation.org)). The NAWCP provides a continental perspective on conservation needs for waterbirds, and complements plans developed by the other bird conservation initiatives linked through the North American Bird Conservation Initiative (U.S. NABCI Committee 2000a). NAWCP is being implemented through a series of regional plans such as this Intermountain West Waterbird Conservation Plan (IWWCP). The IWWCP is focused on regional waterbird populations, habitats, and associated conservation issues. It represents the next steps in waterbird conservation called for in the NAWCP.

This plan was developed with the assistance of the Intermountain West Waterbird Working Group, an informal association of biologists, wildlife managers and interested citizens who provided input into the planning process (see Appendix A). The planning area includes Bird Conservation Regions (BCRs) 9, 10, 15, and 16, and encompasses portions of 11 western states and two Canadian Provinces (Figure 1). BCRs are geographic regions with similar habitat conditions delineated by the North American Bird Conservation Initiative (NABCI) to facilitate coordinated bird conservation efforts (U.S. NABCI Committee 2000b). This plan focuses on the U.S. portions of the region while a complementary plan is being developed for Canada.

The Intermountain West region includes a vast inland area from the Rocky Mountains on the east to the Sierra Nevada and Cascades mountains on the west, and from southern Canada on the

north to northern New Mexico and Arizona on the south. It includes the extensive Great Basin, Columbia Basin, Colorado Plateau, and Wyoming Basin physiographic regions and their associated mountain ranges (Partners In Flight 2004). Characterized by diverse basin and range topography, the region provides a variety of habitats for waterbirds, including high mountain lakes, rivers and streams, fresh and brackish wetlands, and large terminal hyper-saline lakes. Due to the arid climate—a result of the rain shadow cast by the mountains to the west—Intermountain West wetlands serve as life-giving, yet inconsistent, oases for aquatic birds.

The overall goal of the IWWCP is the maintenance of healthy populations, distributions, and habitats of waterbirds throughout the Intermountain West region. This document:

- Assesses the importance of the Intermountain West to waterbirds.
- Describes current knowledge on population sizes and trends, habitat requirements, and distribution of individual species.
- Describes key sites for waterbirds in the region.
- Assesses status, vulnerability, and management priority rankings for each species on the basis of regional biological information, regional conservation issues, and continental ranking schemes.
- Identifies threats to waterbirds in the region.
- Provides guidance on conservation and management strategies applicable to waterbirds.
- Provides direction for integrated landscape-level waterbird conservation that considers and incorporates conservation planning for other species.
- Identifies high priority information gaps that must be filled to increase our ability to successfully manage waterbird species, and identifies related research questions needing to be addressed.
- Provides regionally-based waterbird conservation guidance that will step down the goals of the continental plan within the Intermountain West while simultaneously assisting in the rolling-up of population and habitat objectives for range-wide species conservation.

A number of actions will be required to successfully achieve the goals of the IWWCP, including:

- Acquiring sufficient information about the population dynamics, population trends, breeding, migration and staging strategies, and habitat preferences of the region's waterbirds to make knowledgeable management recommendations.
- Preserving and enhancing sufficient high-quality habitat to support healthy populations in the region.
- Informing the public, decision-makers, and land managers in the region about the importance of the region to waterbirds and about the biology, trends, and management of these species.
- Ensuring that coordinated conservation efforts (regional, national, and international) are in place to address the key conservation priorities of waterbirds.
- Developing partnerships that facilitate needed conservation including funding and management strategies.

**Figure 1. Intermountain West Waterbird Conservation Plan planning area.**



# DESCRIPTION OF THE INTERMOUNTAIN WEST

## Waterbird Habitat Types

The Intermountain West provides waterbirds with a diversity of habitats:

- Freshwater marsh complexes of great importance to breeding and migrating waterbirds; these areas often include numerous man-made managed wetlands on Wildlife Areas (WAs) and National Wildlife Refuges (NWRs).
- Freshwater lakes and reservoirs that provide nesting habitat for grebes and loons and foraging habitat for a variety of fish-eating waterbirds.
- Large saline lakes of importance to post-breeding and migrant Eared Grebes and gulls.
- Rivers, streams, and riparian areas that provide nesting and foraging habitats.
- Irrigated agricultural fields that serve as nesting and foraging sites for some species (e.g., rails, cranes, gulls, ibises).
- Various man-made structures that are used by nesting birds, especially dikes, berms, and roadways.

*Freshwater marsh complexes.* These are large wetland systems that include a variety of wetland types such as wet meadows, seasonal wetlands, emergent marshes and, in many cases, managed wetland impoundments. The region includes several large freshwater marsh complexes of critical importance to a variety of breeding waterbirds and numerous migrant species. Most notable are the marshes associated with the Great Salt Lake in Utah, Klamath Basin in Oregon and California, Lahontan Valley wetlands in Nevada, Malheur-Harney Lakes Basin in Oregon, and Centennial Valley and Freezeout Lake in Montana. There are many other important freshwater marsh complexes in the region and most of them have been identified as Important Bird Areas (IBAs).

*Freshwater lakes and reservoirs.* There are numerous lakes and reservoirs in the region. Their

value to waterbirds generally depends on the level of recreational use they receive. The direct (e.g., disturbance) and indirect (e.g., erosion) effects of human activities decrease the quality of lakes and reservoirs as waterbird habitat. Additionally, rapid changes in water levels make many of these sites unsuitable for breeding waterbirds. Some notable examples of important lakes and reservoirs include Eagle Lake, Goose Lake, and Lake Almanor in California; Upper Klamath Lake in Oregon; and Blackfoot Reservoir and Lake Cascade in Idaho. These habitats are particularly important to nesting and staging Common Loons and grebes, and as foraging sites for fish-eating waterbirds. Staging is a term used to describe the congregation of birds in an area in preparation for migration.

*Large saline lakes.* Saline lakes provide an abundance of food in the form of brine flies and brine shrimp for a variety of birds. Brine shrimp are a critical food resource to migrating and molting Eared Grebes. Most of the world's population of Eared Grebes congregate at Great Salt and Mono lakes in the summer prior to migrating south. California, Franklin's, and Ring-billed gulls also stage at these lakes in large numbers. Other important saline lakes include Lake Abert, Harney, and Summer lakes in Oregon.

*Rivers, streams and riparian areas.* Modest numbers of waterbirds of many species migrate along and/or breed in association with riparian areas. These habitats are particularly valuable for fish-eating waterbirds such as Double-crested Cormorants and Great Blue Herons; both of these species sometimes nest in streamside cottonwoods. Adjacent wet meadows often provide habitat for rails, cranes, gulls, and ibises.

*Irrigated agricultural fields.* Cranes and rails utilize flood-irrigated hay fields for nesting, and many other waterbird species forage in these areas. Egrets and herons sometimes forage in dry pastures for mice and grasshoppers. Irrigated crops are also used for foraging in some cases (e.g., White-faced Ibises use irrigated alfalfa fields in the Lahontan Valley, Nevada, and around Great Salt Lake, Utah), and grain fields are important

for Sandhill Cranes during migration and winter. Where these habitats are associated with wetland complexes, they provide very important foraging options for many waterbird species.

*Facilities and structures.* Some waterbirds utilize structures built for other purposes. Examples include nesting and loafing on dikes, berms, power poles, and roadways. In some cases, birds have established nests on flooded buildings (e.g., flooded ranch houses, barns, and haystacks, G. Ivey pers. observ.). These facilities and structures sometimes provide important sites for colonial nesting waterbirds.

## Bird Conservation Regions

BCRs are geographic areas with similar habitats that were developed to provide a consistent spatial framework for NABCI's bird conservation strategy. The BCRs comprising the Intermountain West are described below in terms of waterbird habitats.

*Great Basin (BCR 9).* This region is very dry due to its position in the rain shadow of the Cascade and Sierra Nevada ranges, and its wetlands are very dynamic due to extreme fluctuations in water supplies. The portion of this BCR within the true Great Basin is internally drained, while the other areas eventually drain into the Columbia River. There are several large wetland complexes, a number of which are among the most important on the continent for a variety of waterbirds. Most notable are the wetlands associated with the Great Salt Lake in Utah (particularly Bear River Migratory Bird Refuge and seven State WAs), Klamath Basin in Oregon and California, Malheur-Harney Lakes Basin in Oregon, and Lahontan Valley in Nevada. Many other wetlands in the area are heavily used by certain waterbird species (e.g., Walker Lake, Nevada [migrant Common Loons]). Large saline lakes created by internal drainage, such as Great Salt Lake and Mono Lake, are very important to most of the world's population of Eared Grebes and California Gulls. A myriad of areas are of moderate importance to breeding and migrant waterbirds, and thousands of ephemeral wetlands, streams, and man-made lakes in the region support various species of waterbirds.

*Northern Rockies (BCR 10).* Major wetland complexes important to waterbirds in this BCR include the Centennial Valley and Freezeout Lake in Montana, and Teton Basin and Grays and Bear

lakes in Idaho. Many small mountain lakes in this region provide nesting sites for Common Loons. Additionally, numerous small wetlands occur in the mountains and the Wyoming Basin, as well as thousands of stream/river valleys and natural and man-made lakes.

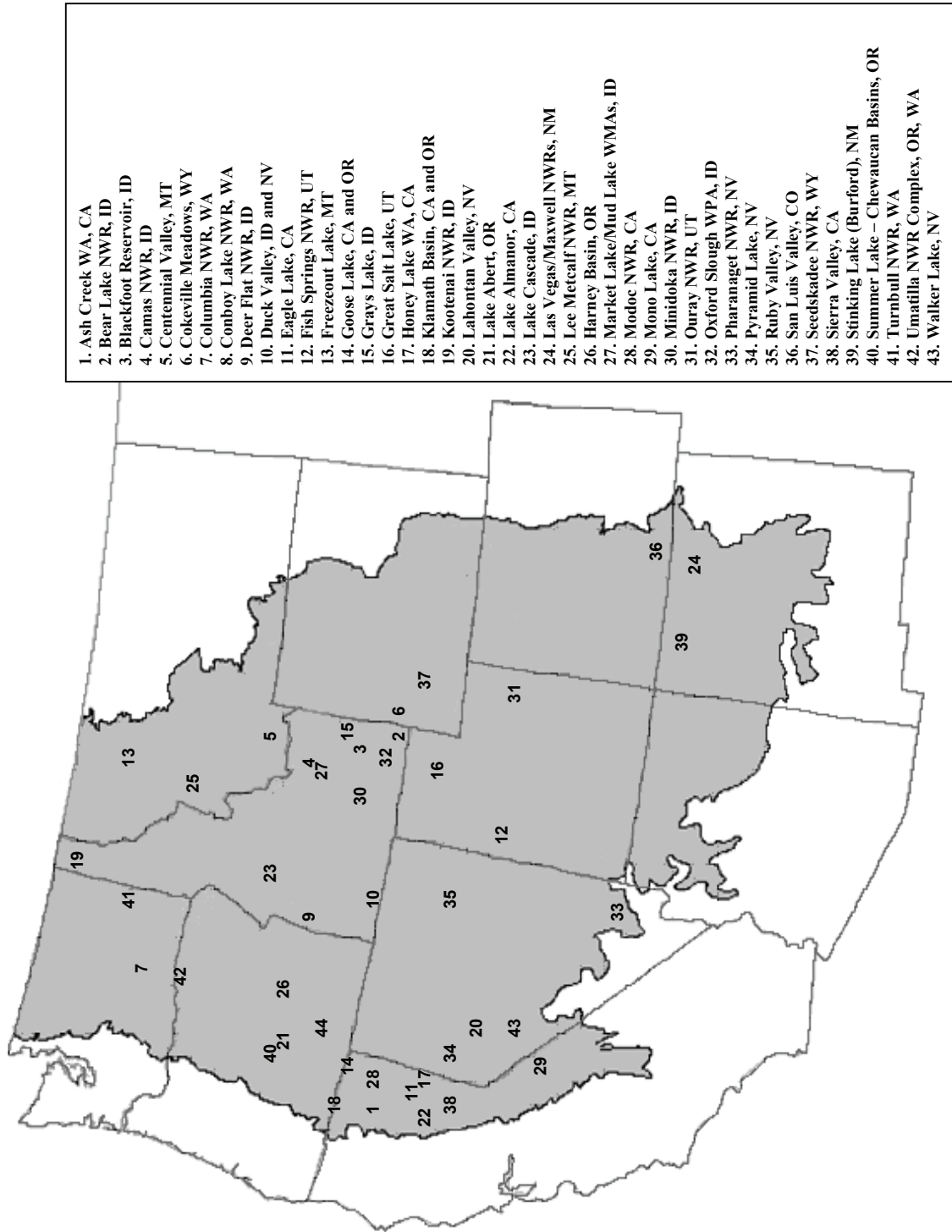
*Sierra Nevada (BCR 15).* Important wetland habitats in this BCR are primarily mountain lakes, most significantly habitat at Eagle Lake and Lake Almanor. Many wet meadow systems provide habitat for breeding rails, and in larger meadows, Sandhill Cranes. Sierra Valley is the most important meadow/wetland complex in this BCR, however, there are numerous smaller wetland sites associated with streams and small lakes.

*Southern Rockies - Colorado Plateau (BCR 16).* The most significant waterbird area in this region is the San Luis Valley, where wetlands provide habitat for breeding waterbirds such as White-faced Ibises as well as staging habitat for Sandhill Cranes. Stinking Lake is New Mexico's largest natural freshwater wetland, and is important for breeding waterbirds. Other wetlands are widely scattered in this BCR, many of which are small, occurring in the form of montane streams and man-made impoundments. There is modest breeding waterbird diversity and usage by migrants.

## Important Waterbird Sites

Figure 2 displays approximate locations of some important waterbird sites in the Intermountain West Region.

Figure 2. Approximate locations of notable waterbird sites in the Intermountain West Region.



1. Ash Creek WA, CA
2. Bear Lake NWR, ID
3. Blackfoot Reservoir, ID
4. Camas NWR, ID
5. Centennial Valley, MT
6. Cokeville Meadows, WY
7. Columbia NWR, WA
8. Conboy Lake NWR, WA
9. Deer Flat NWR, ID
10. Duck Valley, ID and NV
11. Eagle Lake, CA
12. Fish Springs NWR, UT
13. Freezout Lake, MT
14. Goose Lake, CA and OR
15. Grays Lake, ID
16. Great Salt Lake, UT
17. Honey Lake WA, CA
18. Klamath Basin, CA and OR
19. Kootenai NWR, ID
20. Lahontan Valley, NV
21. Lake Abert, OR
22. Lake Almanor, CA
23. Lake Cascade, ID
24. Las Vegas/Maxwell NWRs, NM
25. Lee Metcalf NWR, MT
26. Harney Basin, OR
27. Market Lake/Mud Lake WMAs, ID
28. Modoc NWR, CA
29. Mono Lake, CA
30. Mimidoka NWR, ID
31. Ouray NWR, UT
32. Oxford Slough WPA, ID
33. Pharanaget NWR, NV
34. Pyramid Lake, NV
35. Ruby Valley, NV
36. San Luis Valley, CO
37. Seedskaadee NWR, WY
38. Sierra Valley, CA
39. Stinking Lake (Burford), NM
40. Summer Lake – Chewaucan Basins, OR
41. Turnbull NWR, WA
42. Umatilla NWR Complex, OR, WA
43. Walker Lake, NV

## Waterbird species in the Intermountain West

The region's dispersed lakes, marshes, and riparian zones host 41 waterbird species (33 breeding species and eight additional migrants or vagrants). This group includes nine families of birds (Table 1). In this plan, species are listed in Sibley-Monroe order (Sibley and Monroe 1990), as this is standard for NAWCPs. The region supports approximately 500,000 breeding waterbirds and a few million migrants, including many or most of the world's

California Gulls (Paul et al. 1990), Eared Grebes (Jehl 2001), White-faced Ibises (Ivey et al. *in prep* b), and American White Pelicans (D. Paul pers. comm.). Waterbird species using this region must be highly adaptable to constantly changing wetland conditions and depend on a landscape-scale association of wetlands. A list of waterbird species and their occurrence status for each BCR in the region is presented in Table 2. Scientific names of species mentioned in the plan are presented in Appendix B and acronyms defined in Appendix C.

**Table 1. Bird families included in the Intermountain West Waterbird Conservation Plan**

Family	Common name	Species/Subspecies
Gruidae	Cranes	2 subspecies
Rallidae	Rails	3 species
	Coots	1 species
	Moorhens	1 species
Laridae	Gulls	8 species
	Terns	4 species
Podicipedidae	Grebes	6 species
Phalacrocoracidae	Cormorants	2 species
Ardeidae	Egrets	3 species
	Hérons	4 species
	Bitterns	2 species
Threskiornithidae	Ibises	1 species
Pelecanidae	Pelicans	1 species
Gaviidae	Loons	3 species

**Table 2. Intermountain West waterbird species and their occurrence in Bird Conservation Regions (BCRs) 9, 10, 15, and 16 (b=breeding, m=migrant, and w=winter).**

SPECIES	BCR 9	BCR 10	BCR 15	BCR 16
Greater Sandhill Crane	b, m	b, m	b, m	b, m, w
Lesser Sandhill Crane	m, w	m	m	m, w (rare)
Yellow Rail	b, w		b	
Virginia Rail	b, m, w	b, m, w (rare)	b, m, w	b, m, w
Sora	b, m, w	b, m, w (rare)	b, m, w	b, m, w
Common Moorhen	b, m, w (all rare)			b, m
American Coot	b, m, w	b, m, w	b, m, w	b, m, w
Mew Gull	m (rare)	m (rare), w (rare)		
Ring-billed Gull	b, m, w	b, m, w	b, m, w	m, w
California Gull	b, m, w	b, m, w	b, m, w	b, m, w
Glaucous-winged Gull	b, m (rare), w	w (rare)		
Thayer's Gull	m (rare), w (rare)	m, w (rare)	m, w (both rare)	
Herring Gull	m, w	m, w	m, w (both rare)	m, w (rare)
Bonaparte's Gull	m, w	m	m	m
Franklin's Gull	b, m	b, m		b, m
Caspian Tern	b, m	b, m	m	m (rare)
Common Tern	b (rare), m	b, m		m (rare)
Forster's Tern	b, m	b, m	b, m	b, m, w
Black Tern	b, m	b, m	b, m	b, m
Pied-billed Grebe	b, m, w	b, m, w	b, m, w	b, m, w
Red-necked Grebe	b, m (rare), w (rare)	b, m	-	m, w (both rare)
Horned Grebe	b, m, w (rare)	b, m, w	m, w	m, w
Eared Grebe	b, m, w	b, m	b, m	b, m, w
Western/Clark's Grebe	b, m, w	b, m, w	b, m, w	b, m, w (rare)
Neotropic Cormorant	-	-	-	m (rare)
Double-crested Cormorant	b, m, w	b, m	b, m, w (rare)	b, m, w
Little Blue Heron	-	-	-	m (rare)
Snowy Egret	b, m, w (rare)	b, m	b, m, w	b, m
Great Blue Heron	b, m, w	b, m, w	b, m, w	b, m, w
Great Egret	b, m, w	-	b, m	m
Cattle Egret	b, m, w (rare)	b (rare), m	b, m	b (rare), m
Green Heron	b, m, w (rare)	-	b, m	b, m
Black-crowned Night-Heron	b, m, w (rare)	b, m	b, m, w	b, m, w
Least Bittern	b, m (rare)	-	b, m	b (rare), m
American Bittern	b, m, w	b, m	b, m, w	b, m, w
White-faced Ibis	b, m, w (rare)	b, m	b, m	b, m
American White Pelican	b, m, w (rare)	b, m	m, w	b, m
Red-throated Loon	m (rare)	m (rare)	-	m (rare), w (rare)
Pacific Loon	m (rare)	m (rare)	-	m (rare), w (rare)
Common Loon	b, m, w	b, m, w (rare)	m, w (b: extirpated)	m, w (rare)

# WATERBIRD CONSERVATION ISSUES AND THREATS

In this section, habitat alterations, mortality factors, conflicts between humans and waterbirds, and other issues pertaining to waterbird conservation are discussed. Though impacts to populations associated with each issue cannot be precisely quantified, these issues are generally ordered by degree of conservation concern.

## Wetland Loss, Water Supplies, and Water Quality

Historically, reclamation projects drained wetlands and reduced options for breeding waterbirds. Ratti and Kadlec (1992) estimated that 57% of this region's historic wetlands have been lost. Loss of wetlands continues. Because of a 2000 Supreme Court decision, fill of many isolated wetlands is no longer regulated by the U.S. Army Corps of Engineers (U.S. Supreme Court 2000). Such areas include playas, wet meadows, and marshes that are not navigable and do not have an interstate commerce connection. Therefore, these areas are more vulnerable to development and loss.

Human demand for both agricultural and municipal water continue to threaten wetland habitats. For example, Lower Klamath NWR, the most significant waterbird nesting site in California, is threatened with loss of water as water rights are adjudicated in the Klamath Basin. Additionally, until the adjudication occurs, water for Lower Klamath is being directed to higher priority users within the Bureau of Reclamation's (BOR) Klamath Irrigation Project (i.e., endangered species needs [salmon and suckers], tribal subsistence [lake levels and river flows], and agricultural irrigation). Within the Federal list of responsibilities for the Klamath Irrigation Project, refuge water is fourth (Mauser 2001). In Idaho, Camas NWR is spending a great deal of money to pump water since ground water levels are dropping due to increased irrigation from wells and in-steam flows in Camas Creek are no longer sufficient to fill refuge wetlands. At Grays Lake, long-standing water rights and withdrawals result in very low water conditions in most summers and, in turn, insufficient habitat for brood-rearing or molting birds. In Utah, urbanization is altering hydrology of Great Salt Lake wetlands,

causing changes in volume, timing, and location of discharge. At Stillwater NWR in Nevada, public support rallied to begin purchasing water rights, primarily because of concerns about concentrations of contaminants (USFWS 1996, Neel and Henry 1997).

Existing wetlands are also impacted by a variety of human-caused perturbations. Upslope development for housing and industrial use can alter water supplies and hydrology. Sedimentation from croplands can degrade existing wetlands.

Adequate water supplies need to be secured for important wetland areas. Because of the erratic water regime in the arid Intermountain West, wetland habitats are often insufficient to support waterbirds during drought periods. Water of high quality, which can be moved by gravity, will provide habitat for waterbirds wherever it is placed. Meeting the water needs for waterbirds will require planning on a large scale. Water rights purchases are underway at Stillwater NWR to ensure a more secure water supply for this refuge, resulting in increased wetland areas and improved habitat for waterbird feeding and nesting. Waterbirds at many other wetlands in the region would also benefit from water rights acquisition. The 2002 Farm Bill included provisions for improving water supplies for terminal lakes (At-Risk Desert Terminal Lakes Program), although these funds are targeted to be used to improve water conditions at Walker and Pyramid lakes in Nevada. Even though the Farm Bill appropriated an impressive sum of money to help conserve terminal lakes, the bill prohibits the use of this money for water acquisition. The BOR is attempting to determine how they can spend the money to benefit the lake and yet comply with this limitation.

Water supply has been an important concern at Mono Lake in California. Starting in 1941, water diversion to Los Angeles diminished Mono Lake's tributary streams, and eventually threatened the lake's value for countless birds. Birds became a rallying point for the lake's protection and a legal case that resulted in a mandate to manage the lake's water level between its pre-diversion

level of 1941 and its historic low in 1982 (State of California Water Resources Control Board 1994). This decision will help maintain the health of the lake's ecosystem, maintain minimum stream flows, and allow for continued managed diversions to Los Angeles. Implementation of the decision and the Water Board's 1998 restoration order will help restore lake levels and Mono Lake's damaged tributary streams. However, as the lake's water level rises, the decreased salinity may impact the lake's brine flies and brine shrimp populations, and the Eared Grebes, gulls, and other species that depend on them.

Competing demands for water supplies affect water quality. Reduced flows can exacerbate contaminant problems (e.g., mercury concentration in Lahontan Valley wetlands) and threaten wildlife values of important areas. Salinity level in large Great Basin hypersaline lakes is also a major issue. The natural hydrology of these lakes supports large populations of brine shrimp and brine flies, an important food source for staging and breeding waterbirds. Great Salt Lake, Lake Abert, and Mono Lake are crucial to Eared Grebes and California and Ring-billed gulls. Each of these large hypersaline lakes are subject to water level manipulations that can result in reduced or increased salinity, beyond the tolerance of brine flies and brine shrimp.

Conversions in agricultural irrigation practices from flood irrigation to mechanized pivot irrigation systems conserve water, but reduce breeding habitat and limit feeding options for many waterbird species. Private flood-irrigated meadows and hayfields provide breeding and foraging habitat for several waterbird species (e.g., rails, cranes, Black Terns, ibises). Flood-irrigated croplands are also important foraging areas for some species (particularly ibises). Loss of these habitats due to water conservation measures is a significant threat to associated waterbird species and should be mitigated by providing additional seasonal wetland habitats.

## **Wetland Habitat Management**

The dynamic wetland conditions of this region dictate holistic, integrated wetland management approaches. Enhancing habitat diversity should be a component of on-the-ground wetland projects, providing variable water depths in wetlands with waterbird nesting, roosting, and foraging needs in mind. Project planners should consider wetlands

at a landscape level to determine the most critical waterbird requisites at a particular location. Many waterbird needs overlap with those of waterfowl and shorebirds. Therefore, wetland management for these species lends itself to a guild approach. Both spatial and temporal diversity is important, and wetland managers need to understand waterbird needs as well as natural hydrologic cycles. For example, managers could maintain stable water levels within wetlands during the nesting period and provide lower water depths in late summer that provide enhanced foraging conditions for waterbirds. Another consideration is maintenance of ideal habitat conditions at select key sites to provide alternatives for waterbirds during extreme drought and flood years.

The challenge to effective comprehensive wetland management for all birds is to think in terms of landscape-level habitat conditions and focus on maintaining productive wetlands through time. Most waterbird species are relatively long-lived and can maintain their populations through a few bad years. For example, some species (e.g., cranes) thrive reproductively during years when conditions are very good, and can maintain their populations despite several years of very low recruitment. Droughts and floods are very important ecological processes that enhance wetland productivity and habitat value to birds. Fish populations may crash during droughts, yet they rapidly recover when water conditions improve, and for a few years after a drought size-classes of fishes are ideal for various fish-eating birds. Grebe numbers generally increase when fish are very small, but decline as their prey becomes larger, benefiting increasing numbers of cormorants and pelicans. Eventually some species of fish become so large that even pelican and cormorant use decreases (Ivey et al. *in prep* a). Aquatic invertebrates and aquatic plants also go through cycles as wetlands change and various waterbird populations respond positively to them when foraging conditions are optimal.

An issue at several reservoir sites in the region is the problem of water-level manipulations during the nesting period for irrigation or power needs. This management practice can cause productivity problems for waterbirds as a result of the loss or abandonment of eggs or young due to flooding or stranding. Where water level manipulations negatively impact waterbirds, measures to minimize impacts should be developed on a site-by-site basis. Likewise, on both public and private managed

wetlands, objectives that favor the aggregation of waterfowl during the fall hunting season may divert or delay the delivery of water which might otherwise have been available for waterbirds, waterfowl, and shorebirds during the nesting season (Neel 1994).

## Exotic Species

Invasive exotic plants pose a threat to many waterbird habitats in the region. Some of the most significant problem species include salt cedar, Russian olive, and purple loosestrife, each of which is capable of replacing native vegetation and reducing wetland habitat quality for waterbirds. Although salt cedar and Russian olive provide some benefit to birds, both species compete with native riparian vegetation that better serves native avifauna. In some cases, although salt cedar and Russian olive have replaced important riparian gallery forests, both still provide habitat for some species. Alternative habitat restoration using native trees should be a component of a pest management program for these two exotic plant species. Purple loosestrife is a major problem in the Snake and Columbia River basins. Eurasian water milfoil, a submersed aquatic plant, is a problem in some wetlands and lakes (e.g., Lake Tahoe). Common reed is primarily a local problem in some wetlands (e.g., Great Salt Lake) as it replaces more suitable emergent plant species. Perennial pepperweed (tall whitetop) has invaded grasslands, riparian areas, and shallow wetland habitats at many sites, displacing native vegetation and limiting foraging habitats. Giant river cane is a problem in California and may eventually spread to Nevada via the Truckee River. Biological controls for some exotic species are available. Even more extensive habitat conversions are on the horizon unless all forces are brought to bear on exotic vegetation and there are some significant breakthroughs in control.

Exotic fishes have been introduced in many of the region's aquatic systems and, in many cases, these exotics have significantly compromised the natural values of these systems. The carp has severe impacts on North American aquatic systems, disrupting food chains, causing turbidity, eliminating beneficial aquatic plants, and out-competing native fish and wildlife (Ivey et al. 1998). While carp are a major food source for pelicans, they can get too large for pelicans to consume and can out-compete native fishes (Ivey et al. *in prep a*). Fisheries management should be geared

towards eliminating carp where possible, otherwise populations should be managed to maintain younger age classes. This is a difficult issue, but an important one, particularly at Malheur-Harney Lakes Basin, Great Salt Lake, Bear Lake, and Lahontan Valley wetlands. Additionally, many species of exotic game fish (e.g., catfish, bass, sunfish, and trout) have been introduced and, in many instances, may directly compete with waterbirds for available wetland foods. Direct competition for forage occurs when larger sport fish like introduced trout eat smaller forage fish that piscivorous waterbirds depend on. Coordination between waterbird and fisheries managers is essential in order to eliminate or minimize these conflicts.

## Water Quality and Contaminants

Contaminants have been identified as a problem to waterbirds at several sites in the region. The Carson River below Dayton, Nevada, is mercury laden, and birds using the Lahontan Valley and Carson Lake are exposed locally and/or remotely to elevated levels of mercury, selenium, and DDT and its metabolites (DDE). Evidence of mercury-related toxicity was found to affect the immune (spleen, thymus, bursa), detoxicating (liver, kidneys), and nervous systems of young Black-crowned Night-Herons, Snowy Egrets, and/or Double-crested Cormorants nesting along the Carson River (Henny et al. 2002). A study is now underway to determine if post-fledging survival (via radio-telemetry) of young snowy egrets is reduced due to these contaminants. Migrant Common Loons staging at Walker Lake, Nevada have the highest blood mercury levels documented in the U.S. (M. Yates pers. comm.), and sources of contamination within the watershed have been identified (Seiler et al. 2004). DDE may have played a role in the historic decline of White-faced Ibises, as DDT-DDE contamination causes eggshell thinning and lowered hatching success (e.g., Henny and Herron 1989, Henny and Bennett 1990). DDE levels have remained high among ibises in Carson Lake in recent years (Henny 1997). PCP residues were found in Double-crested Cormorant eggs from American Falls Reservoir in Idaho (U. S. Geological Survey 1988-89).

The use of pesticides and herbicides for agriculture, mosquito control, and other purposes also poses a threat to waterbirds (Henny et al. 1985). These chemicals often enter wetlands via runoff from adjacent areas. Oil fields can also contribute contaminants to wetlands. There are direct and

indirect effects of the use of pesticides; overdoses of organochlorine chemicals (e.g., Malathion) can kill birds, and the loss of invertebrate foods from spraying can limit foraging opportunities. Spraying for mosquito control has increased in some areas because of the appearance of encephalitis and West Nile virus. The disturbance associated with spraying can also be a problem, especially around active nesting sites. Outreach is needed to better educate the public about environmentally sound options for mosquito problems. National concern for West Nile virus could trigger a massive effort toward mosquito control on wetlands in coming years. The problems with mosquito control could be far-reaching and impacts are little known, even for biological controls such as Bti (a bacterium used for mosquito control). Land managers and citizens need to integrate vector control with other wetland management objectives. Indiscriminate application of vector control without consideration of other wetland values could potentially have far-reaching negative effects on wildlife.

## Waterbird Conflicts

There are several cases of waterbirds causing perceived damage to agricultural crops and fish stocks, and of colonies becoming established in urban areas and causing aesthetic problems. These are generally very local but important issues. Demands for control (i.e., bird removal or destruction) can be intense and the consequences of negative public perception far-reaching.

*Crop Depredation.* USDA Animal and Plant Health Inspection Service, Wildlife Services (WS) is the Federal agency mandated by Congress to manage programs to reduce human/wildlife conflicts. This includes the management of waterbirds to reduce agricultural crop damages, conflicts in urban areas, and management to reduce conflicts with threatened or endangered species. Under the authorities of the Migratory Bird Treaty Act, the USFWS can authorize lethal control of depredating migratory birds through permits on a case-by-case basis, by designating special hunting seasons in some cases, or permit lethal control through depredation orders that allow the take of specific species without individual permits to alleviate depredations. For example, staging Sandhill Cranes sometimes depredate grain crops, seed potatoes, and newly-planted alfalfa (Subcommittee on Rocky Mountain Population of Greater Sandhill Cranes 1997, Launhan and Gammonley 2002). These problems

have been addressed through authorization of special hunting seasons in some areas (e.g., in southeast Idaho and northwest Utah). However, there is no evidence that hunting reduces crane depredation. Rather, the hunting program encourages the perception that something is being done about a problem that is actually minor in scope (e.g., McIvor and Conover 1994a, 1994b). Feeding White-faced Ibises have also caused crop damage in alfalfa fields near Stillwater NWR.

*Fishery predation and depredation.* There are several examples of birds consuming fish that are perceived as impacting sensitive fish populations or desirable game species. These include cormorants and pelicans consuming cui-ui, a threatened species in Pyramid Lake, Nevada; pelicans consuming endangered Yellowstone cutthroat trout at Blackfoot Reservoir, Idaho; cormorants consuming rare endemic fish at White River Valley, south of Ely, Nevada; and pelicans eating game fish at Canyon Ferry Reservoir, Montana. In some areas of the United States Double-crested Cormorant populations have greatly increased, creating fishery conflicts with both commercial aquaculture and warmwater fish management. This issue is addressed in an environmental impact statement (USFWS and WS 2003).

In the Intermountain West, fishery conflicts with waterbirds are typically site-specific problems such as waterbirds consuming fish at privately owned aquaculture facilities. The USFWS has issued depredation permits to control losses of commercially raised fish at privately owned aquaculture facilities when non-lethal measures (e.g., hazing with cracker shells, netting, or wire grids over rearing ponds) have failed to alleviate depredation. Lethal control is not authorized at federally owned or operated hatcheries as these facilities serve to demonstrate the array and efficacy of non-lethal measures to control depredation.

*Commercial harvest of brine shrimp.* This activity is occurring at Great Salt Lake and Lake Abert; the concern is that over-harvest of brine shrimp could have negative impacts on birds that depend on them (especially Eared Grebes). This issue is currently being studied at Great Salt Lake where the Utah Division of Wildlife Resources has regulatory and stewardship responsibility for brine shrimp under the guidance of the Great Salt Lake Ecosystem Project assisted by an advisory team. The primary

goal is to sustain long-term populations of brine shrimp for their ecological values and commercial harvest. This is accomplished through a model for brine shrimp sustainability that considers waterbird food needs as well as harvest interests. For example, the brine shrimp density requirements for staging Eared Grebes at the Great Salt Lake was recently investigated through a PhD program in association with Utah State University (Caudell 2001).

*Urban colonies.* In some areas, particularly BCR 16, urban waterbird colonies (usually Black-crowned Night-Herons) have created concerns about public health and sanitation as birds defecate on dwellings. A standard programmatic approach is needed to address this issue. These situations are typically addressed by WS in coordination with USFWS (when lethal control measures are necessary).

*Golf courses.* American Coots sometimes cause problems on golf courses by consuming grasses and defecating on the greens. This issue could be incorporated into the initiative for all-bird conservation on golf courses by developing recommendations that reduce coot use.

*Use of artificial nesting sites.* Waterbirds sometimes nest on artificial substrates, which can conflict with human activities. For example, a gull colony appeared on dikes at a sewage pond facility in Hines, Oregon, blocking a maintenance road. Gull colonies sometimes appear in landfills, interfering with refuse burial, and cormorants have nested on bridges and in shipyards interfering with operational and maintenance needs.

*Aircraft strikes.* Larger species, such as cranes and pelicans, can threaten human safety through aircraft strikes. Low-level military training routes pose the greatest aircraft strike risk. It is important to work with the military to integrate consideration for the timing of migration and movements of larger waterbird species into training activities to minimize risk of strikes.

## **Disturbance**

Human intrusion into waterbird nest sites can cause abandonment, especially early in the breeding season during nest-site selection, nest building, and incubation (e.g., Ryder and Manry 1994). Disturbance keeps adults away from nests and can lead to hypothermia or hyperthermia of eggs and

young, increased predation, and ultimately reduced production. Disturbance during the late portion of the nesting season is particularly harmful because late nesting birds will not have another chance to nest. The effects of recreation on wildlife have been reviewed (York 1994, DeLong 2002). Bunnell et al. (1981) describe the effects of disturbance on nesting pelicans.

Disturbance caused primarily by recreational boating on lakes is a problem for nesting Common Loons and grebes in particular because of the low profile of their floating nests. Boat wakes often wash eggs from nests, and excess disturbance reduces productivity, precludes loon nesting (Richardson et al. 2000), or causes abandonment of loon (Casey 2000) and Western and Clark's grebe nests (D. Anderson pers. comm., Ivey 2004). Boat recreation is increasing on many lakes as lakeside cottages expand, and some lakes are used for jet skiing and snowmobile surfing (driving snowmobiles across water). Public education is an important element in the protection of nesting security. For instance, in Montana 75 percent of loon nesting lakes are bordered by private land; it will take awareness by landowners to ensure continued nesting (Casey 2000). In addition to outreach and education (in some cases hiring Loon Rangers to educate the public at selected sites), managers in Montana and Wyoming are signing territories and establishing wake zones for boating (wakeless designation areas with 200 m wakeless buffers). Wildlife officials in British Columbia are not as concerned about loon disturbance issues as loons are more abundant there.

Recreational boating disturbance likely prevents colonial nesting waterbirds from using otherwise suitable islands and in some cases has caused abandonment of colonies. For example, 800 pelican nests were abandoned on an island in Malheur Lake when artifact hunters illegally visited the island in 1988 (Ivey et al. *in prep a*).

Surveys of nesting colonies can also cause problems if not thoughtfully conducted. For example, the pelican colony on an island at a National Wildlife Refuge re-established in the mid 1980s after survey methods were converted from an invasive off-shore boat survey to a non-invasive ground count from a nearby shore.

Biologists typically use airboats to survey marsh colonies. This method allows collection of data

on Global Position System coordinates, colony configuration, nest density, and nesting chronology, and may be most effective in remote sites as nests and/or attending adults are often visible. Airboats can be a useful and often necessary tool in the assessment of colonies, however, caution should be taken to reduce disturbance as much as possible. Occasional use near ibis colonies does not appear to adversely effect nesting success or nesting effort (G. Ivey and D. Paul pers. observ.). However, prolonged use in close proximity to nesting ibis colonies can result in nest abandonment (Kelchlin 2000), and short-term airboat use within colonies has resulted in destroyed nests and wakes that wash eggs from nests (G. Ivey pers. observ.). Some waterbirds construct nests of emergent vegetation that are often unattached to other vegetative structures and are low to the water (e.g., Eared and Western Grebes), thus, are highly susceptible to boat wash. Pelicans seem particularly sensitive to airboat surveys which have caused nest abandonment in some cases.

## Agricultural Activities

In some areas, flood-irrigated private lands (especially hay meadows and pastures) provide very important habitats to nesting and foraging waterbirds. These habitats are being lost in some cases to development (e.g., Great Salt Lake, Utah, and Carson Sink, Nevada). In some areas there is a movement to conserve water by replacing the wildlife-beneficial practice of flood-irrigation with sprinkler or drip irrigation. If this conversion continues on a large scale, significant wetland area will be lost.

Timing of irrigation, farming, and ranching activities can affect the success of nesting waterbirds. In Oregon, wetlands in private ownership which support nesting waterbirds have been dewatered to facilitate haying and livestock grazing, resulting in nest abandonment and production failures (G. Ivey and M. St. Louis pers. comm.). Water is drained from hayfields about three weeks before mowing commences. This reduces food supplies and tends to concentrate young birds near remaining water, increasing their vulnerability to predators (G. Ivey pers. observ.). Early cutting of hay, as early as mid-June on some native hay meadows in the region, results in mortality of unfledged waterbirds. Young rails and cranes are particularly vulnerable to haying mortality. Overgrazing by livestock and inappropriate or

unmanaged livestock grazing systems can degrade wetland habitats, making them less suitable for waterbirds. For example, nests are sometimes trampled by cattle on private lands grazed during the nesting season (Capen 1977, Herron and Lucas 1978). Nesting trees of Great Blue Herons have been bulldozed on private land in southern Idaho (Trost and Gerstell 1994).

## Riparian Forests and Associated Habitats

Riparian gallery forests and associated wetlands or wet meadows provide nesting sites for some species (e.g., Great Blue Heron, Green Heron). Species such as Virginia Rail, Sora, American Bittern, American Coot, and Black-crowned Night-Heron will use the cottonwood-willow association. Cottonwoods and willows are sometimes damaged by colonial nesting birds as they become over-fertilized by the urea excreted by the birds. Riparian wetlands and meadows have, in many cases, been degraded by improper livestock use. The need to restore and maintain these habitats overlaps with needs of certain landbird species.

## Mortality Factors

Because waterbird species are generally long-lived, adult mortality is a key determinant in population trends. Thus, threat management aimed at reducing adult mortality can help maintain regional populations.

*Disease.* In some areas of this region, chronic outbreaks of avian botulism and avian cholera occur almost annually. Erysipelas, a bacterial disease, killed several thousand Eared Grebes at Great Salt Lake in 2001, and avian cholera killed about 30,000 Eared Grebes in 2004 (F. Howe pers. comm.). Salmonellosis was a cause of severe gull mortality in Idaho (Winkler 1996). Newcastle disease, encephalitis, and West Nile virus are potential future threats. Further research is needed to identify causes and remedies (e.g., are contaminants exacerbating disease outbreaks). One consideration is the ability to control water to rapidly drain or deep flood managed wetlands where disease outbreaks occur, especially for avian botulism.

*Lead poisoning.* Hunting shot and fishing weights containing lead cause mortality in some waterbirds when ingested for grit or incidentally while feeding. Common Loons are particularly

susceptible to consuming fishing weights. Sandhill Cranes occasionally succumb to lead poisoning from consumption of lead shot. While lead shot is now illegal for hunting waterfowl, some areas still allow its use for upland species which are hunted near wetlands (e.g., pheasants), prolonging the problem of lead poisoning in wetland birds. Changes in policies should be considered regarding where lead shot can be used. The use of lead weights should be prohibited on lakes used by loons.

*Powerlines and fences.* Powerline strikes are among the major mortality factors for adult cranes and pelicans, as well as some other waterbirds. Options for reducing powerline strikes include removing unnecessary lines, burying lines (though this is very expensive), or installing line markers to increase their visibility to birds (Brown and Drewien 1995, Morkill and Anderson 1991). Barbed-wire fences have killed cranes and other waterbirds, and are particularly problematic where they cross streams and wetlands. Fences should be removed where possible or marked to increase visibility near wetlands. These are very local issues; sites with a history of mortalities should be addressed on a case-by-case basis.

*Predators.* For some species, predators have had significant impacts on populations, primarily through depredation of eggs and young. Sandhill Cranes and other solitary-nesting species are particularly vulnerable to predators. Human-induced changes have led to increases in predation in some areas. For example, the Common Raven, an aggressive egg predator, has generally increased in the region, likely because of increases in available forage from agriculture, highway systems (providing roadkills), and garbage dumps. Powerlines and other human structures have increased options for raven nest sites. Elimination of wolves from the landscape has allowed coyote populations to increase, and introduced red foxes have become problem predators in some areas. Red foxes are particularly adept at hunting ground-nesting birds. Mink and raccoons are a significant problem at some sites since they are more aquatic and sometimes swim to colonies. Feral cats can also pose a problem for young waterbirds in some situations. Future research on this issue should focus on the primary predators and their interactions with breeding waterbirds. There are some means to protect nesting sites

from predators, such as keeping water levels high so that nesting islands do not become peninsulas or installing electric fencing to protect peninsula-nesting waterbirds. However, in many cases, our understanding of the causes of predation and the means to ameliorate the problems (i.e., management to reduce predation) is poor. Changing predator communities have resulted in both favorable and unfavorable situations for waterbirds, depending on local conditions. Interactions between predators and prey are complex and dynamic.

## Interspecific Conflicts

Conflicts sometimes arise between waterbirds and other wildlife species. An example includes a common waterbird species out-competing a rare or sensitive species. These should be taken into account when planning for waterbird conservation. To help resolve conflicts, there is a need to prioritize management objectives and understand species behavior, biology, and ecology.

*Nest site competition.* There are local incidents of competition for nest sites. For example, Canada Geese sometimes compete with Double-crested Cormorants and Great Blue Herons for nest sites and also sometimes take over loon nests in Canada. The increasing population of cormorants may impact nest site availability to other waterbird species. In Utah, artificial islands constructed for waterfowl and shorebird nesting have been colonized by California Gulls to the exclusion of other species.

*Waterbirds as predators on other birds.* Some species of waterbirds prey on other wetland birds. California Gulls and Black-crowned Night-Herons are particularly adept at eating ducklings and young shorebirds. To minimize conflicts, guidelines for establishing artificial colony sites should be developed (e.g., it would be unwise to build a bare nesting island in a marsh that is important for duck broods or an important shorebird breeding site). However, duck nesting near gull colonies can be highly successful, and if good brood cover is nearby, the broods may have good survival after hatching as well. Careful planning and an understanding of ecological relationships are needed to effectively manage or avoid conflicts arising from waterbird predation on other birds.

## **Beavers**

Beavers often provide habitat for a variety of waterbirds, such as cranes, bitterns, and rails, through their dam-building activities. Their distribution and abundance is critical as they generally benefit smaller wetlands in forest environments. Beavers can cause water control problems on managed wetlands. There are nonlethal ways to minimize beaver conflicts, such as modifying water control structures and by using electric fences. Wetland managers should be informed about these beaver-friendly methods of solving water control problems.

## **Threats Outside the Region**

Waterbirds using the Intermountain West also face threats outside the region, often at wintering or staging sites. Large numbers of waterbirds are occasionally killed by oil spills on the Pacific Coast (especially loons, grebes, gulls, and terns), and by disease outbreaks at wintering areas such as the Salton Sea (grebes, pelicans). Some waterbirds are exposed to pesticides in the Imperial Valley, California, and in Mexico and Central America. Also, some birds staging in the region primarily breed in BCRs outside of the region (e.g., Eared Grebes, Common Loons); degrading habitat conditions in those regions may reduce the numbers using the Intermountain West. These external threats may affect the status of waterbird populations and should be addressed by establishing a network for coordination between BCRs using an international/flyway approach.

# CONSERVATION STATUS ASSESSMENT

## Species Rankings

In order to determine which waterbird species should receive greater conservation efforts and population objectives, we assessed their status in each of the four BCRs in the Intermountain West. This involved several steps:

1. Estimating BCR waterbird populations and assessing data quality.
2. Determining Area Importance (AI) scores.
3. Reviewing species' status on Federal, state, and PIF plan lists.
4. Reviewing the NAWCP rankings for colonial waterbird species.
5. Developing criteria for colonial and marshbird species' regional rankings.
6. Developing a concern matrix for each BCR to identify priority waterbird species.
7. Developing a waterbird species priority list for the Intermountain West.

Details of this species ranking process are described in Appendix D. Final priority rankings for species are detailed in Table 3. Species accounts for these priority waterbirds appear in Appendix E. Waterbirds ranked as High or Moderate concern are considered Priority species, and will serve as the focus for implementing the conservation measures identified in this plan.

**Table 3. Concern matrix for priority waterbird species in each Bird Conservation Region (BCR) in the Intermountain West Waterbird Conservation Plan (breeding species are reported here unless noted as migrant; b = breeding, m = migrant).**

Concern Category	BCR 9	BCR 10	BCR 15	BCR 16
<b>High Concern</b>	Greater Sandhill Crane (CVP) (b, m)	Franklin's Gull	Greater Sandhill Crane (CVP)	Greater Sandhill Crane (RMP) (m)
	Greater Sandhill Crane (LCRVP) (m)	American White Pelican	Western Grebe	American Bittern
	Lesser Sandhill Crane (PFP) (m)	Common Loon	Clark's Grebe	
	Yellow Rail		Common Loon	
	Franklin's Gull (b)			
	Black Tern			
	Eared Grebe (m)			
	Western Grebe			
	Clark's Grebe			
	Snowy Egret			
<b>Moderate Concern</b>	American White Pelican (b, m)			
	Common Loon (b)			
	Greater Sandhill Crane (LCRVP) (b)	Greater Sandhill Crane (RMP)	Virginia Rail	Greater Sandhill Crane (RMP) (b)
	Virginia Rail	Virginia Rail	Sora	Virginia Rail
	Sora	Sora	Black Tern	Sora
	California Gull	California Gull	Pied-billed Grebe	Black Tern
	Franklin's Gull (m)	Forster's Tern	American Bittern	Pied-billed Grebe
	Forster's Tern	Black Tern		Western Grebe
	Pied-billed Grebe	Pied-billed Grebe		Clark's Grebe
	Great Blue Heron	Western Grebe		Snowy Egret
<b>Low Concern</b>	Black-crowned Night-Heron	Clark's Grebe		Green Heron
	Least Bittern	Snowy Egret		Black-crowned Night-Heron
	American Bittern	Great Blue Heron		Least Bittern
	White-faced Ibis	Black-crowned Night-Heron		
	Common Loon (m)	American Bittern		
		White-faced Ibis		
	Greater Sandhill Crane (RMP)	Greater Sandhill Crane (CVP)	Forster's Tern	California Gull
	Caspian Tern	Greater Sandhill Crane (LCRVP)	Eared Grebe	Franklin's Gull
	Red-necked Grebe	Caspian Tern	Black-crowned Night-Heron	Forster's Tern
	Horned Grebe	Red-necked Grebe	White-faced Ibis	Eared Grebe
Eared Grebe (b)	Horned Grebe		White-faced Ibis	
	Eared Grebe		American White Pelican	

# POPULATION AND HABITAT OBJECTIVES

Comprehensive wetland bird management requires conscious balancing of objectives. Waterbird objectives must be integrated into wetland management strategies that consider annual needs in a context of long-term population maintenance. An understanding of the ecology and biology of the various species being managed is necessary to set appropriate habitat management objectives. Establishing explicit management objectives from a sound biological basis will best serve waterbird conservation. Appendix E reviews basic ecology of priority species and Appendices G and H review habitat objectives and conservation strategies that can be used to form management objectives for waterbirds.

## Population Objectives

Population objectives are scientifically-based targets that will function as a basis for setting habitat objectives and as performance indicators. We derived numerical population objectives for priority (High or Moderate Concern) waterbird species by each state and BCR (Appendix F). Habitat objectives are detailed in Appendix G. For priority migrant species, population objectives are set for individual sites that support high numbers and were derived from estimates of peak numbers of staging birds using those sites. The focus for species in this category will be based on maintenance of habitat at those key staging sites (see Appendix H, Conservation Strategies). For breeding waterbirds, population objectives were derived using the methodology described below. These numbers are, as possible, consistent with other plans (e.g., recovery plan goals for endangered species, Flyway plans). Two steps were involved in this process:

1. *Determine population trend (PT) index.* A consensus was reached by the planning team to use the PIF approach as a foundation for determining Population Trend (PT), with some necessary modifications. In PIF documents, PT scores were based on the degree of population change or trend, indicated by Breeding Bird Survey (BBS) data since 1966, with objectives defined for different PT levels. The overall objective for PIF is to return populations toward historic levels in the early BBS

years (1966-68). Because BBS data often does not well represent waterbird trends, our approach relies less on BBS and uses other sources of trend information (sometimes anecdotal). Table 4 summarizes the criteria used here to establish objectives.

2. *Derive State and BCR numerical population objectives.* Using criteria from Table 4 and species population estimates on a state-by-state-by-BCR level (Tables D-2 to D-5 in Appendix D), we derived population objectives. Table 5 summarizes objectives for each BCR, while Table 6 summarizes objectives for each state. Appendix F details the objectives derivation process and the distribution of objectives among states and BCRs.

## Habitat Objectives

Establishing habitat objectives is a difficult task at this time, as existing information is not adequate to translate population objectives into habitat objectives. Defining relationships of population numbers to habitat is an important research need. An inventory of existing wetland habitats is also needed to further this task. National Wetland Inventory coverage is incomplete in this region and we should advocate for completion of this survey for future habitat assessments.

While more detailed habitat objectives should be identified in the future, we decided to use objectives developed by the 11 western states in their Coordinated Bird Conservation Implementation Plans (Arizona Steering Committee 2005, California Steering Committee 2005, Colorado Steering Committee 2005, Idaho Steering Committee 2005, Montana Steering Committee 2005, Nevada Steering Committee 2005, New Mexico Steering Committee 2005, Eastern Oregon Working Group 2005, Utah Steering Committee 2005, Washington Steering Committee 2005, Wyoming Steering Committee 2005). These plans identify priority habitat types for all birds (including waterbirds), Bird Habitat Conservation Areas (BHCAs), and habitat goals and objectives. These BHCAs are designated geographic areas that were selected by state committees at focus meetings that choose sites

from regions of each state. The selection criteria were relatively similar within each state and were driven by these criteria:

- Areas rich in priority birds and habitats
- Opportunities for conservation and partnerships
- Threats to priority species and habitats
- Areas large enough in scale to achieve meaningful conservation and small enough to capture local working groups

The Intermountain West Joint Venture (IWJV) is encouraging Coordinated Bird Conservation Implementation Plan Committees to stay organized and use the BHCAs as work areas within their shared bird habitat conservation efforts. Each State Committee has or is encouraged to have individuals interested and involved with the IWWCP as committee members. This will provide some potential brokering for waterbird habitat conservation within the BHCAs. The IWJV is focusing cost-share funding opportunities within

these BHCAs to assist in waterbird and other bird habitat conservation. The IWJV Technical Committee also has a waterbird biologist as a committee member. Digital maps of BHCAs were produced to calculate acreages of all habitats which include the priority habitat targets of the BHCA by state. These priority acreage numbers are the measurable habitat objectives in the BHCA that will be targeted for specific conservation work. Partners will use these acreage targets as focal points to develop specific conservation actions (e.g., improve colonial nesting habitat for x number of pairs of White-faced Ibis and other species in the marsh nesting guild—see Conservation Strategies below). The mapping will also identify land ownership to assist in partnership development and on-the-ground planning. Habitat objectives that relate to waterbirds are listed in Table 7. Additional details on these objectives and habitat type definitions can be found in each state’s Coordinated Bird Conservation Implementation Plans.

**Table 4. Definitions of Population Trend (PT) indices for priority waterbird species and population objective goal for the Intermountain West Waterbird Conservation Plan.**

PT Index	PT Definition	Population Objective Goal
PT = 5	Species with a biologically significant (estimated 50%) historic population decline or range contraction. This includes species that were severely impacted by market hunting, habitat loss, and contaminants (primarily DDT-DDE). Also species with evidence of recent major declines and those that have been extirpated or nearly extirpated in a state.	Double the current population over the next 50 years or restore breeding populations of extirpated species.
PT = 4	Species that experienced significant historic declines and have shown an increasing trend, but have not recovered to their potential. Also species with recent moderate population decline.	Increase the current population by 50% over the next 50 years.
PT = 3	Species that historically declined and have apparently recovered. Also species with recent unknown trends. Priority migrant species are also included, but did not receive numerical objectives (only habitat objectives).	Maintain or increase the current population over the next 50 years.
PT = 2	Species with recent suspected or moderate increase.	Maintain the current population over the next 50 years.
PT = 1	Species with recent large population increase.	Maintain the current population over the next 50 years.

**Table 5. Population objectives for priority waterbird species by Bird Conservation Regions (BCRs) in the Intermountain West Waterbird Conservation Plan region (b = breeding, m = migrant, TBD = To Be Determined after data become available or species resumes nesting).**

Species	BCR 9 objective #	BCR 10 objective #	BCR 15 objective #	BCR 16 objective #
Greater Sandhill Crane (CVP) (b)	3,630		190	
Greater Sandhill Crane (CVP) (m)	>8,000			
Greater Sandhill Crane (LCRVP) (b)	TBD			
Greater Sandhill Crane (LCRVP) (m)	>2,000			
Greater Sandhill Crane (RMP) (b)		TBD		450
Greater Sandhill Crane (RMP) (m)				>18,000
Lesser Sandhill Crane (PFP) (m)	>2,000			
Yellow Rail (b)	1,220			
Virginia Rail (b)	TBD	TBD	TBD	TBD
Sora (b)	TBD	TBD	TBD	TBD
California Gull (b)	314,400	9,470		
Franklin's Gull (b)	42,580	21,100		
Franklin's Gull (m)	>85,000			
Forster's Tern (b)	7,340	230		
Black Tern (b)	9,780	>670	270	40
Pied-billed Grebe (b)	TBD	TBD	TBD	TBD
Eared Grebe (m)	>3 million			
Western Grebe (b)	17,280	>5,030	1,930	380
Clark's Grebe (b)	5,130	>110	20	210
Snowy Egret (b)	3,400	50		940
Green Heron				220
Great Blue Heron (b)	4,560	>1,800		
Black-crowned Night-Heron (b)	5,590	>320		660
Least Bittern (b)	TBD			TBD
American Bittern (b)	TBD	TBD	TBD	TBD
White-faced Ibis (b)	57,980	1,710		
American White Pelican (b)	34,110	10,500		
American White Pelican (m)	>55,000			
Common Loon (b)	>10	270	TBD	
Common Loon (m)	>1,000			

**Table 6. Population objectives for priority waterbird species by state in the Intermountain West Waterbird Conservation Plan region (b = breeding, m = migrant, TBD = To Be Determined after data become available or species resumes nesting).**

Species	AZ	CA	CO	ID	MT	NV	NM	OR	UT	WA	WY
Greater Sandhill Crane (CVP) (b)		1,390				30		2,140		260	
Greater Sandhill Crane (CVP) (m)		>8,000						>6,000		>2,000	
Greater Sandhill Crane (LCRVP) (b)				TBD		TBD			TBD		
Greater Sandhill Crane (LCRVP) (m)						>2,000					
Greater Sandhill Crane (RMP) (b)			450	TBD	TBD						TBD
Greater Sandhill Crane (RMP) (m)			>18,000								
Lesser Sandhill Crane (PFP) (m)		>20,000		>1,000				>20,000		>20,000	
Yellow Rail (b)		20						1,200			
Virginia Rail (b)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Sora (b)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
California Gull (b)		62,470		72,640	920	4,200		11,330	150,000	14,000	8,310
Franklin's Gull (b)		150		23,500	6,000	10		3,270	30,650		100
Franklin's Gull (m)									>85,000		
Forster's Tern (b)		3,510		40	130	190		1,610	1,590	400	100
Black Tern (b)		5,820	30	200	200	550		>3,180	130	300	100
Pied-billed Grebe (b)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Eared Grebe (m)		>2 million						>20,000	>1.6 million		
Western Grebe (b)	200	7,390	150	6,140	250	80		>5,800	730	1,000	430
Clark's Grebe (b)	50	1,030	150	>710	30	450	10	2,560	300	100	80
Snowy Egret (b)			400	650		600	500	250	1,980		10
Green Heron			20				200				
Great Blue Heron (b)		110		1,970	900	660		>320	470	1,530	400
Black-crowned Night-Heron (b)		310	600	1,610	50	910	40	>1,380	470	1,000	200
Least Bittern (b)	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD		
American Bittern (b)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
White-faced Ibis (b)		2,310		6,760	20	12,230		18,100	20,000		270
American White Pelican (b)		5,880		2,770	8,000	12,620		2,360	10,120	360	2,500
American White Pelican (m)									>55,000		
Common Loon (b)		TBD		>10	200			TBD		20	50
Common Loon (m)						>1,000					

**Table 7. Waterbird habitat objectives (in acres) for the Intermountain West Waterbird Conservation Plan, by state.**

State:	Playa/ vernal pool	Agriculture	Alkaline wetlands	Open Water Lacustrine	Emergent Marsh Palustrine	Wet Meadow	Grassland	Riparian Woodland	Riparian Shrub	Aspen
Arizona		28,000		maintain existing	19,000		513,000	17,200 (690 miles)		10,000
California				36,733	25,871	12,069	30,521	6,397		1,404
Colorado		880,000		30,000	100,000		400,000	(6,500 km)		
Idaho		1,780,000			270,5371		1,300,000	289,705		432,161
Montana		972,773			292,6581		3,400,000	199,547	175,442	252,237
Nevada		13,000			25,0001			(450 miles)		40,000
New Mexico				no net loss	no net loss	protect		no net loss	no net loss	
Oregon	55,500	215,000	95,000	176,100	175,000	185,000	365,000	7,000	40,000	25,000
Utah	126,200				440,4501	36,000		55,808		
Washington	15,000	200,000			80,000		2,000,000	45,000		3,500
Wyoming		430,000			27,000	270,000	282,000	317,000		176,000

## Conservation Strategies

A variety of conservation strategies will be used to implement the IWWCP and achieve population and habitat objectives (Appendices F and G). Because wetlands are generally isolated oases in the Intermountain West landscape, most waterbird habitat conservation will be focused on important wetland sites in the region, within BHCAs and IBAs. Descriptions of IBAs provide an additional source of conservation strategies which should be consulted when developing conservation plans (Audubon Society 2004). Additionally, waterbird-focused habitat management practices need to be implemented at a broad scale in wetlands around the region. A regional assessment of waterbird habitat enhancement opportunities, restoration projects, and local management issues should be conducted. Site-specific habitat conservation should be addressed using the strategies in Appendix H and IBA descriptions as guidelines. Appendix I summarizes some potential sources of funds for conservation projects.

## Critical Conservation Needs and Recommendations at Major Waterbird Sites

Several important waterbird sites need support and attention to resolve outstanding issues that are limiting waterbird values, including:

*Mono Lake protection.* Issues that need to be resolved at Mono Lake include monitoring of the effects of meromixis (a condition in which lighter, less saline water overlies heavier, more saline water) on staging grebes and breeding gulls, and controlling human disturbance. State Water Board-mandated water levels may affect brine shrimp and brine fly abundance, and unregulated recreational boating disturbance could impact grebe use and gull nesting colonies (J. Jehl pers. comm.). We recommend inclusion of Mono Lake in the USFWS National Wildlife Refuge System or as a State Wildlife Area to help ensure protection of its high wildlife values.

*Lower Klamath NWR water supplies.* This most significant waterbird nesting site in California is currently at risk of insufficient water supplies to maintain refuge wetlands. Due to a multitude of competing demands (endangered fish, tribal treaty

rights, agriculture, and power generation), water supplies for wetland management are extremely limited in the Klamath River Basin (Basin). Lower Klamath NWR lies within the Klamath Reclamation Project (Project), which has no legislated fish or wildlife purpose. As a result, refuge wetlands are the lowest priority for water delivery in the Project. Ultimately, some of the water priority issue will be resolved by the ongoing State of Oregon Klamath River Adjudication. In filing for both irrigation and Federal reserved water rights in the Adjudication, the USFWS may achieve some certainty for refuge wetlands. However, a long-term solution in the Basin will require that individuals, agencies, nongovernmental organizations (NGOs), and others interested in waterbird conservation and other natural and social resource issues become involved in negotiations and discussions to achieve a balanced solution to the Basin's water issues.

*Grays Lake NWR water levels.* Grays Lake has chronic water problems, as water levels typically decline during the spring and summer due to water withdrawals by the Bureau of Indian Affairs (BIA) for the Fort Hall Irrigation District. This has resulted in regular failures of nesting colonies of waterbirds using the marsh (S. Bouffard pers. comm.). Annual drawdown results in declining water levels during the nesting season, which may limit nest success for some species, and low water levels each summer seriously limit the availability and quality of habitat for brood-rearing and molting. Also, the artificially-managed hydroperiod, which remains static across most wet and dry years, provides no opportunity for high water—a necessary component of natural flood-drought variations for healthy wetland ecosystems. Water levels cannot be manipulated because of long-standing agreements with local landowners and the Fort Hall Irrigation District. The Shoshone-Bannock Tribe owns the water rights. A modification of the water management agreement between the USFWS, BIA, and private landowners is needed to allow higher water levels during most summer and fall seasons, and to allow greater natural annual variability in water levels. These changes are needed to provide enhanced conditions for nesting birds, enhanced habitat for brood-rearing and molting, and allow the Grays Lake NWR to fulfill its mission.

*Lake Abert conservation.* Lake Abert, Oregon, is currently designated as a Bureau of Land Management (BLM) Area of Critical Environmental

Concern. However, this designation does not necessarily offer long-term protection of the site, which has been threatened in the past by water development proposals. Commercial harvest of brine shrimp is another concern. We recommend inclusion of Abert Lake in the NWR System to ensure protection of its high wildlife values.

*Lahontan Valley Wetlands water supplies.* Stillwater NWR and Management Area and the Lahontan Valley Wetlands represent the most vital wetland ecosystem in Nevada. It is important that support continue for efforts currently underway to increase the quantity and quality of water entering the Lahontan Valley Wetlands by acquiring sufficient water and water rights to sustain, on a long-term average, approximately 25,000 acres of primary wetland habitat within Lahontan Valley. The three primary wetland areas have been identified as the Stillwater NWR and Management Area, Carson Lake and Pasture, and Fallon tribal land wetlands.

*Great Salt Lake foraging habitat loss.* Foraging habitat losses on flood-irrigated farm lands, particularly within the Great Salt Basin in Utah, are a threat to some species of waterbirds (e.g., ibises). At Great Salt Lake, ibis-colonized wetlands are closely associated with feeding sites dominated by flood-irrigated pastures. During the last 20 years, there has been a steady loss of these farmland habitats to urbanization, as well as the conversion of flood-irrigated agriculture to sprinkler irrigation. Flood irrigation has been converted to pressurized water-delivery systems as the landscape has changed from farms to houses. There are now 1.5 million people living between Great Salt Lake and the Wasatch Mountains, and the loss of quality foraging habitat has emerged as a limiting factor for ibises (Ivey et al. *in prep* b). Losses of flood-irrigated agriculture on private lands should be mitigated through development of additional seasonal wetland foraging sites on NWRs and WAs. Due to the significant human population and projected growth, there is a significant threat to a stable water supply for wetlands and the Great Salt Lake proper. This threat will impact water volume, distribution, distribution type and points, and quality.

*Walker Lake water supplies and mercury contamination.* Diminishing water supplies here will impact migrant Common Loons. Walker Lake, Nevada, a remnant of the ancient Lake

Lahontan at the terminus of Walker River, is rapidly declining in both water volume and water quality. Since 1920, the surface elevation of Walker Lake has dropped by over 110 feet, and the alkalinity of the water is increasing. If the current trend continues, fish habitat in the lake will no longer exist, resulting in the loss of prey for loons and other piscivorous waterbirds. Lake water levels are expected to decline for several more decades due to its deficit water balance, and will likely reach equilibrium (evaporation losses = lake inflow) in about 50 to 100 years. At that time, the total water volume of the lake will be about one-fourth of the current volume and the lake will cease to exist as a viable fishery. While significant money has been appropriated by Congress to address the problem, an effective conservation strategy acceptable to all local interests has yet to be devised. Negotiations among stakeholders must continue, and discussions must address the stickiest political issues if Walker Lake's current wildlife values are to be preserved. Time will run out for Walker Lake if it cannot gain the status of a regional resource treasure valued by the entire community with stake in its future.

*Cokeville Meadows NWR acquisition.* Cokeville Meadows is the most extensive waterbird nesting and foraging site in Wyoming (A. Cerovski pers. comm.), however, much of the land within the approved refuge boundary has not yet been acquired. The USFWS is acquiring additional private parcels along with water rights as willing sellers come forward. Fluctuating water levels and water management are also issues to be addressed here.

*Conboy Lake NWR acquisition.* Conboy Lake NWR is an important nesting site for Greater Sandhill Cranes in Washington, where the species is listed as endangered. Only about half of the land within the approved refuge boundary in the historic Camas Prairie has been acquired by USFWS. The private ownership of the south half of the lake bed has made refuge water management very difficult, as water levels cannot be maintained while the neighbors drain water from their land for early haying. This situation has resulted in lower productivity and wetland degradation there. This issue is discussed in the state's crane recovery plan (Littlefield and Ivey 2002) and the USFWS and Washington Department of Fish and Wildlife should pursue resolution to the water and land ownership issues through easements, land use agreements, or acquisition as willing sellers emerge.

# POPULATION MONITORING ACTIVITIES AND NEEDS

The most important information needed to further waterbird conservation in the Intermountain West is improved estimates of waterbird population status, distribution, and trends. These estimates will be facilitated by the development and implementation of a regional waterbird monitoring program. This comprehensive multi-species monitoring program will refine planning and evaluate management actions to achieve the IWWCP's overall goal of maintaining healthy waterbird populations. Although some monitoring has been, and is being, conducted in the region (Appendix J), existing information is inadequate to estimate population numbers and trends for most waterbird species. Because few sites have good historic data, many current population estimates and trend information are imprecise. A well-planned monitoring program will help avoid waterbird crises and will reduce the need for future Threatened and Endangered (T&E) listings.

For efficiency, waterbird monitoring should be integrated with other bird monitoring programs (i.e., landbird, shorebird and waterfowl programs) and Coordinated Bird Monitoring Plans (CBM, see Bart 2003a) for states, BCRs, and the region. Because most waterbird colonies are on State or Federal lands, region-wide monitoring is a feasible goal. Similarly, because several refuges and State agencies already conduct local surveys, region-wide monitoring need not be an economic burden to any single agency and will be conducted through a partnership of State, Federal, Tribes, and NGOs. State wildlife agencies and tribes will soon have additional funding resources to implement monitoring programs from USFWS's State and Tribal Wildlife Grants Program (<http://federalaid.fws.gov/swg/swg.html>). Some western states have prepared coordinated aquatic bird monitoring plans or are near their completion (e.g., Idaho Bird Inventory and Survey [IBIS]). These plans will be advantageous to region-wide monitoring. They follow similar protocols and design that complement the process recommended here.

## Goal and Objectives

One goal of this plan is to facilitate a coordinated, meaningful approach to waterbird monitoring in the Intermountain West by developing reliable, comparable estimates of populations and trends of priority waterbird species. The IWWCP will also provide recommendations for assessing the effect of habitat and management projects on local waterbird populations. A formal monitoring plan will be developed for the entire region. This plan will be linked with national and international monitoring schemes to facilitate evaluation of continental trends. A regional monitoring plan will complement existing local monitoring programs while providing the added value of a regional context of waterbird population estimates and trends. Existing long-term monitoring efforts (e.g., state, NWR, WA programs) should continue at key waterbird concentration sites, where annual surveys allow interpretation of local long-term trends. Because of our lack of precise trend and population numbers, we should strive to derive improved population and trend estimates for all priority waterbird species. Ideally, they should be monitored annually until we have a better understanding of their status. However, comprehensive regionally coordinated annual surveys may not be practical. As a second-best option, we may invoke efforts to survey a particular species or nesting guild in a given year. For example, while some NWRs or states may count local colonies of White-faced Ibises annually, a coordinated survey of *all* ibis colonies in the Intermountain West might be conducted every third year. The following objectives should be accomplished over the next five years:

1. Develop a regional waterbird monitoring plan.
2. Develop regional standardized protocols for monitoring priority species.
3. Implement regional waterbird monitoring.

4. Develop atlases of current and historical waterbird breeding colony locations and important waterbird congregation sites within each state and BCR in the Intermountain West. Periodic, rather than annual, surveys focused on a particular species or nesting guild will be more practical to implement and yield reliable data on population size and trends over time.
  - Write site descriptions for these sites (Bart 2003a).
  - Conduct an inventory to determine the distribution and species composition of colonies within each area of interest.
5. Derive population estimates and trends for priority species.
6. Update waterbird distributional information as new information is developed.

*Justification.* The status and trends of waterbird populations must be understood at various geographic scales in order to make informed management decisions. Collection of site-specific data using different methodologies confounds interpretation of population trends at larger geographic scales; therefore, it is important to standardize waterbird survey methodologies and coordinate survey efforts regionally in order to identify problems with species and evaluate their responses to management actions.

## Elements of a Monitoring Plan

Several sources provide useful guidance for designing a monitoring program. A draft Waterbird Monitoring Manual, focused on colony monitoring, is available (Steinkamp et al. 2003a), and this information is supplemented by a paper on waterbird sampling designs (Steinkamp et al. 2003b). A standardized monitoring protocol aimed at secretive marsh bird species is also available (Conway 2004). A plan for regional monitoring has been proposed by Jon Bart, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center (Bart 2003a, 2003b). Such a plan should define standard monitoring protocols to ensure that data collected are meaningful and comparable, coordinated regionally, and have enough statistical power to determine waterbird trends. The North American Waterbird Conservation Plan sets as a target the ability to detect a 50 percent change in population over 10 years or three generations. To derive population estimates and trends for some

species, surveys should be stratified to sample numerous wetlands of all sizes and types found in the region. To document regional changes in distribution, surveys should be geographically extensive and should be referenced to allow development of habitat models. Survey data should be linked to local indices of water conditions to further our understanding of waterbird dynamics in relation to wetland conditions at local and regional scales. The monitoring program should also address other considerations such as costs, frequency, timing, and techniques, including measures of detectability. Monitoring efforts should focus on priority waterbird species, however; for some surveys, it would be prudent to count all associated species (e.g., colony censuses). Different species require different survey methodology; for some species, complete censuses are appropriate (e.g., breeding colonies), while for others (e.g., secretive marshbirds), a sampling strategy may be more useful for estimating populations and trends. The BBS survey may adequately serve for monitoring trends of some species, and might be used to derive population estimates. Monitoring priorities should be based on species priorities (and/or guilds) in this plan, and should be designed to test management prescriptions and fill important information gaps.

## Monitoring Committee

A monitoring committee to develop and coordinate regional waterbird monitoring was commissioned by the Regional Working Group in 2002. The committee will integrate waterbird monitoring with CBM efforts in states, BCRs, and the region. Also, the committee should participate in a continental alliance (a waterbird monitoring partnership to use comparable techniques and share data; e.g., keep in communication with the monitoring coordinator at Patuxent). The committee will use the Western Working Group meetings as an opportunity to share recommendations with the Intermountain West Waterbird Working Group.

## Management of Monitoring Data

The National Bird Population Data Center at U.S. Geological Survey, Patuxent Wildlife Research Center, has 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 via the World Wide Web (Patuxent Wildlife Research Center 2004), and all monitoring data should be

sent to this repository. This will help facilitate information exchange and species status reviews in the future.

## Monitoring Priorities and General Approaches

Priority species will be the primary focus of region-wide waterbird monitoring (Table 8). However, other bird species should be counted in conjunction with surveys for these priority species, when practical. Because of the varied life histories of waterbirds, a mix of monitoring strategies for different species

and guilds is necessary to accomplish objectives. Table 9 summarizes recommended methods and frequencies of surveys for priority waterbird species. Detailed standardized protocols need to be developed for each regionally coordinated survey. Table 10 summarizes proposed annual regional accomplishments over the next 5 years. While recommendations for frequencies of surveys are provided in Table 10, it would be ideal to conduct annual regionally-coordinated surveys for all priority species, and this annual surveying option should be evaluated during the development of the regional waterbird monitoring plan.

**Table 8. Focal species list for waterbird monitoring efforts in the Intermountain West.**

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**Priority Species:**

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Greater Sandhill Crane (breeding, migrants)	Western Grebe (breeding)
Lesser Sandhill Crane (migrants)	Clark’s Grebe (breeding)
Yellow Rail (breeding)	Snowy Egret (breeding)
Virginia Rail (breeding)	Great Blue Heron (breeding)
Sora (breeding)	Green Heron (breeding—BCR 16)
California Gull (breeding)	Black-crowned Night-Heron (breeding)
Franklin’s Gull (breeding, migrant in UT)	Least Bittern (breeding)
Forster’s Tern (breeding)	American Bittern (breeding)
Black Tern (breeding)	White-faced Ibis (breeding)
Pied-billed Grebe (breeding)	American White Pelican (breeding, migrants in UT)
Eared Grebe (migrants)	Common Loon (breeding, migrants in NV)

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**Table 9. Potential strategies for monitoring individual species or guilds of waterbirds in the Intermountain West.**

<b>Monitoring Strategies</b>	<b>Species</b>	<b>Minimum frequency</b>
Count and map breeding territories (all populations)	Sandhill Crane Common Loon	Every 10 years Annually
Complete census at important staging sites for priority migrant species	Sandhill Crane Franklin’s Gull (Great Salt Lake) Eared Grebe (Great Salt Lake, Mono, Abert Lake) American White Pelican (Great Salt Lake) Common Loon (Walker Lake)	Annually Annually Annually Annually Annually
Develop a sampling strategy to estimate breeding population trends	Sandhill Crane Black and Forster’s Tern Green Heron	Annually Every 5th year Every 5th year
N.A. Marsh Bird Monitoring Protocol for secretive marsh birds—develop a regional sampling strategy, stratified by state and BCR	Yellow Rail, Virginia Rail, Sora, Pied-billed Grebe, Least Bittern, American Bittern	Annually at official survey stations
Comprehensive survey of all island-nesting colonial waterbirds	American White Pelican, California Gull, Forster’s Tern, Great Blue Heron	Every 3rd year
Comprehensive survey of all marsh-nesting colonial waterbirds	Franklin’s Gull, Forster’s Tern, Black Tern, Snowy Egret, Great Blue Heron, Black-crowned Night-Heron, White-faced Ibis	Every 3rd year
Tree-nesting colonial waterbirds	Great Blue Heron	Every 3rd year
Lake-nesting colonial waterbird	Clark’s Grebe Western Grebe	Every 3rd year

**Table 10. Proposed schedule of accomplishments for regional waterbird monitoring in the Intermountain West, through 2010.**

Year	Activities
2005	<ul style="list-style-type: none"> <li>• Develop a draft regional monitoring plan.</li> <li>• Develop an atlas of all known and historical colony locations in each state, by BCR.</li> <li>• Develop site descriptions for important waterbird congregation sites in each state, by BCR.</li> <li>• Design a protocol for conducting secretive marsh bird species surveys during the breeding season on an annual basis for each state, by BCR. Select an adequate sample size of survey sites and define the protocols for each site.</li> <li>• Conduct surveys of priority staging species (annually).</li> <li>• Enter all available waterbird data into state and national databases.</li> </ul>
2006	<ul style="list-style-type: none"> <li>• Finalize Intermountain West waterbird monitoring plan.</li> <li>• Finalize an atlas with site descriptions of all known colony locations and important waterbird congregation sites in each state, by BCR.</li> <li>• Conduct region-wide coordinated survey of all American White Pelican colonies and other island nesting guild species; repeat this survey every third year (i.e., 2009, 2012, etc.).</li> <li>• Conduct pilot secretive marsh bird surveys to test methodologies and identify problems with survey routes.</li> <li>• Conduct annual surveys of priority staging species.</li> <li>• Enter all available colony data into the Waterbird Database.</li> </ul>
2007	<ul style="list-style-type: none"> <li>• Conduct region-wide coordinated survey of marsh-nesting colonial waterbird guild, Black Tern, Forster's Tern; repeat this survey every third year (i.e., 2010, 2013, etc.).</li> <li>• Implement annual secretive marsh bird surveys at selected sites.</li> <li>• Conduct annual surveys of priority staging species.</li> <li>• Enter all available colony data into the Waterbird Database.</li> </ul>
2008	<ul style="list-style-type: none"> <li>• Conduct region-wide coordinated survey of tree-nesting colonial waterbird guild; repeat this survey every third year (i.e., 2011, 2014, etc.).</li> <li>• Conduct region-wide coordinated survey of lake-nesting colonial waterbird guild (grebes); repeat this survey every third year (i.e., 2011, 2014, etc.).</li> <li>• Conduct annual secretive marsh bird surveys at selected sites.</li> <li>• Conduct surveys of priority staging species (annually).</li> <li>• Enter all available colony data into the Waterbird Database.</li> </ul>
2009	<ul style="list-style-type: none"> <li>• Conduct region-wide coordinated survey of all American White Pelican colonies and other island-nesting guild species; repeat this survey every third year (i.e., 2012, etc.).</li> <li>• Conduct surveys of priority staging species (annually).</li> <li>• Enter all available colony data into the Waterbird Database.</li> </ul>
2010	<ul style="list-style-type: none"> <li>• Conduct region-wide coordinated survey of marsh-nesting colonial waterbird guild, Black Tern, Forster's Tern; repeat this survey every third year (i.e., 2013, 2016, etc.).</li> <li>• Implement annual secretive marsh bird surveys at selected sites.</li> <li>• Conduct annual surveys of priority staging species.</li> <li>• Enter all available colony data into the Waterbird Database.</li> </ul>

# RESEARCH AND INFORMATION NEEDS

This plan provides an opportunity to encourage research on waterbirds and related conservation issues that will influence future research funding. Our goals for research include increasing funding opportunities for research, addressing important waterbird issues, facilitating regionally coordinated research, and increasing funding opportunities for research. Members of the Research Committee, as well as research needs and recent and current research programs, are summarized in Appendix K.

## Setting Research Priorities

Applied research that results in the beneficial management of waterbird populations and their habitats through the determination of causes of population declines, and the engagement of important waterbird issues, should be encouraged. Considerations for assigning research priorities include:

1. Determines causes of population decline.
2. Addresses priority species.
3. Refines links between population and habitat objectives.
4. Fills an important information gap relating to waterbird issues.
5. Considers multiple waterbird species.
6. Results applicable at regional and continental scales.

## Funding Needs

Currently, there are few direct funding opportunities for waterbird research. The USFWS' Webless Migratory Game Bird Research Grants Program provides some research funding for cranes, coots, moorhens, and gallinules (hunted waterbird species). Partners should support full funding for this program. Additional funding dedicated to waterbird research is needed at the Federal and State level and waterbird partners should seek such funding. Research projects would best be funded by multiple partnerships between agencies and the private sector, possibly through the IWJV.

## Education and Outreach Needs

There is a need to increase public understanding of the Intermountain West's importance to waterbird populations. Much wetland habitat has been lost historically, as some of the most important habitats for waterbirds were perceived as wastelands to be "reclaimed" for human use. With the current over-allocation of water resources in the west, political decisions about water use rarely take waterbird needs into account. Agencies often identify waterbird conservation as a secondary target in management schemes and, frequently, land managers are not trained in waterbird habitat management practices. There is also need for environmental education materials about waterbird ecology, management, and the value of these birds to our quality of life. Without the availability of this information, funding for waterbird management and research often remains low on the priority list of organizations responsible for wildlife conservation. An informed and engaged public can assist with monitoring of colonies, work to improve management of colonies and wetland habitats, and seek adoption of appropriate legislation to protect waterbirds and their habitats. Appendix L summarizes outreach recommendations for waterbirds in the region from various sources.

## Outreach Committee

An outreach committee should be established to coordinate and facilitate important aspects of outreach related to the IWWCP. This would best be accomplished through a partnership approach with multiple agency and private sector partners. The committee should recruit a volunteer who is a professional information management specialist to lead this group. Efforts should be coordinated among the many agencies, organizations, and groups involved with communication of wetland issues to maximize communication efficiency and encourage frequent communication through relevant media. Media releases involving other partners should be reviewed by them in advance. Articles should be shared with the committee in a timely fashion.

## An Outreach Strategy

An outreach strategy should be developed to help further the goals of the IWWCP. A well planned outreach strategy will greatly further the waterbird conservation goals and objectives in this plan. Outreach is needed on many levels—from informing land managers and agencies about waterbird management techniques and educating anglers and boaters about disturbance issues, to teaching children about their wildlife heritage. Waterbird education and public awareness should be incorporated into the many existing outreach programs, with emphasis on local programs to provide personal experiences with waterbirds. Steps for developing an outreach program and many ideas for outreach programs are identified in the NAWCP, including internet sites, training workshops, school programs, interpretive programs and signs, public monitoring programs, and waterbird merchandise (Kushlan et al. 2002). There are several important steps to develop an outreach strategy. Following is a summary of a draft outreach approach for consideration by the Outreach Committee:

*Identify audiences.* This task involves assessing groups of people who can make a difference for waterbird conservation. Following is a list of current and potential partners to engage in implementation of the IWWCP through habitat delivery and management:

### **International Partners:**

- Tribes
- British Columbia Fish and Wildlife Recreation and Allocation Branch
- Alberta Sustainable Resource Development Fish and Wildlife Division
- Canadian Wildlife Service
- Waterbird Conservation Council of the Americas

### **Governmental agencies:**

- State fish and wildlife agencies
- State land management agencies
- U. S. Fish and Wildlife Service
- U. S. Forest Service
- Bureau of Land Management
- Natural Resource Conservation Service
- Bureau of Indian Affairs
- Agricultural Experiment Stations
- Bureau of Reclamation
- Department of Defense
- Environmental Protection Agency
- Municipalities
- Universities

### **Non-governmental conservation organizations:**

- Intermountain West Joint Venture
- Partners In Flight
- Intermountain West Shorebird Group
- Audubon Society
- Bird observatories
- Ducks Unlimited, Inc.
- The Nature Conservancy
- Trust for Public Lands
- Land trusts
- Waterfowl conservation organizations (e.g., California Waterfowl Association)
- Wetland conservation organizations
- Water resources agencies

### **Private interests:**

- Private landowners, especially farmers and ranchers
- Outdoor recreation groups: hunting, fishing, off-road vehicle groups, birdwatchers
- Power industries, utilities
- Water related industries, irrigation districts, irrigators
- Aquaculture industry
- Birding/ecotourism industry

The following groups should be informed about waterbird issues and to seek funding and legislation to support waterbird conservation:

### **Political affiliates:**

- State and national legislators
- County governments
- Fish and Game Commissions
- Policy makers - State and Federal levels
- Universities and community colleges
- Public and private elementary and secondary schools
- Non-government conservation organizations
- General public

*Identify key outreach messages and strategies.* The following important messages and strategies have been identified for outreach to IWWCP partners and appropriate audiences:

### **General public, partners and legislators**

- Importance of water for wildlife; especially aquatic birds in the west, including seasonal availability, quality, and amount.
- Benefits of wetlands to ecosystem functions, the importance of wetland complexes, and the dynamic and ephemeral nature of wetlands.
- The importance of upland management to wetland ecosystems and waterbird populations.

- Importance of the Intermountain West to continental waterbird populations.
- Waterbird conservation issues and funding needs and, where possible, integrate IWWCP and IBA goals into State laws and ordinances for zoning and planning.
  - Develop field trips to educate legislators.
- Educate the public and legislators about the effects of mosquito control on waterbirds and about bird-borne diseases (e.g., West Nile virus).
  - Engage agricultural extension offices to help get the messages across.
  - Use NWRs that manage haylands as demonstration sites for good examples.
- Availability of key resources, such as the USFWS's Partners for Fish and Wildlife program and the U.S. Department of Agriculture's Natural Resources Conservation Service programs.
- Management needs for waterbirds on private lands.

### Resource users

- Facts behind fisheries issues.
  - Educate public to the importance of rough-fish fisheries to pelicans and other piscivorous birds.
- The impacts of disturbance on Common Loons (e.g., Loon Ranger Program) and other waterbirds. Develop guidelines for public lands to minimize human disturbance to colonial waterbirds on public lands (see Erwin 1989).
  - The successful Loon Ranger programs in Idaho and Montana could be expanded to other species. This is a great outreach tool requiring small funding levels to hire seasonal people to administer the program.
- The negative effects of lead fishing sinkers and lead shot on waterbirds.
  - Availability of lead-free alternatives.
- Inform educational organizations associated with waterbird areas. Work to incorporate the Shorebird Sister Schools Program, Project WILD, Flying WILD, or other programs of importance to waterbirds into the curriculum or activities of these organizations.
- Develop Watchable Wildlife Programs with some focus on outreach about waterbirds (Washington is proposing to develop a program on a heron rookery if it can be accomplished without causing disturbance).
- Involve schools in local wetland/habitat projects.
- Utilize NWRs, State WAs, birding trails, and Important Bird Areas as opportunities for outreach.

### Federal, State, Tribal and private land managers:

- Integrate IWWCP goals and objectives into agency land management plans.
- Educate the public, policy makers, and ranchers about the wildlife values and best management practices for flood-irrigated haylands.
  - Provide information on how to grow good hay and provide quality waterbird habitat.

### Private volunteers:

- Recruitment through outreach programs: local naturalists, bird enthusiasts and conservation groups who can assist in monitoring of waterbirds (e.g., Rocky Mountain Bird Observatory's Project Colony Watch).
- Develop user-friendly citizen scientist protocols, including surveys, IBA designation forms, wetland enhancement and habitat preservation how-to materials, and ecotourism development plans.
- Involve volunteers in noxious weed control programs.
- Utilize sportsmen, scout groups, and wildlife enthusiasts to help clean up wildlife areas and develop habitat enhancement projects.

*Identify outreach products.* Outreach media (fliers, videos, brochures, signs, websites, etc.) should be tailored in formats for specific users (e.g., provide waterbird objectives on website for North American Wetlands Conservation Act [NAWCA] proposals), and written in layman's terms. Determine what sorts of outreach materials are important. Following is our preliminary list of potential products:

- Develop Best Management Practices for waterbird management for land managers.
- Develop a manual for wetland managers specific to the management of colonial waterbird habitats in the Great Basin. The document should describe management of ephemeral wetlands, playa lakes, salt marshes, flood-irrigated agricultural lands, water distribution needs, and food and foraging habitats for waterbirds.
- Develop landowner incentive programs that encourage wildlife-friendly management programs in coordination with extension programs for farmers and ranchers.
- Develop an Intermountain West Bird Conservation page on the IWJV website.

- Develop classroom materials for children.
- Develop user-friendly packages with map layers to address conservation needs for public use (e.g., acquisition planning by land trusts).
- Work with the media to develop a TV documentary on Intermountain West waterbirds.
- Develop articles and submit to outdoor magazines.
- Develop fliers on specific topics for distribution at agency public use areas and other locations.
- Develop wetland/waterbird information kits.
- Host workshops to promote and advance waterbird monitoring.

# IMPLEMENTATION AND COMMUNICATION

Implementation of the IWWCP will require the cooperation of partners from private and governmental sectors and strong public support. Communication among the various public and private partners who will implement the IWWCP will be critical to successful plan implementation.

## Implementation Process and Adaptive Planning

Implementation of the IWWCP provides the opportunity for many groups and individuals to partner and develop an integrated landscape approach to waterbird conservation. While the IWWCP will serve as a guiding document for regional waterbird conservation, implementation will require communication among partners to coordinate and facilitate projects, track accomplishments, measure and celebrate successes, and facilitate future updates of the plan. The IWJV is committed to integrated bird conservation and will assist in the implementation of this plan. Under the leadership of an IWWCP Coordinator, the committees that have been mentioned throughout this document will promote the implementation of the IWWCP. It is proposed that the Coordinator serve a term of time to be determined and that the coordinator position be shared through time by Federal, State, and conservation organizations on a rotating basis.

The purpose of this plan was to synthesize available information, identify information needs, and prioritize conservation issues with the goal of guiding waterbird conservation in the Intermountain West. Actual implementation of the plan is an additional step that will need to be undertaken by partners within the region.

An excellent conservation base and partnership network exists in the IWJV, which is committed to the conservation of waterbirds as well as the species covered by other bird initiatives. For funding, programs such as NAWCA grants, as well as some Federal and state-level habitat grant programs, are available to support conservation efforts. The IWWCP was developed with limited information, and objectives and expectations will change as new information becomes available. It is imperative that the IWWCP be flexible and updated periodically, using an adaptive management approach.

## Communications Among Partners

To maintain a viable plan and facilitate communication, IWWCP implementers need to take advantage of opportunities to meet and discuss current waterbird issues. Partners In Flight's Western Working Group's biannual meetings will provide a primary opportunity for such communication. IWWCP implementers will also take advantage of other meeting opportunities to discuss IWWCP implementation, such as Flyway meetings, professional meetings, and agency meetings. BCR coordinators and the IWJV will help communicate and facilitate the IWWCP goals and objectives to further implementation of the plan. BCR coordinators will work to integrate waterbird objectives and priorities into agency plans and State Comprehensive Wildlife Conservation Strategies. Flyway Council involvement is also anticipated. Committees will work to further monitoring, research, outreach, and other elements of the plan, as needs arise. The IWWCP, our accomplishments, and current events will be posted on NAWCP's and IWJV's web pages and periodically reported in newsletters of the various partners.

# CONCLUSION

The ultimate measure of success of the IWWCP will be how well it meets the stated goal of “maintenance of healthy populations, distributions, and habitats of waterbirds throughout the Intermountain West region.” A number of actions will be required to successfully achieve this goal and further waterbird conservation in the Intermountain West, including:

- Acquire sufficient information about the population dynamics, population trends, breeding, migration and staging strategies, and habitat preferences of waterbirds in the region to make knowledgeable management recommendations.
- Preserve and enhance sufficient high-quality habitat to support healthy populations in the region, and securing the water needed to support these habitat values.
- Ensure that coordinated conservation efforts (regional, national, and international) are in place to address the key conservation priorities of waterbirds. Collaboration should occur between partners within and between states, BCRs, and other regions, as well as internationally, to achieve conservation objectives.
- Facilitate communication by informing the public, decision-makers, and all those involved in land management in the region about the importance of the region to waterbirds, and about the biology, trends, and management of waterbird species. Lobby for legislation and funding to further aquatic bird conservation.
- Implement regional monitoring, coordinated at all levels, and support priority research projects. Develop statistically sound, defensible estimates of abundance and population trends for key waterbird species in the Intermountain West.
- Resolve conservation issues at important sites.
- Update the IWWCP and refine population and habitat objectives and conservation strategies.
- Advocate for a complete inventory of existing wetland habitats to further this plan. Partners should lobby for complete National Wetland Inventory coverage in this region.
- Track accomplishments and celebrate successes.

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