Chapter Five **Shorebirds**

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Photo by Scott Root

INTERMOUNTAIN WEST
JOINT VENTURE
conserving habitat through partnerships

Inside this Chapter

Joint Ventures have collectively embraced all-bird conservation and have been tasked with improving the science driving species and habitat conservation actions through the use of integrated biological planning, conservation design, and delivery as well as addressing monitoring and research. One goal of this task is to link species-specific population objectives to explicit habitat targets for priority bird species in the Joint Venture. To meet that goal, a team of biologists focused on shorebird conservation in the Intermountain West (Appendix I) was convened to develop and guide the process. This Shorebird Science Team (SST) established focal species, developed population estimates and objectives, established focal species, and identified key sites.

Guiding Documents

This Shorebird Conservation Strategy builds upon the U.S. Shorebird Conservation Plan (USSCP; Brown et al. 2000) and the 2005 Intermountain West Joint Venture (IWJV) Coordinated Bird Conservation Plan [a.k.a. 2005 IWJV Implementation Plan (IWJV 2005)]. It is intended to provide a source of quantitative population objectives for shorebirds which have not previously been available that will facilitate the development of landscape level conservation planning for shorebirds in the Intermountain West that can be linked to continental goals. This effort expands on work accomplished in the Intermountain West Regional Shorebird Conservation Plan (IWRSCP; Oring et al. 2000).

The 2005 IWJV Implementation Plan recognized the potential value of wetland conservation for all bird species. Therefore, the plan coordinated the needs of all birds in the Intermountain West through planning focal points set by key geographies where priority birds and priority habitats intersect. These areas were called Bird Habitat Conservation Areas (BHCA). The plan identifies, describes, and ranks priority habitats. Furthermore, it provided habitat goals and quantifiable objectives for priority habitats by state. However, while partners use existing information, including the IWRSCP, to focus shorebird conservation efforts on priority habitats, sites and species, it fell short of developing habitat objectives specifically for shorebirds. This update will build on the strengths of the 2005 Implementation Plan's habitat conservation actions by providing information on specific habitat characteristics important to shorebirds and species-specific population and habitat objectives.

The USSCP provides continental population estimates and objectives, an assessment of conservation concern by species, and step-down plans at the regional level. The IWRSCP includes the entirety of the IWJV and identifies the most important issues facing shorebird conservation in the Intermountain West, such as competition for water (Oring et al. 2000). Finding ample, high quality fresh water will be the greatest shorebird habitat conservation challenge in this area. The IWRSCP plan addresses this and other issues through five goals and associated objectives and strategies. The IWRSCP also identifies important shorebird habitats in the region and provides site-specific information on 11 key sites. The habitat types and key sites identified in the IWRSCP are the focal points of this strategy. Threats and conservation actions are identified by the region and key sites. The plan identifies and prioritizes breeding and migrant shorebird species, provides data on distribution and abundance by Bird Conservation Region (BCR), and identifies important habitat types. However it stops short at providing population or habitat objectives. Since completion of the IWRSCP, limited progress has been made in implementing IWRSCP habitat objectives. Thus, the goal of this strategy is to further develop and implement the objectives listed in the IWRSCP, synthesized and updated herein.

- Work cooperatively with private, state, and federal interests in developing site-specific management plans for key shorebird habitats in the region.
- Coordinate site-specific management activities between sites to ensure that shorebird needs are met within the region.
- Identify habitats by BCR and state that are important to production of priority species dependent on these habitats (e.g., Long-billed Curlew, Wilson's Phalarope).
- Integrate restoration and enhancement action for shorebirds into existing or new wetland management plans in the region.
- Facilitate development and implementation of management strategies that will conserve, protect, and enhance large blocks of upland habitat adjacent to strategically important saline and freshwater wetlands
- Catalyze wetlands conservation by JV partners to address the needs of shorebirds as described in this Strategy through the North American Wetlands Conservation Act, Wetlands Reserve Program, and other conservation programs.
- Develop strategies that will help protect water quality and ensure sufficient water supplies for important shorebird habitats.

Partnership Guidance

With the development of population estimates and objectives for the BCRs within the Intermountain West and identification of important sites, partners will have information not previously available to develop and assess conservation measures for shorebirds and their habitats (e.g., development of targeted Farm Bill or NAWCA projects). In addition, this information should also be useful in the development and ranking of NAWCA Small and Standard Grants by providing a framework from which to evaluate the relevance of sites throughout the Intermountain West and habitat objectives that are meaningful in the context of important sites and species.

Development of habitat objectives will be an ongoing, iterative process. While they have been developed at a subset of sites, the intention for the JV partnership is to continue development of site-based conservation strategies for additional key sites in the future following the framework established for the current sites. This Strategy is intended to be relevant for approximately 15 years, at which time the population and habitat objectives will be reassessed if new information is available.

Planning Approach: Key-Site Strategy, Bioenergetics Modeling

The IWJV's SST recognized early in this planning that bioenergetics modeling would greatly advance shorebird conservation in the Intermountain West by establishing defensible shorebird habitat objectives. This approach has been used effectively by Joint Ventures across the Nation to identify the food energy resources needed to support non-breeding waterfowl and characterize the capability of the landscape to provide those resources. This modeling process informs habitat protection, restoration, and management by defining the amount of various habitats needed to "keep the table set" for waterfowl at continental goal populations. The SST determined that bioenergetics modeling for shorebirds would be most appropriately conducted at the "key site" scale.

The SST made the decision to employ bioenergetics modeling for shorebirds in two key sites – the Great Salt Lake and the Blanca Wetlands Habitat Area. These sites were chosen to pilot the bioenergetics modeling process in the Intermountain West and serve as a prototype for similar modeling projects in the other 16 shorebird key sites in the future. The sites were chosen because they represent the extremes in size and complexity of the key sites described in this Strategy. The Great Salt Lake is the largest, most important, and most complex of the shorebird key sites. The Blanca Wetlands is a small key site owned and managed by a single landowner, perhaps the least complex of the shorebird key sites. As such, this approach allowed the IWJV to test the bioenergetics modeling approach for shorebirds at both ends of the spectrum, a valuable step in determining appropriate population-habitat modeling approaches for migrating shorebirds in the Intermountain West.

This approach was successfully employed and resulted in two sub-chapters of the 2013 IWJV Implementation Plan – The Great Salt Lake Shorebird Key Site Conservation Strategy (Chapter 5.1) and the Blanca Wetlands Habitat Strategy (Chapter 5.2). These sub-chapters are summarized within this Strategy but are presented as stand-alone documents within the context of the overall 2013 Implementation Plan. These documents will help habitat managers and members of the JV partnership carry out strategic shorebird habitat conservation in these landscapes – doing the right things in the right places – while providing a roadmap for the JV partnership to conduct shorebird conservation planning in other key sites in the future.

Description of the Region

With 486 million acres spread over 11 western states, the IWJV is one of the largest JVs in North America. The IWJV boundary falls within two major flyways – the Pacific and Central Flyways, the majority of 3 BCRs – Great Basin (BCR 9), Northern Rockies (BCR 10), Southern Rockies/Colorado Plateau (BCR 16), and small portions of 7 BCRs – Sonoran and Mojave Deserts (BCR 33), Sierra Madre Occidental (BCR 34), Chihuahuan Desert (BCR 35), Pacific Rainforest (BCR 5) and Sierra Nevada (BCR 15), Badlands and Prairies (BCR 17) and Shortgrass Prairie (BCR 18; Fig. 1). Because they encompass such a small area within the IWJV boundary, we will not address BCRs 5, 15, 17 and 18 in this Strategy. These BCRs have been addressed within implementation plans developed by the Pacific Coast, Central Valley, Northern Great Plains and Playa Lakes Joint Ventures respectively.

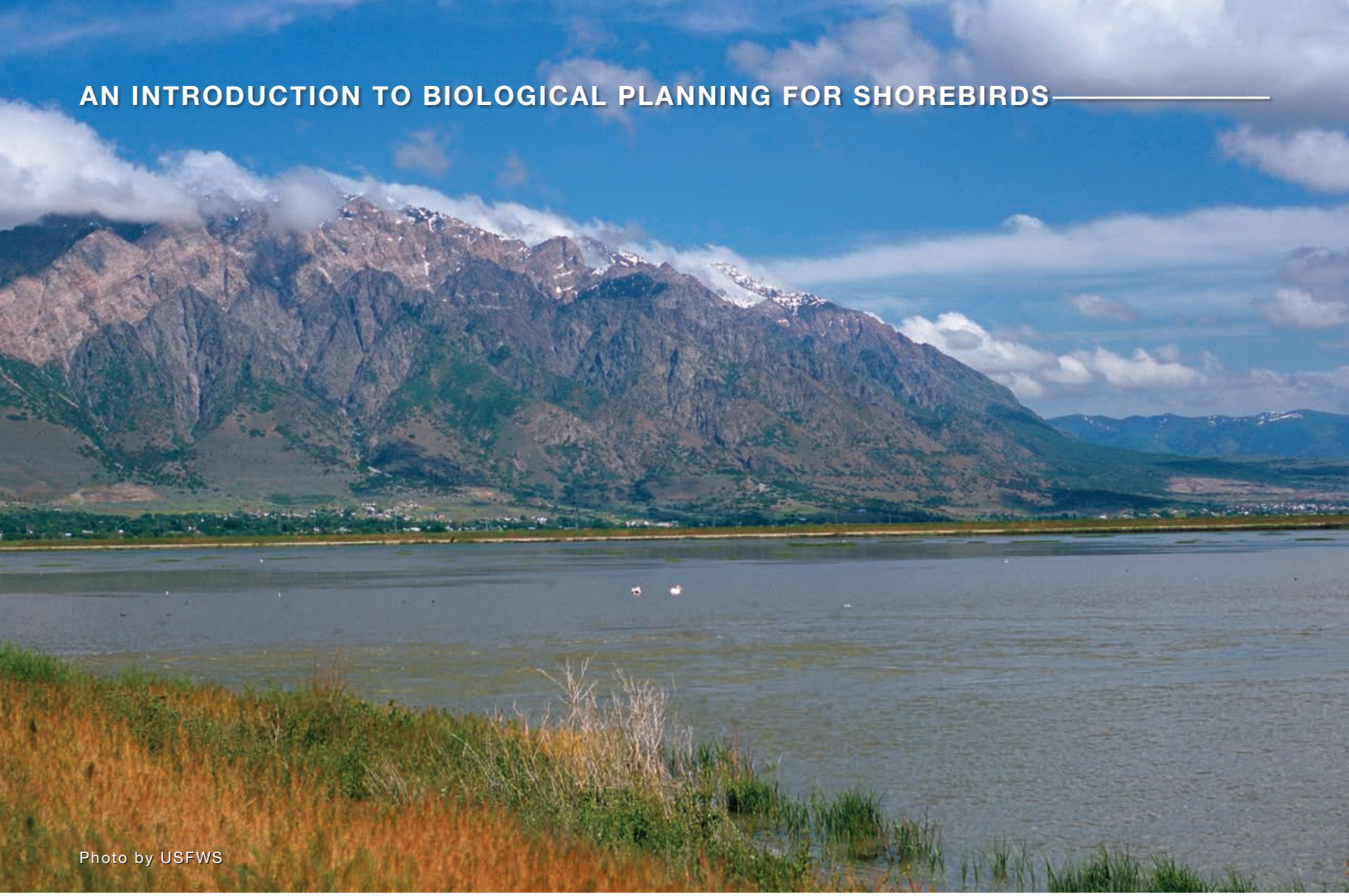

Photo by USFWS

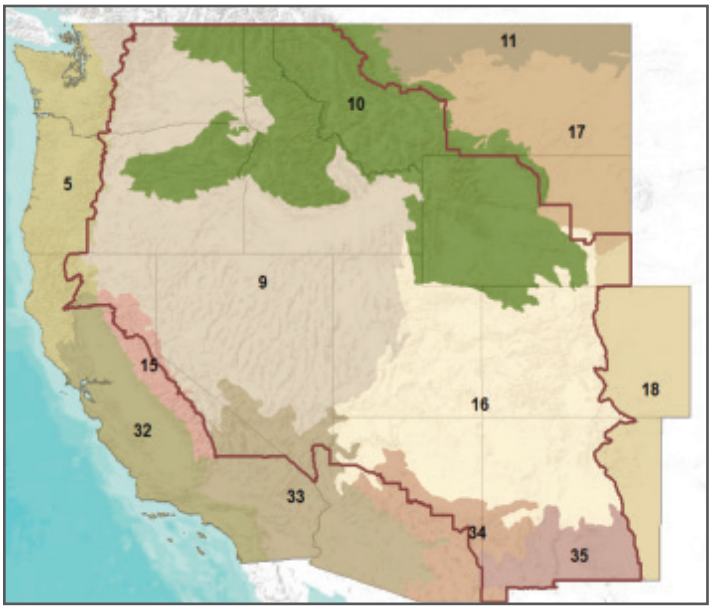

Figure 1 Bird Conservation Regions occurring within the Intermountain West Joint Venture. 5 = Northern Pacific Rainforest, 9 = Great Basin, 10 = Northern Rockies, 15 = Sierra Nevada, 16 = Sierra Nevada, 17 = Badlands and Prairies, 18 = Shortgrass Prairie, 33 = Sonoran and Mojave Deserts, 34 = Sierra Madre Occidental, 35 = Chihuahuan Desert.

As a result of its vast size, the Intermountain West encompasses some of the most diverse habitats of any Joint Venture due, in part, to significant ranges in degrees of latitude, elevation (–285 to >14,000 feet), and climate. Important shorebird habitats identified by the IWRSCP include: large saline lakes; marshes and lake/marsh complex; upland areas near wetlands; agricultural fields; ephemeral wetlands and playas; impoundments; and riparian areas (Oring et al. 2000). The vast majority of shorebird habitat in the Intermountain West exists as inland oases of discrete wetlands separated by over 600 mountain ranges and seven of the largest deserts in North America. Four Western Hemisphere Shorebird Reserve Network (WHSRN) sites are located in the region, including: Great Salt Lake, UT (site of Hemispheric Importance); Lahontan Valley, NV (Hemispheric); Mono Lake, CA (International); and Springfield Bottoms/American Falls Reservoir, ID (Regional). Eight additional sites meet or exceed qualification for designation as WHSRN Sites of Regional Importance, including: Harney Basin, Lake Abert, Summer Lake, Warner Basin, Klamath Basin in OR; Goose Lake in OR/CA; Honey Lake in CA; and San Luis Valley in CO.

Photo by Phil Douglass

The Intermountain West supports approximately one million breeding shorebirds and several million passage birds of 34 species (Oring et.al. 2000). The majority of North America's populations of Snowy Plover, American Avocet, Black-necked Stilt, and Long-billed Curlew breed in the area (Appendix II). Scientific names of shorebird species referenced in this strategy are found in Appendix III. The Intermountain West is most important to shorebirds during migration. Approximately 90% of the global population of Wilson's Phalaropes, and very large numbers of Red-necked Phalaropes, Long-billed Dowitchers, Western Sandpipers, and Marbled Godwits stage or stopover in the area (Oring et al. 2000). Due to its vast size, the Intermountain West supports thousands of wintering shorebirds as well. Table 1 provides an indication of seasonal importance of the BCRs in the Intermountain West by species. This information can help to guide conservation actions within the most important BCRs by the appropriate season. For instance, habitat conservation measures in BCRs 9 and 10 would help meet population and habitat objectives for breeding Wilson's Phalaropes in the Intermountain West.

Table 1 Seasonal occurrence of shorebird species in the Intermountain West and each BCR within the IWJV. Table adapted from Oring et al. (2000). Codes: M = Migrant, W = Wintering, B = Breeding. **B,M,W** = high concentrations, region extremely important to the species relative to the majority of other regions. B,M,W = common or locally abundant; region important to the species relative to other regions. b,m,w = uncommon to rare; region within species range but occurs in low abundance relative to other regions.

		BIRD CONSERVATION REGION					
SPECIES	**ENTIRE IWJV**	**9**	**10**	**16**	**33**	**34**	**35**
Black-bellied Plover	M,W	M	M	M	M,W		
Snowy Plover	M,W,**B**	**B**,M		B,M	B,**W**		b
Semipalmated Plover	M,w	M	m	M,w	M,w		
Killdeer	M,W,B	M,B	M,B	M,W,B	M,W,B	m,b	m,b
Mountain Plover	m,W,**B**		m,B	m,B	**W**		W
Black-necked Stilt	M,W,**B**	m,**B**	M	M,**B**	M,W,B		m
American Avocet	M,W,**B**	M,**B**	M,B	M,B	M,W,B		m
Greater Yellowlegs	M,W	M	M	M	m,w		m,w
Lesser Yellowlegs	M,w	M	M	M	m,w		m
Solitary Sandpiper	M	M	m	M			m
Willet	M,W,**B**	M,**B**	M,**B**	M	M,W		
Spotted Sandpiper	M,W,**B**	m,B	M,B	M,B	m,w	m	m
Upland Sandpiper	m,b	B	m,b	M			m
Whimbrel	**M**	M	m	M	**M**		m
Long-billed Curlew	M,W,**B**	M,**B**	M,**B**	M,b	M,W		m
Marbled Godwit	M,W,b	M	M,b	M	M,W		
Red Knot	M	M	m	M	M		
Sanderling	M	M	m	M	m,w		
Semipalmated Sandpiper	M	M	m	M			
Western Sandpiper	**M,W**	M,**W**	M	M	**M**,W		m
Least Sandpiper	**M**,W	M	M	M,W	M,W		m
Baird's Sandpiper	M	M	M	M	m		
Pectoral Sandpiper	M	M	M	M			
Dunlin	M,W	M	M	M	m,w		
Stilt Sandpiper	M			M	m,W		
Short-billed Dowitcher	M			M	m		
Long-billed Dowitcher	**M**,W	**M**	**M**	**M**	M,W		
Wilson's Snipe	M,W,B	m,W,B	m,W,B	M,W,B	m,w		
Wilson's Phalarope	**M**,B	**M**,B	**M,B**	**M**,b	M		M
Red-necked Phalarope	**M**	**M**	**M**	**M**	M		

The USSCP provides Area of Importance Scores for each BCR for populations of shorebirds in North America (Table 2). These scores signify the relative importance of each BCR to a species throughout their annual life cycle. They also reflect perceived importance of management and protection activities relative to other regions. When combined with the information in Table 1 they can provide an excellent means to direct conservation actions at broad scales within the most important BCRs during the most appropriate seasons.

Table 2 Regional and Bird Conservation Region (BCR) Area of Importance Scores (AI) for shorebirds in the Intermountain West. Table shows only those species with critical to common occurrence within the IWJV and BCRs adapted from Bird Conservation Region Area Importance Socres at www.fws.gov/shorebirdplan/RegionalShorebird.htm

		BIRD CONSERVATION REGION					
SPECIES	**IWJV**	**9**	**10**	**16**	**33**	**34**	**35**
Black-bellied Plover	4	4	4	4	4	1	1
Snowy Plover	5	5	1	4	5	2	3
Semipalmated Plover	4	3	3	4	4	1	2
Killdeer	4	4	4	4	4	3	3
Mountain Plover	5	1	4	4	4	2	2
Black-necked Stilt	5	5	4	5	3	2	3
American Avocet	5	5	4	4	4	1	3
Greater Yellowlegs	4	3	4	4	4	2	3
Lesser Yellowlegs	4	3	4	4	3	2	3
Solitary Sandpiper	3	3	3	3	1	1	3
Willet	5	5	5	4	3	1	1
Spotted Sandpiper	5	4	4	4	3	3	3
Upland Sandpiper	3	3	3	3	1	1	3
Whimbrel	5	3	3	3	5	1	3
Long-billed Curlew	5	5	5	4	4	2	3
Marbled Godwit	4	4	4	4	4	1	1
Red Knot	3	3	3	3	4	1	1
Sanderling	3	3	3	3	3	1	1
Semipalmated Sandpiper	3	3	3	3	1	1	1
Western Sandpiper	5	5	3	3	5	2	3
Least Sandpiper	5	4	3	4	4	2	3
Baird's Sandpiper	4	4	3	4	3	1	1
Pectoral Sandpiper	3	3	3	3	1	1	1
Dunlin	4	3	3	4	3	1	1
Stilt Sandpiper	3	1	1	3	4	1	2
Short-billed Dowitcher	2	1	1	1	2	1	1
Long-billed Dowitcher	5	5	5	5	4	2	2
Wilson's Snipe	4	4	4	4	3	2	2
Wilson's Phalarope	5	5	5	5	4	2	3
Red-necked Phalarope	5	5	5	5	4	1	1

Codes: 5 = The area is critical for supporting hemispheric populations of the species; 4 = The area is important to supporting hemispheric or regional populations; 3 = The area is within the range of the species and the species occurs regularly within the region but in low abundance; 2 = The area is within the range, but in general, management is not warranted for this species; 1 = Does not occur in the area

Most shorebirds forage in water depths up to 7 inches, depending on bill length; however, as with all species groups, exceptions can be found. The Wilson's Phalarope forages in open water taking its prey from the top of the water column. Vegetation density is also an important factor in habitat preferences as most shorebirds prefer short, sparse vegetation. The majority of species will select foraging habitats with less than 25% vegetative cover (Helmers 1992). Wilson's Snipe is an exception to the rule in their preference for dense sedge stanch. The following habitat types follow those described in the IWRSCP.

Large Saline and Alkaline Lakes

These are typically large terminal lakes that have a high salt concentration, at times greater than the concentration of seawater. Alkali lakes are also included in this category and differ from salt lakes due to a higher concentration of a basic ionic salt. Large saline lakes differ from playas in that they contain water year-round. Large saline lakes are considered lacustrine habitats according to the National Wetlands Inventory classification system.

The most important shorebird sites in the Intermountain West are located adjacent to large saline lakes. In fact, one of the most important sites for shorebirds in North America, Great Salt Lake, has been identified by WHSRN as a site of Hemispheric Importance (supporting at least 500,000 shorebirds annually). During wet years, saline lakes and adjacent wetlands in the Lahontan Valley of Nevada, also reach Hemispheric Importance. Other large saline lakes in the region surpass the annual requirement of 100,000 and 20,000 shorebirds for status as a WHSRN site of International or Regional Importance, respectively. These include: Lake Abert and Summer Lake, Oregon; Mono Lake, California (International significance), Honey and Alkali Lakes, California; and Goose Lake, California/ Oregon (Regional significance). These sites have been identified as key sites for conservation action within this plan.

Thirty percent (5,510 individuals) of the current estimated population of inland-breeding Snowy Plovers occur at Great Salt Lake (Thomas 2005, Morrison et al. 2006). Saline lakes are also important breeding sites for American Avocets; approximately half of the global population breeds in the Intermountain West, predominantly on saline lake habitat. Black-necked Stilts, Long-billed Curlews, Wilson's Phalaropes, Spotted Sandpipers, Killdeers, Willets and Wilson's Snipe also nest in saline lake habitat. Saline lakes are also important to passage American Avocets and Wilson's and Red-necked Phalaropes. In fact, over 50% of the global population of Wilson's Phalaropes stage at three of the most prominent saline lakes in the Intermountain West: Great Salt Lake, Lake Abert, and Mono Lake (Colwell and Jehl 1994). Black-necked Stilts, Marbled Godwits, and Western Sandpipers also use saline lakes in high concentrations on migration.

Marshes and Lake/Marsh Complexes

Marshes are typically shallow, low-lying areas (near the water table), with fluctuating water levels and salinities. They are also referred to as wet meadow, submerged aquatic beds, or emergent wetlands. They can be predominantly fresh, brackish, or saline. They support an abundance of grasses, rushes, reeds, and sedges and differ from grasslands in having soils that are wet in most years. This habitat type can be classified as palustrine open water, emergent, aquatic bed, unconsolidated bottom, or unconsolidated shore according to NWI.

Large freshwater marshes of importance to a variety of shorebirds are associated with most of the major saline lakes and playas in the Intermountain West, such as the Bear River marsh complex adjacent to Great Salt Lake, Utah. Examples of freshwater marshes not associated with saline lakes/playas include the Warner Valley, Oregon, and Lower Klamath NWR, California. A high proportion of the world's American Avocets and Black-necked Stilts breed in the wetlands of the Intermountain West, especially in the saline lake associated marshes of the Great Basin. Moderate numbers of Wilson's Phalaropes and Willets and lesser numbers of other species also breed in these marshes. Large numbers of Long-billed Dowitchers, Calidris sandpipers, primarily Western and Least Sandpipers, and lesser numbers of many species, stop over at Great Basin marshes on migration (Oring et al. 2000).

Ephemeral Wetlands/Playas

Small ephemeral wetlands, playas, and salt flats abound in the Intermountain West. They are typically shallow depressions lined with a salt or alkali crust limiting vegetation growth along the shore. These depressions fill with water seasonally, intermittently, or temporarily depending on the depth of the water table or amount of precipitation. Ephemeral wetlands or playas can be classified as palustrine, particularly in association with palustrine unconsolidated bottom, open water, or unconsolidated shore according to NWI.

In wet years, ephemeral wetlands can support high numbers of shorebirds, especially breeding American Avocets and migrant Western Sandpipers (Neel and Henry 1997). However, in any given year and area, this habitat type may be dry and will not support shorebirds unless a

steady seep or spring is available. Examples of important playas in the Intermountain West include old salt lake beds such as Winnemucca Lake, Nevada, that rarely holds water in any but the wettest years.

Upland/Grasslands

Primary upland/grassland types include bunchgrasses, short and mixed grass prairie, and grassland shrub types in the southwest. Dry grasslands are important to nesting Long-billed Curlews, Mountain Plovers, Upland Sandpipers, and Willets. This habitat type is particularly important for a variety of grassland nesting shorebirds such as the Willet and Long-billed Curlew when adjacent to wetlands and riparian areas. Mountain Plovers nest in arid upland areas with low vegetation. An isolated population of Upland Sandpipers breeds in short to mid height grasslands and forages in shorter stature vegetation in eastern Oregon and possibly still in eastern Washington, northern Idaho, and western Montana (Paulson 1993).

Agricultural Fields

Agriculture has become an important source of habitat for shorebirds particularly if near a stable source of fresh water for chick rearing. Hay and grain fields, pastures, and dairy farms are used by shorebird species at different times of the year. Many species, such as Long-billed Curlew and Killdeer flock in flooded or recently dewatered fields during migration. Killdeer, Wilson's Phalarope, and Long-billed Curlew nest in these habitats, particularly near freshwater inflows. The hay fields and flooded pastures of the Ruby Valley, Nevada support a high concentration of Long-billed Curlews during the breeding season. Although waste grain is rarely consumed by shorebirds, the invertebrates in or on the soil surface can be a primary food source.

Manmade Impoundments

This habitat type includes any man-made water storage basins such as reservoirs, salt evaporation ponds, or other types of water catchment basins. The levees that surround the water are often used during the nesting season by Snowy Plovers, American Avocets, and Black-necked Stilts, Long-billed Dowitchers and Western Sandpipers use this habitat type on migration. Suitable water levels (≤ 7 inches for long legged shorebirds) are necessary to support shorebirds in this habitat. The American Falls Reservoir in southeastern Idaho is an example of an important manmade impoundment in the Intermountain West. This site along with adjacent Springfield Bottoms wetlands has been designated as a WHSRN site of Regional Importance supporting up to 20,000 shorebirds annually.

Riparian Areas

Sand bars and mud flats along rivers and streams support small numbers of shorebirds annually. They are equivalent to NWI riverine classification. These areas are particularly important to breeding Spotted Sandpipers. Small numbers of American Avocets, Black-necked Stilts, Least Sandpipers, and Wilson's Phalaropes use riparian habitats during migration stopover.

Photo by Josh Vest

POPULATION STATUS & TRENDS

National, regional, and state conservation status of common shorebirds in the Intermountain West is provided in Table 3. All shorebirds listed under the 2008 U. S. Fish and Wildlife Service's (USFWS) Birds of Conservation Concern list (USFWS 2008), which updates the 2002 Birds of Management Concern List and NAWCA Priority Bird Species list (Online at http://www.nabci-us.org/aboutnabci/nawcaspp.pdf), are included in Table 3. Seventeen species of shorebirds have been identified by state fish and wildlife agencies as Species of Greatest Conservation Need in State Wildlife Action Plans (Table 3).

Table 3 National, Regional, and State conservation status of shorebird species in the Intermountain West.

			STATE WILDLIFE ACTION PLAN SPECIES OF GREATEST CONSERVATION NEED										
COMMON NAME	**CC[2]**	**IA[1]**	**AZ**	**CA**	**CO**	**ID**	**MT**	**NM**	**NV**	**OR**	**UT**	**WA**	**WY**
Black-bellied Plover	3	4							√				
Snowy Plover	5	5	√		√			√	√	√	√		
Semipalmated Plover	2	4											
Killdeer	3	4											
Mountain Plover	5	5		√	√		√	√			√		√
Black-necked Stilt	2	5				√			√	√	√		
American Avocet	3	5				√			√		√		
Greater Yellowlegs	3	4							√				
Lesser Yellowlegs	3	4											
Solitary Sandpiper	4	3											
Willet	3	5							√				
Spotted Sandpiper	2	5							√				
Upland Sandpiper	4	3								√		√	√
Whimbrel	4	5											
Long-billed Curlew	5	5		√	√	√	√	√	√	√	√		√
Marbled Godwit	4	4			√				√				
Red Knot	4	3											
Sanderling	4	3											
Semipalmated Sandpiper	3	3											
Western Sandpiper	4	5							√				
Least Sandpiper	3	5							√				
Baird's Sandpiper	2	4											
Pectoral Sandpiper	2	3											
Dunlin	3	4							√				
Stilt Sandpiper	3	3											
Short-billed Dowitcher	4	3											
Long-billed Dowitcher	2	5							√				
Wilson's Snipe	3	4											
Wilson's Phalarope	4	5			√	√		√					
Red-necked Phalarope	3	5							√				

[1] Conservation Categories from US Shorebird Conservation Plan. 5 = Highly Imperiled, 4 = Species of High Concern, 3 = Species of Moderate Concern, 2 = Species of Low Concern, 1 = Species Not at Risk.

[2] From Bird Conservation Region Area Importance Scores at www.fws.gov/shorebirdplan/RegionalShorebird.htm

Codes: 5 = The area is critical for supporting hemispheric populations of the species; 4 = The area is important to supporting hemispheric or regional populations; 3 = The area is within the range of the species and it occurs regularly within the region but in low abundance; 2 = The area is within the species range, but in general, management is not warranted for this species; 1 = Does not occur in the area.

POPULATION STATUS & TRENDS

Morrison et al. (2006) provided summary of general population trends for species or sub-species of shorebirds in North America. These trends are provided in Table 4 to provide further context of shorebirds in the Intermountain West relative to continental trends.

Table 4 North American population trend information by species or subspecies if available. Table adapted from Morrison et al. (2006).

COMMON NAME	SUBSPECIES DESIGNATED	DECLINE[1]
Black-bellied Plover	*P.s. squatarola*	DEC
Snowy Plover	*C.a.nivosus*	DEC
Mountain Plover		DEC
Lesser Yellowlegs		DEC
Solitary Sandpiper	*T.s. solitara and cinnamomea*	DEC
Upland Sandpiper		DEC
Long-billed Curlew		DEC
Marbled Godwit	*L.f. fedoa*	DEC
Red Knot	*C.c. roselarri*	DEC
Sanderling		DEC
Semipalmated Sandpiper		DEC
Least Sandpiper		DEC
Pectoral Sandpiper		DEC
Dunlin	*C.a.pacifica*	DEC
Wilson's Snipe		DEC
Wilson's Phalarope		DEC
Red-necked Phalarope		DEC
Western Sandpiper		DEC/U
Semipalmated Plover		STA/U
Black-necked Stilt	*H.m. mexicanus*	STA/U
Greater Yellowlegs		STA/U
Willet	*T.s. inornatus and semipalmatus*	STA/U
Baird's Sandpiper		STA/U
Stilt Sandpiper		STA/U
Long-billed Dowitcher		STA/U
Short-billed Dowitcher	*L.g. caurinus*	U
Killdeer		STA
American Avocet		STA
Spotted Sandpiper		STA
Whimbrel	*N.p. rufiventris*	STA

[1] DEC = decline, STA = stable, U = unknown

The USSCP provides more detailed information on the status of each species through Regional Conservation Scores (Appendix II). These can be used as a tool for partners in prioritizing species and habitat conservation measures by species and season of use at a regional, national, and BCR scale.

Water Quantity and Quality

Degradation of water quality or changes in water quantity are the most pervasive threats to shorebird habitat conservation in the Intermountain West. Water loss can occur in many ways and is almost always exacerbated by the other threats listed in this section. In fact, loss of water is typically the outcome of the threats listed below. It can affect shorebirds directly or indirectly and can occur at the source or thousands of miles away. Historic and contemporary policies pertaining to the protection and use of water in the arid West prioritize agriculture and municipal uses over environmental uses such as wetland management for migratory birds (Downard 2010). Wetland complexes critical to western shorebird populations such as Mono Lake, Great Salt Lake, Lahontan Valley, and Klamath Basin have all been subject to significant declines in water supply due to diversion and withdrawal of water from inflow streams and tributaries, primarily for agricultural purposes (Jehl 1994, Ivey 2001, Downard 2010). Increasing competition for water supplies stemming from population growth in the region is further taxing already limited water resources in the arid Intermountain West.

Timing and availability of an adequate quantity of water in the Intermountain West is of primary concern. This issue is further exacerbated by periodic drought cycles. Diversion of water for irrigation or changes in irrigation practices for water conservation can lead to a significant impact on the availability of water during important stages of the shorebird life cycle. This is particularly important during chick rearing since the young must have fresh water for survival. Once that water is no longer available, chicks must move overland to the next water source, exposing them to further threats. Conversely, an increase in water levels also can be detrimental to most shorebirds. This can occur due to increased incidence of flooding events, changes in water delivery, or through conversion to deepwater wetlands or those with very steep slopes that render the habitat unsuitable for shorebirds. Shorebirds such as the Snowy Plover, American Avocet, and Black-necked Stilt typically nest near the water's edge, leaving nests susceptible to flooding. In addition, most shorebirds must have shallow water to forage.

Water quality is just as important as quantity. Poor water quality is essentially symptomatic of other threats identified in this section. Examples include increased sedimentation from runoff due to loss of wetland buffer habitat, concentrations of contaminants such as selenium from agricultural runoff, and increased concentration of salt in water beyond the physiological limit of chicks to process.

Habitat Loss or Degradation

The USFWS report, Status and Trends of Wetlands in the Conterminous United States 1998– 2004 (Dahl 2006), provides the best overall assessment of the status and trends in wetlands by assessing a subset of randomly selected established wetland plots throughout the U.S. This report identified a decline in freshwater emergent marshes by approximately 142,570 acres throughout the U.S. from 1998–2004. Urban and rural development accounted for an estimated 61% of freshwater wetland loss in the U.S. An additional 8% was lost to drainage or filling of wetlands for silviculture. The wetland loss during this period was offset by a net gain of wetlands that were restored on agricultural lands, primarily through federal conservation programs such as the USDA's Wetlands Reserve Program (WRP). WRP provides excellent shorebird habitat in some regions (e.g., the Central Valley of California) but its value to shorebirds is influenced by the level of vegetative disturbance conducted annually by private landowners. However, in the absence of vegetative disturbance, WRP wetlands generally trend toward late succession emergent marshes that are not favorable to most shorebirds. This vegetative disturbance usually only occurs in the Intermountain West when the Natural Resources Conservation Service issues Compatible Use Authorizations (CUA) to landowners for haying or grazing. The potential exists to improve WRP wetlands for shorebirds through CUAs, but this has not materialized at large scales to date. Thus, the restoration of wetlands through WRP and other similar programs likely has not offset losses of shorebird habitat in the Intermountain West.

Nationally, the creation of freshwater ponds has contributed substantially to the net gain of wetlands. However, the majority of these ponds are not an equivalent replacement for wetland loss for shorebirds. In fact, artificial ponds are seldom used by shorebirds as they are typically constructed with steep banks that limit access for foraging. Dahl (2006) noted an increase in deepwater lake and reservoir acreage; but did not provide an assessment of ephemeral wetlands, an important wetland habitat for shorebirds in the Intermountain West.

Agriculture

One of the primary reasons for wetland and native grassland loss in the Intermountain West is due to conversion to croplands. In addition, many agricultural practices such as water diversion, changes in irrigation practices, herbicide applications, harvest during the nesting season, and maintenance of extensive monocultures can have negative impacts on shorebird habitat. For instance, grassland loss could cause site abandonment by adults and increased nest and chick

loss due to lack of cover. However, agricultural uses can provide protection from urbanization and thus more realistic opportunities for future habitat restoration. In addition, they can provide important feeding and staging areas for some species such as Wilson's Phalarope.

In the Harney Basin, Oregon, the private hay fields of the Silvies River Floodplain support thousands of breeding shorebirds (Paullin et al. 1977). Fledging shorebirds in this area were especially vulnerable to mortality from hay cutting. As an example, one mower operator estimated that he killed 400–600 birds between July 1 and 13. The most common bird killed was Wilson's Phalarope; other mortalities included Long-billed Curlew, Sora, Common Snipe, and blackbirds. Unlike ducks, the shorebirds and especially the Wilson's Phalarope, tend to remain in hay meadows to feed after hatching. Consequently, even the earlier nesting species are vulnerable to mowing. The rate of mortality declined throughout the haying season as more birds fledged, and most critical period for mowing mortality in 1976 was the first two weeks in July. Hay cutting begins as early as mid-June on the Silvies River River Floodplain and other native hay meadows in eastern Oregon, which likely causes even higher rates of shorebird mortality. A related problem affecting shorebird survival in hayfields is early de-watering. Water is drained from hayfields about three weeks before mowing commences. This action reduces food supplies and tends to concentrate young birds near remaining water, thus increasing their vulnerability to predators (Oring et al. 2000).

Flood irrigated hay meadows provide benefits to many other wetland dependent birds such as migrating and breeding ducks and waterbirds. Given the diversity of annual cycle requirements, achieving multiple species habitat objectives on the same acres is predictably challenging, especially on private lands with other land management objectives. Thus, a landscape level approach to evaluate the habitat needs of priority species in reaction to the conservation estate and management practices is required.

Rural Urbanization

The Intermountain West has experienced unprecedented human population growth over the past two decades. While high-density metropolitan areas (e.g., Salt Lake City, Utah) have experienced high population growth, traditionally rural intermountain valleys throughout the Intermountain West have witnessed substantial population growth as well. These intermountain valleys were historically populated by humans at low density and typically centered around agricultural production, namely ranching. The rapid increase in rural urbanization has drastically altered the landscape composition and has left many intermountain valleys highly fragmented from only two decades ago. Urban development typically results in an irreversible loss of wetlands (Dahl 2006). The indirect effects of development on shorebirds can be just as harmful. With increased housing in rural or urban areas comes increased predation from pets and feral cats. Rural urbanization reduces surface and groundwater levels due to changes in water rights and uses and alters hydrologic conditions that may change the location or rate of runoff as well as compromised water quality.

Invasive Species

Invasive species, particularly plant species, can have a drastic affect on habitat quality. With poor nesting cover, breeding birds are more susceptible to disturbance or predation. In some areas, invasive species such as phragmites (*Phragmites australis*) have colonized open areas historically used for nesting. Grasslands at lower elevations have been heavily impacted by invasive exotic species such as cheatgrass (*Bromus tectorum*). Wetlands throughout the west are becoming choked by phragmites, tamarisk (*Tamarix* spp.), and purple loosestrife (*Lythrum salicaria*), and shoreline habitats traditionally used for foraging and nesting are therefore no longer available. Upland habitats are also at risk. Dikes and levees around impoundments or reservoirs that provide nesting habitat can become chocked with invasive weeds (e.g., knapweed [*Centaurea spp.*] or thistle [*Cirsium arvenre*) and they become unsuitable for nesting shorebirds. In some areas, over grazing and suppression of natural fire regimes followed by invasion by cheatgrass has led to the loss of grassland, particularly in southeastern Oregon and the Columbia Plateau. Poorly managed livestock grazing in wet meadows can result in trampled nests, compaction of the soil, and reduced water quality.

Invasive, non-native mammals can directly and indirectly effect shorebirds and their habitat. Non-native herbivores can destroy habitat through forage pressure or become a year-round food source for predators. Predators, such as red foxes, raccoons, or rats, can prey on eggs, chicks, and adults. Raccoons and foxes were unknown in the Salt Lake Valley of Utah prior to the 1970s but occur at high densities now. Changes in predator communities have likely impacted demographic performance of shorebirds at this continentally significant area. Invasive species eradication involves a long-term commitment and can be expensive. Without a coordinated effort throughout the affected area, eradication on one property may not be effective over the long term if an adjacent property still hosts invasive species. To exacerbate the issue, little is known regarding how to control certain invasive species (e.g., cheatgrass) or the effects of removal on focal breeding species such as the Long-billed Curlew, which shows a preference for cheatgrass habitats in southeastern Washington (Pampush and Anthony 1993). Furthermore, control of invasive species

often supersedes other habitat or species conservation measures for management time or funding.

Contaminants and Disease Outbreaks

Concentrations of contaminants in wetlands are of conservation concern in the Intermountain West. Prevalent contaminants include selenium, mercury, DDT, and DDE. DDT and its metabolite DDE have been proven in numerous studies to reduce hatching success of all birds due to egg shell thinning. Selenium is known to reduce hatching success and increase chick mortality. Similarly, mercury contamination reduces reproductive success in shorebirds. Salinities in large Great Basin hypersaline lakes such as the Great Salt Lake, Lake Abert, and Mono Lake and the saline sinks of Lahontan Valley are of increasing concern for shorebirds. Each of these areas face human-induced water level manipulations which alter salinity concentrations and can influence contaminant cycling (Naftz et al. 2008). Furthermore, altered hydrology can cause reduced or increased salinities beyond the tolerance of shorebird chicks and prey (e.g., brine flies and brine shrimp; Oring et al. 2000).

Large-scale die-offs of aquatic birds due to disease outbreaks have been reported in wetland complexes, although shorebirds compose a small percentage of birds affected relative to other species. Causes of die-offs range from botulism to cholera.

Other Anthropogenic Factors

Altered fire and flood regimes have also lead to the loss of grasslands by altering plant community dynamics and succession. By controlling or severely limiting the natural fire regime of grassland habitats, early seral-stage grasslands have been replaced by woodlands and shrub-dominated habitats. These habitats have lower suitability for shorebirds and likely impact demographic performance. Transition back to functional grassland habitats often requires expensive and intensive restoration treatments. Additionally, altered hydrologic patterns from dams and other water control structures can significantly impact wetland plant and invertebrate communities through alteration of nutrient transport within a system.

Climate Change

All of the above threats may be exacerbated by climate change. Many of the direct and indirect effects of climate change on shorebirds and their habitats are unknown however, which hinders proactive conservation measures. Scientists are predicting that species with low genetic diversity, those that breed in the arctic and boreal forest zone, as well as birds that breed in arid environments will be more heavily affected by climate change (NABCI 2010, Climaterisk.net; Meltofte et al. 2007). Migrants are also at risk due to the limited number of secure water sources and the limited extent of wetlands in the Intermountain West. These predictions place shorebirds of the Intermountain West at greater risk than most species, because the majority of the species passing through the Intermountain West breed in the Arctic. In addition, Arctic breeding shorebirds are known for low genetic diversity (Meltofte et al. 2007).

Climate change can have a profound influence on habitat suitability as well. Climate change may result in an overall increase or decrease in precipitation, changes in the intensity and frequency of precipitation events, or shifts in the seasonal patterns of precipitation that will affect the available supply of water. For instance, decreased snow pack results in less water runoff into intermountain basins during the drier summer months. Conversely, increased runoff or flooding events could increase erosion and/or decrease available habitat. The phenology of snow pack runoff has also been shifting in the Intermountain West. Changes in the timing or runoff will likely influence wetland plant and invertebrate community dynamics which shorebirds have evolved to exploit. Combined with other issues affecting shorebird habitat, climate change could prove devastating for shorebirds that rely most on the ephemeral habitats of the Intermountain West. If wetland quality, abundance, or distribution is compromised in the Intermountain West in such a way that migratory connectivity is significantly impaired then survival and recruitment rates for these populations will also be affected.

Demand for water to meet agricultural or urban needs will also increase with increasing temperatures. With decreasing water supplies and increasing temperatures, the risk of harmful algal blooms, concentration of contaminants, and frequency of diseases increases. Decreased water quality will impact invertebrate food sources thereby forcing migrant shorebirds to either remain at each stopover site longer to meet physiological needs or continue migration under less than ideal physical condition. Breeding shorebirds may be forced to adapt to habitat changes or decreases in foraging resources by shifting their breeding range. This in turn can lead to a mismatch in timing of availability of food resources or changes in food resources. In addition, shifts in species range or changes in habitat may facilitate spread of invasive species that degrade shorebird habitats.

Population Estimates

Primarily due to a lack of information, the IWRSCP stopped short of developing population estimates for shorebirds in the Intermountain West. Therefore, the SST developed population estimates and objectives based on the best available data for breeding and passage shorebirds (Table 5). Estimates were developed from a top-down approach using the most current continental and flyway population estimates provided in Morrison et al. (2006). These estimates were then adjusted through a bottom-up process. For passage shorebirds, population estimates were derived from a summation of data from the Pacific Flyway Project (Shuford et al., 2002) for most sites, augmented by site-specific data (Table 5). These estimates reflect the sum of peak counts of passage shorebirds either from spring or fall migration at key sites. For breeding shorebirds, population estimates were derived from Breeding Bird Survey (BBS) data and species-specific surveys.

The top-down and bottom-up estimates were compared and adjustments were made for particular species. For instance, the passage Long-/Short-billed Dowitcher estimate was reduced because site specific data were collected during a very high period in the water cycle and abundance was at or near peak levels. Thus the estimate did not represent abundance levels during an average water year; therefore, the dowitcher population estimate was subsequently reduced.

Assumptions and Limitations of Data

Several assumptions were made during the development of population estimates, primarily that the sums for peak counts of each species accurately reflect the passage shorebird population in the Intermountain West. These sums represent non-standardized data collected during different years or using different methods. Also, many of the estimates presented were derived based on data collected 20 years ago. In addition, this process does not adequately address dispersed species such as the Greater andLesser Yellowlegs or Spotted Sandpiper. Data collected for the BBS were used to calculate breeding shorebird population estimates across the Intermountain West. However, the BBS does not adequately cover wetland breeding habitats and many shorebird species are under sampled.

Due to the limitations of the data, population estimates should be interpreted as an indicator of the population. For this reason, one of the highest monitoring priorities is to collect standardized distribution and abundance data for passage shorebirds at all sites. Range-wide breeding shorebird surveys are needed to provide both Intermountain West-specific estimates and range-wide estimates from which to assess the importance of the Intermountain West to each species. Finally, a properly designed study is needed to sample dispersed migrants.

Regional Population Objectives

The SST set 30-year population objectives for the Intermountain West from the top-down using numeric objectives set in the USSCP. Objectives were set based on the most current population estimates and data on status (Morrison et al. 2006). Options considered were: maintain current levels, increase by 25%, or increase by 50%, or use increases reported in USSCP. These options are generally consistent with the approach used by Partners in Flight for establishing trend-based objectives for landbirds. Limiting factors, the importance of the IWJV to the species, and ability to manage the species habitat were considered when assessing options for setting objectives. The team reviewed each species objective during the breeding and nonbreeding season and agreed on a numeric objective for each season.

Maintaining current population levels will likely require more conservation action than was required during the formation of the IWJV given the loss of grasslands and wetlands in the region. In addition, assessing whether objectives have been met for secretive or cryptic species such as the Wilson's Snipe will be difficult due to issues of detectability.

The assumptions and limitations listed above apply equally to the objectives. Site and in some cases population monitoring is key to evaluate progress toward objectives for all species and habitats. For more information, see the Monitoring and Research section of this chapter.

Table 5 Population estimates and objectives for passage shorebirds by BCR in the Intermountain West JV area.

PASSAGE SHOREBIRDS	JV TOTAL (SUM OF SITE COUNTS)	IWJV ADJUSTED ESTIMATE	IWJV OBJECTIVE	BCR 9 ESTIMATE	BCR 9 OBJECTIVE	BCR 10 ESTIMATE	BCR 10 OBJECTIVE	BCR 16 ESTIMATE	BCR 16 OBJECTIVE	BCR 33 ESTIMATE	BCR 33 OBJECTIVE
Black-bellied Plover	13,567	15,000	27,270	13,556	27,250	0	0	8	20	3	10
Semipalmated Plover	2,300	3,000	3,000	2,178	2,840	0	0	41	50	81	110
Killdeer	14,490	50,000	50,000	13,749	47,440	63	220	606	2,090	72	250
Black-necked Stilt	86,902	120,000	120,000	86,513	119,460	0	0	344	480	45	60
American Avocet	438,960	420,000	420,000	430,094	411,520	71	70	7,788	7,450	1,007	960
Spotted Sandpiper	3,688	10,000	10,000	3,589	9,730	0	0	89	240	10	30
Solitary Sandpiper	144	3,000	3,000	127	2,650	0	0	4	80	13	270
Greater Yellowlegs	2,765	12,000	12,000	2,368	10,280	0	0	375	1,630	22	100
Willet	8,184	50,000	50,000	8,111	49,550	18	110	49	300	6	40
Lesser Yellowlegs	5,612	15,000	15,000	4,285	11,450	0	0	1,317	3,520	10	30
Whimbrel	21	1,000	1,000	15	710	0	0	0	0	6	290
Marbled Godwit	46,298	130,000	162,500	45,823	160,830	0	0	463	1,630	12	40
Red Knot	26	1,000	1,000	25	960	0	0	1	40		0
Sanderling	11,641	15,000	15,000	11,540	14,870	0	0	100	130	1	0
Semipalmated Sandpiper	223	1,000	1,000	49	220	0	0	171	770	3	10
Western Sandpiper	366,823	500,000	500,000	360,491	491,370	0	0	1,312	1,790	5,020	6,840
Least Sandpiper	88,028	100,000	100,000	85,310	96,910	0	0	222	250	2,496	2,840
Baird's Sandpiper	10,953	35,000	35,000	1,986	6,350	0	0	8,967	28,650		0
Pectoral Sandpiper	425	1,000	1,000	382	900	0	0	43	100		0
Dunlin	24,713	25,000	27,500	24,701	27,490	0	0	2	0	10	10
Stilt Sandpiper	62	5,000	5,000	27	2,180	0	0	35	2,820		0
Dowitcher	232,864	250,000	256,000	231,214	254,190	12	10	1,551	1,710	87	100
Wilson's Phalarope	621,666	750,000	850,000	589,434	805,930	1,200	1,640	30,787	42,090	245	330
Red-necked Phalarope	339,639	350,000	350,000	339,301	349,650	0	0	207	210	131	130

Note: Due to lack of data, no estimates or objectives are provided for passage shorebirds in BCR 34 and 35 within the IWJV. In addition, portions of BCRs 34 and 35 in the IWJV provide very little habitat for passage shorebirds.

Table 6 Population estimates and objectives for breeding shorebirds within BCRs 9, 10, 16, 33, 34, and 35 in the Intermountain West Joint Venture.

BREEDING SHOREBIRDS	JV ADJUSTED ESTIMATE	JV OBJECTIVE	BCR 9 ESTIMATE	BCR 9 OBJECTIVE	BCR 10 ESTIMATE	BCR 10 OBJECTIVE	BCR 16 ESTIMATE	BCR 16 OBJECTIVE	BCR 33 ESTIMATE	BCR 33 OBJECTIVE	BCR 34 ESTIMATE	BCR 34 OBJECTIVE	BCR 35 ESTIMATE	BCR 35 OBJECTIVE
Snowy Plover	9,400	9,400	8,800	8,800	0	0	150	150	450	450	0	0	0	0
Killdeer	150,000	300,000	62,550	125,100	30,000	60,000	15,450	30,900	16,650	33,300	6,300	12,600	15,750	31,500
Mountain Plover	6,700	10,000	0	0	3,819	5,700	2,900	4,300	0	0	0	0	0	0
Black-necked Stilt	120,000	120,000	96,120	96,120	2,400	2,400	2,760	2,760	12,720	12,720	0	0	5,520	5,520
American Avocet	250,000	250,000	206,000	206,000	7,500	7,500	5,500	5,500	18,250	18,250	0	0	8,500	8,500
Spotted Sandpiper	15,000	15,000	2,925	2,930	7,950	7,950	2,280	2,280	0	0	0	0	0	0
Willet	20,000	20,000	14,500	14,500	3,800	3,800	0	0	0	0	0	0	0	0
Upland Sandpiper	300	400	0	0	0	0	0	0	0	0	0	0	0	0
Long-billed Curlew	70,000	99,700	47,810	68,100	19,600	27,920	2,940	4,190	0	0	0	0	0	0
Marbled Godwit	1,000	1,500	0	0	1,000	1,500	0	0	0	0	0	0	0	0
Wilson's Snipe	20,000	30,000	5,760	8,640	8,400	12,600	3,240	4,860	0	0	0	0	0	0
Wilson's Phalarope	195,000	292,500	104,910	157,370	35,100	52,650	36,660	54,990	0	0	0	0	0	0

Photo by Josh Vest

KEY SITES FOR SHOREBIRD CONSERVATION

Conservation strategies based on key sites are intended to provide a more detailed approach to implementing objectives of the IWJV Implementation Plan. Since the key-site strategies are developed by all interested conservation partners in the area, they provide a tie in with land managers and site-specific source of information for the development of project proposals for IWJV funds or partners programs. Due to the smaller scale of Key-Site Conservation Strategies, they can focus on site-specific conservation needs, challenges, and priorities.

The SST identified both primary and secondary key sites for conservation action. The objective of this approach is for the JV partnership to ultimately develop a key-site strategy for all primary key sites, effectively capturing a majority of the migratory shorebird habitat conservation needs throughout the IWJV and a significant portion of shorebird breeding habitats of the Intermountain West.

Primary key sites represent important shorebird sites identified by the IWRSCP and WHSRN within the IWJV boundary as well as any sites that support greater than 5,000 shorebirds during peak migration count periods, or greater than 1% of a biogeographic population of a shorebird species in any one season. Each of these sites is part of a BHCA identified in the 2005 IWJV Implementation Plan. The 1% criterion is consistent with that of WHSRN and several other national and international bird conservation groups as a threshold to identify important sites for shorebirds worldwide.

Table 7 Status of Primary Key Sites according to Western Hemispheric Shorebird Reserve Network criteria.

PRIMARY KEY SITE	PEAK MIGRATION COUNT	HEMISPHERIC[1]	INTERNATIONAL[2]	REGIONAL[3]
UT - Great Salt Lake (a)4	1,484,350	Peak Count 67% American Avocet 38% Black-necked Stilt 33% Wilson's Phalarope	26% Marbled Godwit 24% Blackbellied Plover	1% Willet
UT - Fish Springs NWR (b,g)	9,588			
UT - Ouray NWR (h)5	6,067			
OR - Harney Basin (b,c)	84,659			Peak Count 4% Dow sp. 2% American Avocet & Spotted Sandpiper 1% Wilson's Phalarope & Black-necked Stilt
OR - Summer Lake (b)	34,238			Peak Count
OR - Lake Abert (b)	83,031			Peak Count
OR - Warner Basin (b)5	11,703			
CA/OR - Klamath Basin (b,d)	64,318			Peak Count
CA/OR - Goose Lake (b)	37,224			Peak Count
CA/NV - Honey Lake (b)	21,609			Peak Count
CA - Alkali Lakes (b)	19,294			Peak Count
CA - Owens Lake (b)5	9,280			
CA - Mono Lake (b)	102,676		Peak Count	3% Wilson's Phalarope 2% American Avocet
NV - Lahontan Valley (b,e)	214,306	38% Long-billed Dowitcher	Peak Count	
NV - Humboldt WMA (b)	25,628			Peak Count
ID - Am. Falls Res. (b)5	7,299			
ID - Lake Lowell (b)5	12,571			
CO - San Luis Valley (f)	46,016			Peak Count

[1]Hemispheric - At least 500,000 shorebirds annually or >30% of a biogeographic population.
[2]International - At least 100,000 shorebirds annually or >10% of a biogeographic population.
[3]Regional - At least 20,000 shorebirds annually or >1% of a biogeographic population.
[4]Sources: (a) Paul and Manning 2002; (b) Shuford et.al. 2002; (c) Ivey et al. unpubl.; (d) Shuford et al. 2006; (e) Neel and Henry 1997; (f) BLM unpubl. data; (g) Fish Springs unpubl. data; (h) NWR unpubl. data - highest counts over 7 years of data.
[5]Intermountain West Joint Venture Key Site criteria: > 5,000 individual shorebirds during peak migration.

KEY SITES FOR SHOREBIRD CONSERVATION

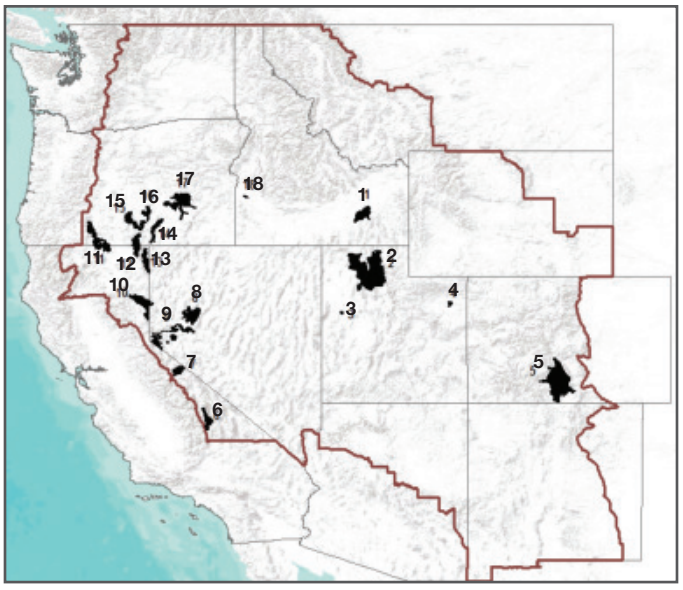

Figure 2 Primary Shorebird Key Sites in the Intermountain West Joint Venture. 1 = American Falls Reservoir, 2 = Great Salt Lake, 3 = Fish Springs NWR, 4 = Ouray NWR, 5 = San Luis Valley, 6 = Owens Lake, 7 = Mono Lake, 8 = Humboldt WMA, 9 = Lahontan Valley, 10 = Honey Lake, 11 = Klamath Basin, 12 = Goose Lake, 13 = Alkali Lakes, 14 = Warner Basin, 15 = Summer Lake, 16 = Lake Abert, 17 = Harney Basin, 18 = Lake Lowell.

Due to concern that the focus on key sites does not adequately address dispersed migrants or dispersed breeding shorebirds, the SST also identified secondary sites for conservation action. They include sites that support less than 5,000 migrants during peak counts over one migration season (Shuford et.al. 2002). These sites represent a lower priority than the 18 key sites for shorebird conservation planning and habitat conservation delivery.

Table 8 Secondary sites for shorebird conservation within the Intermountain West identified by the Shorebird Science Team.

STATE	SITE
WA	Othello Sewage Ponds
	Walla Walla River Delta
UT	Utah Lake
CA	Butte Valley
	Modoc NWR
	Lyneta Ranch
	Bridgeport Reservoir
	Crowley Lake
NV	Long Valley
	Continental Lake
	Sleeper Mine
	Pyramid Lake
	Ruby Valley
	Key Pitman WMA
	Henderson Sewage Ponds
WY	Mortenson Lake NWR
	Hutton Lake NWR
CO	Arapaho

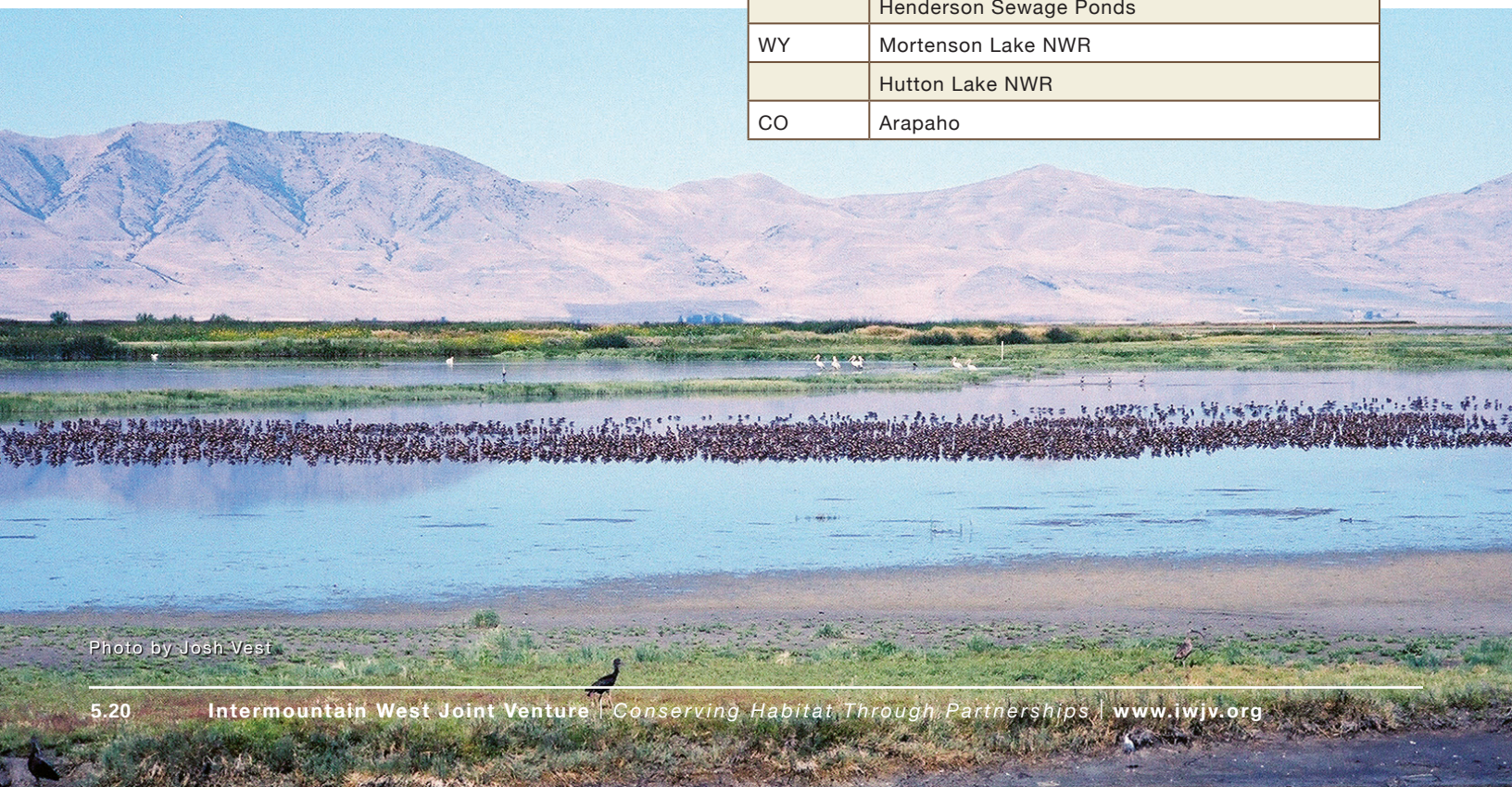

Photo by Josh Vest

The Great Salt Lake Key Site Conservation Strategy

The Great Salt Lake (GSL) was selected as a site for development of a key site conservation strategy (GSL Strategy) due to its importance to shorebirds (Table 7), the size and complexity of habitats, and the existence of an active bird conservation community. The intent of the document was to provide a strategic approach to shorebird conservation that was developed by the primary stake holders active in shorebird conservation on the GSL and linked to explicit continental and regional population objectives.

One of the primary tools developed in this effort was an energetic model for use in linking population objectives with habitat objectives. As a result, much of the GSL Strategy addresses important components of the models. This bioenergetic approach is focused on the nonbreeding component of the annual life cycle. A primary assumption in this strategy is that food is a primary limiting factor during post-breeding and migration in meeting annual life cycle requirements for shorebirds. Components of the model are similar to those identified for the Blanca Wetlands key site conservation strategy (see below), however a higher degree of complexity has been incorporated into the GSL model inputs. The GSL Strategy goes beyond identifying habitat needs, it also identifies human growth trends and threats to shorebirds and their habitats; provides detailed conservation actions to abate and mitigate threats; and identifies potential conservation partnerships and programs that may facilitate these actions.

The entire GSL system occupies roughly 3,011 square miles, consisting of the following regions: Bear River Bay, Farmington Bay, the Gilbert Bay (south arm) and Gunnison Bay (north arm), and adjacent wetland complexes. GSL water levels are extremely dynamic and change in response to long-term precipitation cycles, seasonal changes in evaporation and inflow, and daily influences from wind-driven seiches. As a result, the strategy incorporates the effects of seasonal or annual variation in habitat availability in the form of area estimates for low and average lake levels. This is particularly relevant when considering the amount of suitable habitat along the transient shoreline that can migrate seasonally back and forth for hundreds of yards. During dry cycles, there can be vast reaches of dry mud flat (less productive shorebird foraging habitats, but some plover nesting habitat) several miles between the shoreline where birds actively feed and the nearest other wetland type. Conversely, shallow wetland habitat may be severely limiting during periods of high precipitation as experienced in the mid-to-late 1980s. As a result a shoreline buffering technique was employed to more accurately account for functional shoreline habitat and the macro-invertebrate population it supports. The GSL shorebird team recognized that not all acres within and between habitat types have equal foraging value to shorebirds. As a result, they adopted quality designations recently identified by Ducks Unlimited within the GSL ecosystem. These habitat-quality indicators provide condition classification habitat type, location and acreage. These acreages will be used to model GSL capacity for migratory shorebirds. In addition, macro-invertebrate populations can be influenced by changing salinities, which in turn are influenced by water volume. Invertebrate biomass densities were determined from three previous studies conducted in wetlands surrounding the GSL (Huener 1984, Cox and Kadlec 1995, Johnson 2007). These studies spanned an interval of 23 years and provide invertebrate information prior to and immediately after the 1980s GSL flooding event. Shorebird population objectives were stepped down from continental and regional objectives identified in this chapter. Population objectives were fitted to annual migration phenology based on data derived from the GSL Waterbird Survey conducted from 1997–2001. Over 54.5 million total shorebird use-days were calculated during fall migration and 16.6 million use-days during spring based on these population objectives. These use-day estimates were applied to species specific energetic demands to identify foraging habitat objectives for shorebirds.

Bioenergetic assessments of fall migrating shorebirds in the Great Salt Lake indicate at least 277,000 acres of suitable shorebird-foraging wetlands (i.e., shallow water and sparse vegetation) are required in the GSL to meet population energy demands during fall migration and approximately 87,000 acres during spring migration. Current understanding of wetland productivity and availability to shorebirds limits the ability to assess whether the current conservation estate is able to meet these population demands within the GSL system. Improved understanding of wetland productivity and relationships to hydrologic dynamics will greatly improve the ability to inform and develop explicit conservation targets and strategies for shorebirds and other wetland dependent birds in the GSL system.

The true ‘conservation’ component of the Strategy provides information on conservation partners and landowner priorities, trends in population growth and subsequent development, as well as site-specific threats. Site partners conducted a detailed assessment of the conservation estate considering land ownership, management status, and vulnerability (e.g., to mineral

extraction or change in ownership status). The Great Salt Lake Key-Site Strategy provides a comprehensive assessment of shorebird habitat in the Great Salt Lake and a conservation strategy designed with site- and species-specific data collected at GSL and management recommendations identified by active conservation partners in the ecosystem.

Blanca Wetlands Shorebird Habitat Strategy

The Blanca Wildlife Habitat Area is a complex of wetlands managed by the Bureau of Land Management (BLM) in the San Luis Valley of south-central Colorado. The San Luis Valley has been identified as a primary Key Site for shorebird conservation in the Intermountain West (Table 7.)

The IWJV's SST elected to use a bioenergetic approach to develop shorebird habitat objectives that are explicitly linked to national and regional shorebird population objectives. Blanca WHA is an important stopover site to passage shorebirds in the eastern IWJV. Blanca WHA was selected for testing the viability of bioenergetics modeling as an assumption-based decision support tool for local land managers, while contributing to the knowledge base of shorebird habitat use and supply in the IWJV. This effort was collaborative and included members of the SST, local BLM wetland managers, Colorado Division of Wildlife biologists, and BLM biologists.

Shorebird survey and habitat data collected by the BLM from 2002 to 2007 were used to generate inputs to a bioenergetic model: population objectives, daily food requirement, habitat availability, and energy supplied by playas. Basic carrying capacity equations were used to evaluate bioenergetic demand and supply. Dietary differences during pre- and post-breeding periods were assessed and a range of food items were incorporated in the estimates of energy available in playa foraging habitats. Because direct information was lacking on shorebird diets at Blanca WHA, the most plausible values reported in the literature from saline ponds in the Playa Lakes region were used. Because of the uncertainty involved with these surrogate values, habitat requirements of passage shorebirds under four forage density values were estimated.

Analysis of shorebird counts suggests that Blanca WHA supports more passage shorebirds than previously recognized, particularly during post-breeding migration. The most abundant passage shorebird species included Wilson's Phalarope, American Avocet, and Baird's Sandpiper. Our results indicate that playas on Blanca WHA did not meet the bioenergetic needs of the observed population of passage shorebirds (47,108) and would not have meet the needs of a site-specific population objective of 49,226 shorebirds. Our results indicate that under all but the highest forage density, deficits in meeting the energetic requirements occurred during peak post-breeding migration in early to mid-August.

Shorebird habitat management actions on Blanca WHA should focus on increasing the quantity or quality, relative to the density of shorebird prey items, of playas in late July through August. Further monitoring is also needed to test assumptions of the energetics model and to address data limitations. We provide monitoring and research recommendations that would reduce current uncertainties, particularly around the forage density value. Management recommendations are also provided to reduce the predicted deficits in energy supplies. A next step in the shorebird bioenergetics approach would be to consider all wetland types within the Blanca WHA boundary and possibly within the entire San Luis Valley.

Habitat objectives for breeding shorebirds in the Intermountain West have not been developed for this implementation plan update. However, the Intermountain West contains critical breeding habitat for many shorebird species. The IWJV partnership should therefore strive to develop habitat objectives for important shorebird species as identified through the biological framework discussed in chapter 3 of the implementation plan update. However, the SST has identified a suite of priority breeding shorebird species from which focal species can be selected to focus more detailed biological planning and develop appropriate conservation strategies. Development of meaningful conservation strategies around focal breeding shorebirds will be dependent on the availability of information related to both population demographics and relationships to landscape or habitat metrics.

Priority species were selected because relatively little is known about breeding shorebird distribution, abundance, or limiting demographic parameters within the Intermountain West. Priority species also represent shorebirds of the highest conservation priority by partners (state, NAWCA, and BCC/BMC) in the Intermountain West. However, the list of priority species identified here may not represent true umbrella or indicator species (Lindenmayer et al. 2002). Priority species were selected based on a variety of factors including:

- high conservation scores listed in the IWRSCP (Highly Imperiled or Species of High Concern)
- high Area of Importance scores (the area is critical or important to support hemispheric or regional populations) which signifies a high stewardship value, or
- high degree to fidelity to important habitat types in the IWRSCP

Data used to identify priority breeding shorebirds represent peak counts by species during one migration season. As a result, data provided in the table above represent a minimum abundance (one season). A more accurate representation of the magnitude of use at any site should be presented by counts collected throughout an annual cycle. Further, many of the data presented above were collected in the early 1990's and should be updated.

Focal Species Profiles

Photo by Utah Division of Wildlife Resources

Snowy Plover: This species was selected as a focal breeding species because the Intermountain West is considered 'critical to supporting hemispheric populations' of Snowy Plover (AI = 5, USSCP). This species also was selected because relatively current breeding densities per site are available from the results of a comprehensive, range-wide survey of breeding plovers conducted in 2007. Large saline lakes, ephemeral wetlands/playas, and man-made impoundments with a relatively consistent source of water and little to no vegetative cover are important habitat components. Changes in water management practices, drought or flooding, and vegetative encroachment may limit habitat availability.

Photo by Utah Division of Wildlife Resources

Wilson's Phalarope: Wilson's Phalarope was also selected as a focal breeding shorebird species because the Intermountain West is 'critical to supporting Hemispheric populations' (AI = 5, USSCP). This is a species of marshes and lake/marsh complexes and irrigated agricultural fields. They favor tall, dense vegetation within 100 meters of wetlands. Limiting factors include loss of habitat and lack of sufficient water in breeding and foraging habitats (Colwell and Jehl 1994). Wilson's Phalaropes can also be affected by changes in irrigation practices which limit water runoff and eliminate standing water in flooded fields (Lesterhuis and Clay 2009).

Photo by Utah Division of Wildlife Resources

Long-billed Curlew: Long-billed Curlew also receives the highest conservation ranking within the IWJV (i.e. highly imperiled and critical to supporting hemispheric populations). Long-billed Curlews prefer open grasslands (short to mixed grass and open or recently grazed pastures) with maximum heights less than 30 cm (Fellows and Jones 2009) Researchers speculate that proximity to wetland habitats within one mile of nest sites is preferred, however this has not been definitively proven. Long-billed Curlew was selected by the Partners in Flight Western Working Group as a species to develop habitat objectives for through the HABPOPs model in upland habitats (refer to Landbird Chapter). Thus, habitat and population assessments for Long-billed Curlew are addressed in the Landbird Chapter.


Photo by USFWS

Mountain Plover: Mountain Plovers have a limited distribution within the IWJV in portions of Colorado, New Mexico, Wyoming, and Utah; the Intermountain West is considered critical to supporting hemispheric populations by supporting several important breeding areas for this species. The highest density of breeding Mountain Plovers occurs in South Park, Colorado (Wunder et al. 2003). The Mountain Plover is associated with short-grass and shrub-steppe landscapes throughout its breeding range, prefering sites with very sparse, short vegetative cover (e.g., prairie dog colonies, heavily grazed pasture, or recently burned or tilled fields). Habitat loss and degradation appear to limit population growth on the breeding grounds (Knopf 1996, USFWS 2003). The primary activities that influence degradation or loss include conversion of native grasslands for agriculture, and negative farming and range management practices (Knopf 1996, USFWS 2003).


Photo by USFWS

Upland Sandpiper: While the Upland Sandpiper is not considered of conservation concern throughout the Intermountain West, there is a small isolated population in eastern WA and OR that may be genetically distinct. Research is needed to determine the status of this small, isolated population. For this reason, this species has been designated as a focal breeding species. Upland Sandpipers are considered grassland obligate species and are restricted to large (>100ha), open tracts of short grassland habitat. Preferred habitats include short-grass prairies, dry meadows, pastures, and hayfields with a variety of vegetation heights and densities (Vickery et al. 2010). Limiting factors include loss of grassland habitats for row crop agriculture.

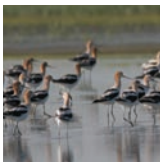
Photo by USFWS

American Avocet: The American Avocet was selected because it is relatively common throughout the Intermountain West with approximately half of the global population breeding in the region. They commonly nest on dikes, islands, or high spots near large saline lakes, man-made impoundments, ephemeral wetlands and playas, or marshes and lake/marsh complexes. Threats include loss or degradation of breeding habitats and water quality and selenium poisoning. This species responds well to nesting habitat management, especially construction of nesting islands within areas of shallow water.

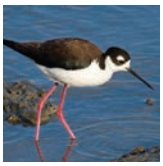
Photo by USFWS

Black-necked Stilt: This species was also selected because Black-necked Stilts are relatively common throughout the Intermountain West. They can be found in similar habitats as American Avocets, although stilts prefer more emergent vegetation than avocets. Black-necked Stilts are considered an important indicator species of contaminants in irrigation drain water due to their sensitivity to selenium (Robinson et al. 1999). Other threats include loss of habitat and degradation of water quality. This species responds well to nesting habitat management especially construction of nesting islands within areas of shallow water.

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APPENDIX A. SHOREBIRD SCIENCE TEAM MEMBERS

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APPENDIX B. STATUS OF SHOREBIRD SPECIES

Status of shorebird species identified through regional conservation scores in the U.S. Shorebird Conservation Plan

These scores can provide a means for partners to assess conservation activities for the highest return on conservation dollars. For instance, a common passage shorebird in the JV with a high TN score coupled with a high score for ND would be an excellent species for conservation measures during the passage or nonbreeding season. Wilson's Phalarope are found in high concentrations at a small number of large saline lakes in the JV on migration, thus their Nonbreeding Distribution = 5. Conservation of foraging resources (e.g. brine flies and brine shrimp) at those sites would be very beneficial for this species. The specific scores for shorebirds in the Intermountain West are provided below.

SPECIES	PT	RA	TB	TN	BD	ND	CS
Black -bellied Plover	5	3	2	2	2	1	3
Snowy Plover	5	5	4	4	3	4	5
Semipalmated Plover	3	3	2	2	1	1	2
Killdeer	5	1	3	3	1	2	3
Mountain Plover	5	5	4	4	5	4	5
Black-necked Stilt	3	3	3	2	1	2	2
American Avocet	3	2	3	4	2	3	3
Greater Yellowlegs	3	4	2	2	2	1	3
Lesser Yellowlegs	3	2	2	3	2	1	2
Solitary Sandpiper	3	4	4	2	3	2	4
Willet	3	3	3	3	3	3	2
Spotted Sandpiper	3	3	2	2	1	1	2
Upland Sandpiper	2	2	2	4	2	3	2
Whimbrel	5	4	2	2	3	2	4
Long-billed Curlew	5	5	4	4	3	3	5
Marbled Godwit	4	3	4	4	3	3	4
Red Knot	5	2	2	4	3	3	4
Sanderling	5	2	2	4	2	1	4
Semipalmated Sandpiper	5	1	2	3	3	3	3
Western Sandpiper	3	1	2	4	4	2	3
Least Sandpiper	5	2	2	2	2	2	3
Baird's Sandpiper	3	2	2	2	3	3	2
Pectoral Sandpiper	3	2	2	3	2	3	2
Dunlin	5	2	2	3	2	3	3
Stilt Sandpiper	3	3	3	4	3	3	3
Short-billed Dowitcher	5	2	2	4	3	2	4
Long-billed Dowitcher	2	2	2	3	4	3	2
Wilson's Snipe	5	1	3	2	1	2	3
Wilson's Phalarope	4	1	3	4	2	5	4
Red-necked Phalarope	4	1	2	3	1	3	3

[1] From Bird Conservation Region Area Importance Scores at www.fws.gov/shorebirdplan/RegionalShorebird.htm

Population Trend (PT) – Represents an assessment of available information on population trends and to estimate broad categories of population decline. They range from 5 = species with documented population decline to 1 = Significant population increase.

Relative Abundance (RA) – An assessment of population size (5 = <25,000 to 1 = >1,000,000)

Threats During the Breeding Season (TB) - Ranks known threats. Also indicates limited knowledge available for determining threats to most shorebirds (5 = Known threats occurring and documented to 1 = Demonstrably secure).

Threats During Non-breeding Season (TN) - This score applies the criteria listed above for TB scores to the migration and over-wintering period and also considers concentration risks (5 = Concentration results in actual risk to 1 = Demonstrably secure).

Breeding Distribution (BD) - This variable ranks the size of the breeding range for species that breed in North America, and only applies during the actual breeding season (5 = <2.5% of North America to 1 = >20% of North America).

Non-breeding Distribution (ND) - This variable refers to distribution during the non-breeding season and rates the relative risks associated with having a smaller absolute range size during the non-breeding season (5 = Highly restricted or very restricted coastal areas, or interior range to 1 = Very widespread).

Conservation Score (CS) – This score takes into consideration all scores presented above. (5 = all species liste as threatened or endangered nationally to 1= no apparent risk of population decline).

APPENDIX C. COMMON & SCIENTIFIC NAMES OF SHOREBIRD SPECIES LISTED IN THIS DOCUMENT

COMMON NAME	SCIENTIFIC NAME
Black-bellied Plover	*Pluvialis squatarola squatarola*
Snowy Plover	*Charadrius alexandrinus nivosus (Interior)*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferous vociferous*
Mountain Plover	*Charadrius montanus*
Black-necked Stilt	*Himantopus mexicanus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitara solitaria/cinnamomea*
Spotted Sandpiper	*Actitis macularia*
Willet	*Catoptrophorus semipalmatus inornatus*
Upland Sandpiper	*Batramia longicauda*
Long-billed Curlew	*Numenius americanus*
Whimbrel	*Numenius phaeopus rufiventris*
Marbled Godwit	*Limosa fedoa fedoa (Plains)*
Red Knot	*Calidris canutus roselarri*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
Baird's Sandpiper	*Calidris bairdii*
Pectoral Sandpiper	*Calidris melanotos*
Dunlin	*Calidris alpina pacifica*
Stilt Sandpiper	*Calidris himantopus*
Short-billed Dowitcher	*Limnodromus griseus caurinus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Wilson's Snipe	*Gallinago delicata*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*