Shorebirds of the Lahontan Valley, Nevada, USA: a case history of western Great Basin shorebirds

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The western Great Basin is one of the least-studied areas in North America for shorebirds, despite the presence of several key sites of the Pacific Flyway. Here, we present detailed surveys of one of these key sites — the Lahontan Valley wetlands. These wetlands include the Stillwater National Wildlife Refuge and Carson Lake. The Lahontan Valley is listed as a Hemispheric Site by the Western Hemisphere Shorebird Reserve Network. We provide peak census numbers and information on reproduction from 1949 to present. The most common shorebird in the Lahontan Valley is the Long-billed Dowitcher (*Limnodromus scolopaceus*), with peak single-day counts as high as 100,000 individuals. This case history demonstrates large-scale fluctuations in shorebird diversity and numbers that occur in the western Great Basin, and illustrates some of the problems that affect wetland management in the region.

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"Carson Sink [in the Lahontan Valley] is the only extensive natural marsh in western Nevada and its importance as a bird refuge cannot be over emphasized. Its wild fowl food resources are equaled [b]y few similar areas in the entire United States - certainly it is not surpassed by anything in the Pacific northwest." (Sperry 1929: 3, unpublished report)

Introduction

The western Great Basin is one of the least-studied areas in North America for shorebirds, despite the fact that it includes several sites recognized as being of key importance to shorebirds using the Pacific Flyway (Myers *et al.* 1987; WHSRN 1992). The Lahontan Valley, including Stillwater National Wildlife Refuge and Carson Lake, Nevada, is listed as a Hemispheric Site, and Mono Lake in California is listed as an International Site by WHSRN (1992). At the time of their designation, Hemispheric Sites supported at least 250,000 shorebirds annually or 30% of a species' flyway population (the criterion has since been increased to 500,000); International Sites support at least 100,000 shorebirds annually or 15% of a species' flyway population (WHSRN 1992). Of the designated shorebird sites in the western Great Basin, Mono Lake has been reasonably well-studied (*e.g.*, Jehl 1986, 1988; Rubega & Inouye 1994), but the Lahontan Valley wetlands remain relatively unknown. Here we present a case history of the Lahontan Valley wetlands, which contains the Stillwater National Wildlife Refuge. This case history demonstrates large-scale fluctuations in shorebird diversity and numbers typical of arid areas. We also point out some problems affecting management of wetlands in this region.

Western Hemisphere Shorebird Reserve Network designation - 1988

In 1986, the Lahontan Valley wetlands were nominated for inclusion in the Western Hemisphere Shorebird Reserve Network (WHSRN), a program designed to give recognition to critical migratory shorebird sites. At the time, the shorebird reserve network was a newly forming concept of a consortium of scientific organizations, conservation organizations and federal and state agencies. Their goal was to heighten public awareness of the importance of key wetland sites to the successful migration of shorebirds. The WSHRN program was designed to lend international recognition to sites in need of protection. Although designation provided no official protection, the hope was that recognition would lead those responsible for management of those sites to take pro-active measures to ensure that resources remained available for migratory shorebirds.

At this time, the Lahontan Valley wetlands were in jeopardy of being lost in a long-term struggle between competing water users (agricultural, municipal, and Native American fish interests). These competing water users reduced the amount and quality of water going into the wetlands (for more detail see Hallock & Hallock 1993; Rubega & Robinson, this volume). At the same time, the federal government began to restrict water deliveries from the Truckee River for human uses in the Lahontan Valley in order to free up water to sustain the recovery of the cui-ui (*Chasmistes cujus*) (an endangered fish that resides only in the Truckee River system). It was clear that with no legal right to contested water, the Lahontan Valley wetlands were

set for sacrifice in the interest of satisfying other priority demands set by the Endangered Species Act, agricultural water entitlements, and municipal needs.

Advocates of the wetlands searched for ways to heighten public awareness of the importance of the Lahontan Valley wetlands. At the suggestion of Dr. Joseph Jehl of Hubbs-Sea World Research Institute, Dr. J. P. Myers, then with the Academy of Natural Sciences of Philadelphia, and one of the main proponents of WHSRN, contacted Stillwater NWR, informing them of the appropriateness of the nomination of the Lahontan Valley wetlands into the program. Refuge biologist Steve Thompson and Nevada Division of Wildlife (NDOW) nongame biologist Larry Neel prepared background information. On 27 October 1986, NDOW director William A. Molini sent a letter of nomination to Mr. Paul D. McLain of the International Association of Fish and Wildlife Agencies (IAFWA), then chairman of that organization's Shorebird Committee and another key proponent of the Network. On 29 July 1987, Mr. Molini received a letter from Dr. Myers acknowledging inclusion of the Lahontan Valley wetlands into the WHSRN program. On 20 August 1988, Dr. Myers joined then Nevada governor Richard Bryan, representatives from NDOW and the U.S. Fish and Wildlife Service, and a host of representatives from a wide range of conservation and sportsman's organizations to dedicate the Lahontan Valley Wetlands into the Shorebird Network as a Site of Hemispheric Importance.

Shorebird census history of Lahontan Valley wetlands

Shorebird census data for the Lahontan Valley wetlands before 1986 were sporadically collected. Historical data can be divided into four more or less discernible subsets.

1) 1949-1969. These data are reported in the Stillwater National Wildlife Refuge Annual Narrative Reports (USFWS 1949). Generally, some effort was made to estimate breeding populations and fledgling production for American Avocets (*Recurvirostra americana*), Black-necked Stilts (*Himantopus mexicanus*), Killdeer (*Charadrius vociferus*), Wilson's Phalaropes (*Phalaropus tricolor*), Snowy Plovers (*C. alexandrinus*), and Long-billed Curlews (*Numenius americanus*). Migrant species' totals were reported opportunistically and usually documented large concentrations. These data pertain only to Stillwater National Wildlife Refuge (Stillwater NWR) and do not include Carson Lake or other area wetlands (Figure 1).

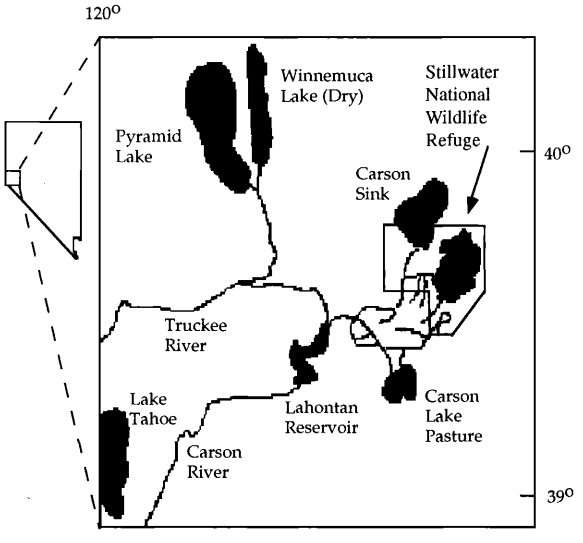

Figure 1. Stillwater National Wildlife Refuge and adjacent waterways and lakes.

2) 1970-1977. Emphasis was on breeding population and production estimates of shorebirds. In 1971 and 1972, Hainline (1974) maintained a shorebird census route at Stillwater NWR. Hainline's totals pertain only to his specific route and should not be compared to comprehensive censuses or opportunistic reports. From 1972 to 1976, the U.S. Fish and Wildlife Service conducted what is now known as the Lahontan Valley Study, a census and monitoring effort designed to establish wildlife baselines for the Lahontan Valley wetlands, including Carson Lake and other major wetland units. Unfortunately for shorebird researchers, this monumental effort is practically worthless for comparative purposes because shorebird data were reported in use-days (census totals averaged and multiplied by number of days between counts) (see Reed *et al.* this volume for a discussion of this problem), and because shorebirds were lumped with gull and tern data in a manner that precludes separation. As far as we know, very little raw count data for shorebirds from the Lahontan Valley Study survive in any form, with the exception of the opportunistic numbers reported in Table 1 as gleaned from annual narrative reports.

3) 1978-1987. From 1978 to 1985, almost no effort was expended toward censusing shorebirds. Breeding population and reproduction estimates were general and reflected a lack of attention (for instance, these estimates went unchanged for three consecutive annual reports). One exception was the Snowy Plover census conducted by Herman *et al.* (1988), which counted Snowy Plovers intensively in Nevada and Oregon in the summer of 1988.

In 1985, plans were made to duplicate the Lahontan Valley Study for the purpose of documenting declines in wildlife numbers associated with wetland habitat losses of 1977-1987. A biologist was hired and the study began in earnest in 1986. This rejuvenated census effort coincided with a monumental flood that created wildlife habitat conditions not present since the early 1950s.

The year 1987 was below average with respect to water inflow to wetlands, but receding waters from the previous year's flood created shallow conditions favorable to shorebirds. On 29 April 1987, Stillwater NWR biologist Steve Thompson conducted an aerial survey of the valley's wetlands. He finally quit trying to count shorebirds because the numbers overwhelmed him. Shorebird totals from that count are reported in Table 1.

4) 1988-1994. The western Great Basin was mostly in drought from 1987 to 1993, and 1988 was the first year that the prolonged drought had a deleterious effect on migratory and breeding shorebirds. In 1989, shorebird censuses were initiated in Lahontan Valley as part of the Point Reyes Bird Observatory's Pacific Flyway Project. During these counts, an effort was made to census all available shorebird habitat during a specified week chosen to coincide with the peak spring and summer migrations. Since these standardized censuses were initiated, only 1989 and 1993 were considered 100 percent water years. During this period, wetland habitat never recovered to pre-flood conditions. Peak shorebird numbers reported in Table 1 for this period include Stillwater NWR, Carson Lake, and other Lahontan Valley wetlands.

Shorebirds of the Lahontan Valley

Twenty-one species of shorebirds were censused in the Lahontan Valley between 1949 and 1994 (Table 1). The most common migrant species in the Lahontan Valley is the Long-billed Dowitcher. Peak single-day counts of this species have been as high as 100,000 individuals (1971, 1987) (Table 1). The next most abundant migrant species are Western and Least sandpipers, with peak counts reaching 66,700 in 1987 and 58,950 in 1990, and Wilson's Phalaropes, with a peak count of 67,000 in 1987. The most common breeding species in the Lahontan Valley were American Avocets and Black-necked Stilts. American Avocet production has been estimated as high as 4,000 young (probably 4,000-5,000 breeding pairs). Black-necked Stilts have produced as many as 2,000 young (probably 1,000 breeding pairs). Single-day migrant counts are as high as 64,030 and 8000 individuals (1987), respectively. One other notable peak count was for Snowy Plovers in 1980. In this year, 671 individuals were reported, accounting for 69% of this species counted in western Nevada (Page *et al.* 1991). Reported shorebird totals during the 1970s were much lower than in the previous period (1949-1969).

Table 1. Lahontan Valley shorebird peak counts, 1949-1994.

	Stillwater National Wildlife Refuge						*All Lahontan Valley Wetlands*			
	1949-1969			*1970-1977*			*1978-1987*		*1987-1994*	
Species	*No.*	*Young Produced*	*Year*	*No.*	*Young Produced*	*Year*	*No.*	*Year*	*No.*	*Year*
Black-bellied Plover				200		1971			320	1989
Pluvialis squatarola										
Snowy Plover	400	225	1969	180	75		671	1980	342	1988
Semipalmated Plover									680	1989
Charadrius semipalmatus										
Killdeer	1800		1953	2300	825	1973			370	1989
Black-necked Stilt	6000	2000	1968	2000	1000	1972	8000	1987	1260	1990
American Avocet	14,000	4000	1960	4000	2100	1972	64,030	1987	23,640	1990
Greater Yellowlegs	125		1955						50	1990
Tringa melanoleuca										
Lesser Yellowlegs									95	1989
T. flavipes										
yellowlegs spp							225	1987		
Solitary Sandpiper									3	1989
T. solitaria										
Willet									14	1989
Catoptrophorus semipalmatus										
Spotted Sandpiper	150		1968						20	1990
Actitis macularia										
Long-billed Curlew	70	30	1968	90	40	1975	130	1987	195	1989
Marbled Godwit	1000		1949				290	1987	465	1989
Limosa fedoa										
Western/Least sandpiper	30,000		1955	4500		1975	66,700	1987	58,950	1990
Calidris mauri/C. minutilla										
Baird's Sandpiper				200		1972			3	1994
C. bairdii										
Pectoral Sandpiper									5	1989
C. melanotos										
Dunlin				800		1972	2000	1986	11,140	1989
C. alpina										
Long-billed Dowitcher	34,000		1968	4000		1971	100,000	1987	100,000	1990
Limnodromus scolopaceus										
Wilson's Phalarope	40,000		1953	5000	3000	1972	67,000	1987	11,000	1988
Red-necked Phalarope	6000		1968						1490	1989
Phalaropus lobatus										
Total of peak counts	133,545	6255		23,270	7040		309,045		210,000	

Data come from USFWS (1949); Osugi & Barber (1972-77); Hainline (1974); Herron (1986-1994); Thompson (1986-88, 1988); Herman *et al.* (1988)

Management

Since the early 1900s, the quality and quantity of wetland habitat in the Lahontan Valley has been reduced significantly (see Hallock & Hallock 1993; Rubega & Robinson, this volume). Historically, the Carson River sustained an average of about 60,700 ha of wetlands in the Lahontan Valley (USGS Water-Resources Investigations Report 92-4024B, 1993). Since the turn of the century, more than 82 percent of wetland habitat in western Nevada was lost (Thompson & Merritt 1988). As recently as 1992, the Lahontan Valley wetlands recorded an all-time low of fewer than 405 ha of primary wetland habitat.

Prior to 1990, all water management was highly dependent on return flows from the Newlands Project. This federally funded irrigation project, under the jurisdiction of the U.S. Bureau of Reclamation, controlled water diversions. The natural water regime in the Lahontan Valley was altered, changing the quality and quantity of water reaching the wetlands. This resulted in a direct loss of valley wetland habitats, and adversely impacted migratory bird populations.

On 16 November, 1990, Congress passed the Truckee-Carson-Pyramid Lake Water Rights Settlement Act, Public Law 101-618 . The law specifically provides for preservation and enhancement of 10,000+ ha of primary wetland habitat within Lahontan Valley. The law authorized the Secretary of the Interior to purchase water and water rights from willing sellers to sustain wetland habitat in the Lahontan Valley. This legislation provided the foundation for the restoration and permanent protection of Great Basin wetland ecosystems in Stillwater NWR, Carson Lake, and Fallon Indian Reservation. Stillwater NWR is administered and managed by the U.S. Fish and Wildlife Service. Carson Lake presently is managed under a joint agreement between the Truckee-Carson Irrigation District and NDOW. The Truckee-Carson Settlement Act authorized the transfer of Carson Lake to State of Nevada ownership to be managed as a wildlife management area. This transfer is presently being researched and negotiated. In the interim, wildlife management recommendations are presented for approval by NDOW to an advisory board. Upon approval, actual water distribution within the designated wildlife area is effected by NDOW personnel.

Lahontan Valley wetlands, like many wetlands in the Great Basin, are composed of a series of ponds or units whose progressive expansion and contraction expresses a diversity of wetland habitats (Hamilton & Auble 1993) (Figure 2). Following a typical cycle through the diagram in Figure 2, in early spring, fresh water (200-400 µmhos/cm) from snow melt initially fills pond A. As runoff continues, the down-gradient ponds B, C, and D are progressively filled. As water enters each pond, it dilutes (freshens) residual water from the previous year. However, mixing with residual water and contact with salty-alkaline soils of dry ponds means water quality is degraded and runoff to the next pond is more saline.

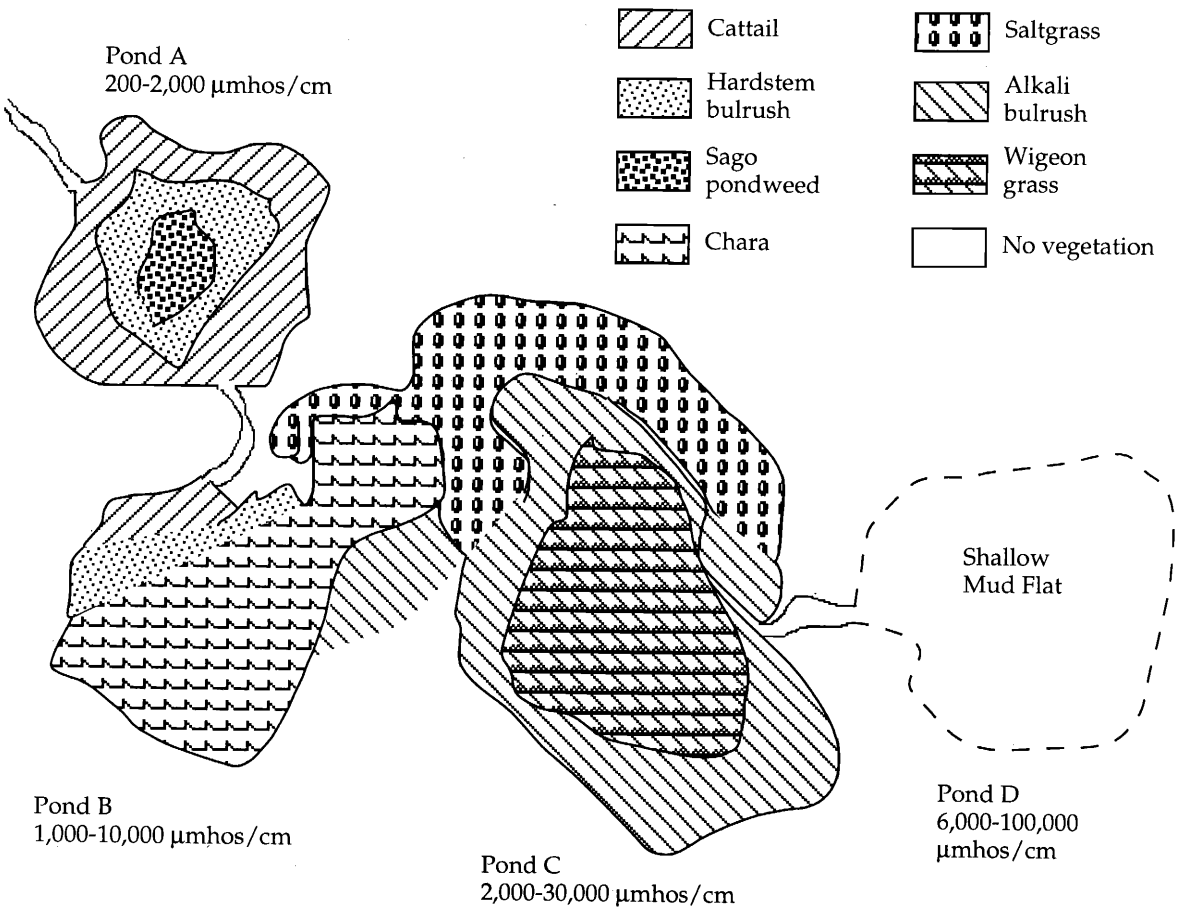

Figure 2. Hydrologic regimes of Great Basin wetlands, and associated conductivity ranges.

By the end of spring runoff, water in the lower ponds may express specific conductance of 6,000-10,000 µmhos/cm. During summer, evaporation concentrates salts and the ponds begin to contract. Pond D dries out first with specific conductance reaching 100,000 µmhos/cm before it becomes a salt-encrusted playa. As a result of the drying and high salinity, little vegetation is found in these lower ponds. However, these ponds are extremely productive in terms of both invertebrates and shorebirds. Ponds C and B dry out next leaving shallow ponds and mudflats utilized by shorebirds through the fall migration period.

Currently, over 14,796,000 m^3 of water rights have been purchased by the U.S. Fish and Wildlife Service (USFWS) and the State of Nevada with the help of The Nature Conservancy. This prime water has been used to manipulate habitats to create shorebird feeding, roosting, and nesting areas. With this "new water", the USFWS and NDOW have begun managing wetlands for increased invertebrate availability for shorebirds, waterfowl, and other wetland-associated species. Minor changes in the timing, depth, and duration of drawdowns or reflooding within a wetland complex have provided habitats for shorebird without causing serious adverse effects for other avian groups.

Present water management has been severely impacted by drought and is further complicated by the challenge of coordinating water deliveries with project operations. This has led to a narrow period of use resulting in less wetland acres during fall and spring shorebird migration peaks. With acquisition of irrigation water the Service and NDOW have been able to enhance shorebird nesting habitat for avocets, stilts and phalaropes at Stillwater NWR and Carson Lake. As a result of these management efforts, over 500 pairs of avocets and stilts were observed during the drought year of 1994 at Stillwater NWR and Carson Lake. When producing at full capacity (10,000+ ha, not including Carson Sink), we predict that the Lahontan Valley Wetlands are capable of providing the nutritional needs for 250,000 migratory and breeding shorebirds.

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