County of Placer

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Habitat Conservation Plan
Phase One

Patterns of abundance and habitat use of breeding Black-necked Stilts and American Avocets in Placer County, California, in 2003

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Patterns of abundance and habitat use of breeding Black-necked Stilts and American Avocets in Placer County, California, in 2003

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ABSTRACT

From early to mid-June 2003, we surveyed various shallow-water habitats in Placer County for breeding shorebirds, mainly Black-necked Stilts *(Himantopus mexicanus)* and American Avocets *(Recurvirostra americana),* as part of a broader study of shorebird use in the entire Central Valley. Surveys consisted of ground counts at specific sites supplemented by sampling of shorebird densities in rice fields. We estimated a total of about 581 Black-necked Stilts and 50 American Avocets in Placer County in June 2003. Of these species, respectively, 557 (96%) and 25 (50%) were in rice fields, 10 (2%) and 20 (40%) were in sewage ponds, 10 (2%) and 5 (10%) were in managed wetlands, and 4 (1%) and 0 (0%) were in pastures. Although the overall number of stilts and avocets in Placer County rice fields was modest, the densities of both species were within the middle of the range of densities recorded for other Sacramento Valley counties. Rice fields accounted for 98% of all stilts and 93% of all avocets in the Sacramento Valley; other habitats that held >3% of either species' regional total were managed wetlands and sewage ponds for avocets. In Placer County, the same habitats were important to stilts and avocets, though rice was much more important to stilts than avocets and vice versa for sewage ponds. These habitat relationships should be viewed with caution, though, as besides rice the other habitats were represented by few sites and limited acreage.

Overall, breeding shorebirds in the Sacramento Valley currently are very reliant on various habitats that serve the water needs of agriculture and municipalities. Use of some of these habitats may expose shorebirds to toxic substances, and, regardless, reliance on these artificial environments is generally risky, as future changes in management practices may serve human efficiencies and economies but reduce benefits to wildlife. Our study highlights the need to restore and enhance large amounts of high quality wetland habitat in the Sacramento Valley in

the summer to counter historic wetland loss and potential future loss of other shallow-water habitats that may be of uncertain reliability and quality. It also would be valuable to work with agricultural interests, particularly rice farmers, to enhance the suitability of agricultural fields to nesting and foraging shorebirds while at the same time maintaining high crop yields. Additional research is needed to determine reproductive rates of stilts and avocets in various Sacramento Valley habitats, identify factors limiting reproduction and actions necessary to increase nesting success, and document the local and landscape features of wetlands that support high densities of breeding shorebirds and high fledging rates of young.

INTRODUCTION

Although massive habitat alteration in this century has undoubtedly reduced many shorebird populations, information showing population declines in western North America is largely anecdotal (Page and Gill 1994). Concerns for shorebird populations catalyzed the preparation of the U.S. Shorebird Conservation Plan (Brown et al. 2001), which is currently being implemented on the ground mainly through regional shorebird conservation plans typically in partnership with joint ventures of the North American Waterfowl Management Plan.

The Central Valley has been a particular focus of wetland conservation because over 90% of its historic wetlands have been lost during the past 150 years (Frayer et al. 1989, Kempka et al. 1991) while the valley concurrently was converted to one of the most productive agricultural areas in the world. Current efforts to increase wetland habitat in the Central Valley in response to continent-wide declines of waterfowl also aim to benefit other wetland-dependent birds, including shorebirds (USFWS 1990, Streeter et al. 1993), but are hampered by a paucity of biological data on most species. Prior information on shorebird occurrence in the Central Valley

is limited but recently was greatly expanded by broadscale surveys that provide an overview of the abundance, geographic distribution, and habitat use of migrating and wintering shorebirds and that document the continent-wide importance of this region to shorebirds at these seasons (Shuford et al. 1998).

The Southern Pacific Shorebird Conservation Plan (Hickey et al. 2003) encompasses the Central Valley and coastal California. Within the former region, the Central Valley Shorebird Working Group functions as a technical subcommittee of the Central Valley Habitat Joint Venture. The regional shorebird working group strives to set population and habitat objectives, implement conservation recommendations, and define research and monitoring priorities for shorebirds. Among the highest research priorities identified by the working group was the need to conduct surveys of breeding shorebirds in the Central Valley. Not only is very little known about their status in the region at this season but wetland habitat reaches its nadir then. The breeding season takes on additional importance because the proportion of current to historic wetland acreage appears to be much lower in summer than at any other season.

To fill this important data gap regarding breeding shorebirds, we coordinated counts at wetlands and other shallow-water habitats throughout the Central Valley, the results of which are summarized in a companion report (Shuford et al. 2004) to the present one. Here we report the patterns of abundance and broadscale habitat use of Black-necked Stilts *(Himantopus mexicanus)* and American Avocets *(Recurvirostra americana)* in Placer County, California, and compare these to patterns in the rest of the Sacramento Valley. We also identify threats to nesting shorebirds and make recommendations for management and research needed to ensure the effective conservation of their populations and habitat in this region.

STUDY AREA

The study area included the lowlands of the western portion of Placer County that lie within California's Sacramento Valley, the northern drainage of the larger encompassing Central Valley. Total precipitation in the Sacramento Valley was close to normal in the winter prior to our surveys but was well above average in the spring of 2003. Precipitation for the climate year (1 July-30 June) 2002-2003 was 100.3 cm (39.5 in) in the Sacramento drainage division, representing 105% of the long-term average (n = 108 yrs) for this area (Western Regional Climate Center; http://www.wrcc.dri.edu/divisional.html). Precipitation for late spring (1 April-31 May) 2003 for this region was 21.8 cm (8.6 in), which represents 195% of the long-term average at that season. The extent of rainfall in the spring delayed planting of rice in the Sacramento Valley, as described below, but otherwise appeared to have limited effects on shorebirds and their habitats. Spring rains may have slightly delayed the drying out of some shallow-water habitats but the normal winter precipitation overall did not create extensive ephemeral breeding habitat, as may occur in years of exceptional rainfall (e.g., 1997-98; Shuford et al. 2001).

METHODS

Survey Design

We attempted to count breeding shorebirds at all key shallow-water habitats in Placer County from early to mid-June 2003. The types of habitats surveyed included irrigated fields and pastures, private managed wetlands, rice fields, and sewage ponds. We identified potential sites to survey on the basis of discussions with knowledgeable local experts.

To minimize over- or undercounting of shorebirds arising from their movement both locally or regionally, we surveyed breeding shorebirds in a short period near the beginning of the breeding season but after the end of spring migration. All counts in Placer County were conducted within the 1-15 June window established for the Sacramento Valley as a whole.

Our primary focus was to estimate the size of the populations of Black-necked Stilts and American Avocets, characteristic breeding shorebirds in Sacramento Valley wetlands. We recognized that some birds counted would likely be nonbreeders given not all individuals of both species breed in their first year and some nonbreeding avocets summer in nesting areas (Robinson et al. 1997, 1999).

Although we instructed observers to count all breeding shorebirds present at each site, it was not possible to obtain population estimates for other species of shorebirds breeding in Placer County. The Killdeer *(Charadrius vociferous)* nests at such a wide variety of wetland, agricultural, and other upland sites that is was not possible to cover many of them. Other species would have required specialized surveys beyond the scope of this project either because they breed in specialized habitats (Spotted Sandpiper *Actitis macularia*; along streams), occur very locally and are cryptic except when performing aerial displays (Wilson's Snipe *Gallinago delicata*), or migrate so late in spring (Wilson's Phalarope *Phalaropus tricolor)* that it was not possible to distinguish migrants from breeders during most of the period selected to survey stilts and avocets.

Because of the varying logistical constraints among habitats, we used a combination of ground counts at individual sites and sampling of random fields in the extensive area of cultivated rice, as described below. PRBO staff coordinated the overall survey effort, conducted

the sampling of rice fields, and assigned local experts to count at smaller discrete sites likely to hold breeding shorebirds.

Ground Counts

We provided all observers with a protocol for counting breeding shorebirds, nests, and broods, for estimating the size of the survey site, and for gathering habitat data. Ground counts generally were conducted at those discrete sites to which we had obtained access. Sites covered included Bull Marsh, the new Lincoln sewage ponds, the Sheridan sewage ponds, Wildlands Mitigation Bank, and a sample of irrigated and dry pastures. Observers covered such sites either by walking or by driving levees or roads and by scanning all suitable foraging and nesting habitat for shorebirds using binoculars and spotting scopes. Evidence of confirmed nesting was obtained by observing nests with eggs and/or recently hatched chicks, adults sitting in incubation posture on apparent nests, or broods of mobile young smaller in size than adults.

Sampling of Rice Fields

We collected data on shorebird densities in a random sample of individual rice fields in the Sacramento Valley to allow estimation of overall shorebird numbers by county in that region's extensive area of rice cultivation.

Typically about 97% of all California rice is grown in the Sacramento Valley, where the total amount averaged 197,689 ha (488,500 acres) from 1995 to 2002 (Calif. Agric. Statistics Service: http://www.nass.usda.gov/ca/coest/indexce.htm). In 2003, an estimated 201,534 ha (498,000 acres) was planted statewide (CASS 2003a) but acreage breakdowns by county or region were unavailable at the time of writing this report (Jack Rutz in litt.). The combined

(much smaller) acreage total for wild rice and sweet rice, not included in the statewide total above, also was unavailable at the time of report writing.

In 2003, planting of rice was delayed by heavy showers in April and early-May and some intended acreage was not planted (NASS 2003). Planting on average was delayed roughly three weeks (5-6 weeks in some areas) in the Sacramento Valley compared to a normal year (peak planting usually 1-10 May); planting on the west side of the valley was advanced about two weeks over that on the east side (P. Buttner pers. comm.). Overall an estimated 80% of all rice in California had been planted by 1 June, 90% by 8 June, and 100% by 15 June (USDC and USDA 2003, P. Buttner pers. comm.). Reflecting the earlier initiation there, it appears that 100% of the rice on the west side of the valley had been planted by 8 June (P. Buttner pers. comm.).

Sampling of 38 rice fields in Placer County was conducted by C. Hickey from 10-13 June. Despite the late start to the rice season and the west-to-east differences in planting, she apparently sampled most fields at or close to the time when all rice had been planted given the dates of sampling and the extent of the delay in planting on the east side of the Sacramento Valley. That sets of fields typically take 2-3 days to flood before they are planted, indicates that planting dates are a conservative gauge of the fields' suitability for shorebirds, which may use them as soon as water is available

The single observer in Placer County randomly selected the individual fields to sample, while also attempting to distribute samples broadly across the county, and used binoculars or a spotting scope to carefully scan each field for foraging adults, incubating adults, and broods. To enable us to estimate densities of shorebirds in each sampled field, the observer obtained data on the size of the field by either collecting three or more GPS (Global Positioning System) points at

the corners of fields, which allowed plotting a polygon and calculating its size on GIS (Geographic Information System) software, or obtained acreages directly from ranchers' maps.

Rice Data Analysis

We estimated the mean stilt and avocet density in rice in each of eight Sacramento Valley counties on the basis of our survey of a simple random sample of rice fields as described above. Although the acreages of rice planted in 2003 are not yet available, we estimated the county acreages as an average of the 2001 and 2002 totals. When the actual 2003 acreages become available later in 2004, they can be substituted for these estimated values. We estimated the total number of stilts and avocets using rice fields in each county as the estimated density of each species per hectare from our sample multiplied by the estimated hectares of rice planted. Because both the hectares and the densities are estimated, we used the variance formula for the product of random variables with no covariance (Mood et al. 1974) as follows:

$var[S] = s^2*var[W] + W^2*var[s] + var[s]*var[W]$, for stilts, and

$var[A] = a^2*var[W] + W^2*var[a] + var[a]*var[W]$ for avocets, where

S = the total number of stilts estimated for the county,

s = the sample density of stilts for the county,

A = the total number of avocets estimated for the county,

a = the sample density of avocets for the county, and

W = the estimated number of hectares of rice for the county.

We found no significant covariance between the density of either stilts or avocets and the size of rice fields in any of the eight counties. We assumed no covariance between the sampled density of stilts and avocets and the countywide estimated rice area totals.

RESULTS AND DISCUSSION

Abundance and Habitat Use

Combining ground counts at individual sites with data from sampling of rice fields (Table 1), we estimated a total of about 581 Black-necked Stilts and 50 American Avocets in Placer County in June 2003. Of these species, respectively, 557 (96%) and 25 (50%) were in rice fields, 10 (2%) and 20 (40%) were in sewage ponds, 10 (2%) and 5 (10%) were in managed wetlands, and 4 (1%) and 0 (0%) were in pastures. Although the overall number of stilts and avocets in Placer County rice fields was modest, the densities of both species fell within the middle of the range of densities recorded for other Sacramento Valley counties (Table 1). For the Sacramento Valley as a whole, rice fields accounted for 98% of all stilts and 93% of all avocets in this region (Table 2 and 3). The only other habitats in the Sacramento Valley that held >3% of either species' regional total were managed wetlands and sewage ponds for avocets. In Placer County, the same habitats were important to these shorebirds overall, though rice was much more important to stilts than avocets and vice versa for sewage ponds. These habitat relationships should be viewed with caution, though, as besides rice the other habitats were represented by few sites and limited acreage.

Coverage

Although we did not survey every potential site for breeding stilts and avocets in Placer County, we did cover the most important ones, and we judge that numbers of shorebirds that occurred in areas not covered were relatively small. Given patterns of habitat use were similar to that for the Sacramento Valley as a whole, we suspect that these patterns would not have changed much by coverage of a few additional sites in Placer County, other than slightly elevating the importance

of other habitats relative to rice, which was covered adequately by sampling broadly across the county's rice lands.

Historical versus Current Conditions

Before European settlement, California's Central Valley contained extensive shallow-water wetland habitat, which varied dramatically both seasonally and annually depending on the amount of flooding from winter rains or high spring runoff from snowmelt. These ephemeral shallow-water wetlands were highly productive, and when they persisted into spring and summer provided important habitat for many species of breeding waterbirds, including shorebirds (see Shuford et al. 2001 for Black Terns, *Chlidonias niger*). Such ephemeral wetland habitat likely occurred in Placer County from the overflow of its creeks and rivers. By the middle of the 20th century, aggregate numbers of stilts and avocets in California had already been reduced commensurate with the reduction in the extent of interior marshlands (Grinnell and Miller 1944). Today almost all of the streams flowing into the Sacramento Valley, including those in Placer County, are dammed or otherwise diverted and, hence, flooding of the valley floor occurs in extremely wet years only, and usually water does not persist for long before it is drained off.

Currently a very high proportion of the habitat in the Sacramento Valley available for breeding shorebirds occurs in areas where water is used for agricultural and municipal needs. Although such sites support breeding shorebirds, there is almost no information available to determine whether these birds are producing numbers of young adequate to maintain a stable population size or whether they are exposed to harmful substances that might reduce their breeding success. Regardless, reliance on these environments is generally risky, as future

changes in management practices may serve human efficiencies and economies but reduce benefits to wildlife.

Threats to Breeding Shorebirds

Known or potential threats to shorebirds in the Sacramento Valley, including Placer County, are habitat loss or degradation to urbanization, changing agricultural and municipal practices, poor water quality, and lack of adequate nesting sites. Breeding shorebirds should benefit, though, from wetland restoration and enhancement for waterfowl and other wildlife (e.g., USFWS 1990) and, particularly, from heightened interest in increasing the amount of wetland habitat in summer. Still, securing a dependable, high quality water supply for wetlands will be an ongoing challenge in light of California's expanding human population, arid climate, and a water delivery system already stretched to its limits. Competition with other interests for increasingly expensive water is bound to intensify, and recent gains from legislation providing a reliable water supply for wetlands (e.g., Central Valley Project Improvement Act; Title 34 of Public Law 102-575) potentially could be reversed in the future.

Use of pesticides in rice fields has caused periodic mortality in waterfowl, raptors, and, rarely, shorebirds but no chronic problem has been documented (Littrell 1988). It is unclear, though, what effect these pesticides may have on the invertebrate resources in rice fields upon which breeding stilts and avocets depend. Loss of invertebrate diversity or biomass potentially could lead to chick starvation. Agricultural practices that rapidly draw down water levels in rice fields have exposed Black Tern nests to rat predation only to later destroy renesting attempts when fields were reflooded above original levels (Lee 1984). Such drawdowns in rice fields are less likely to increase predation rates on nests of stilts and avocets, which typically are placed on

the sloping edges of ponds or narrow levees between rice fields. Drawdowns are more likely to enhance foraging opportunities for breeding shorebirds by exposing invertebrates that otherwise would be unavailable.

Secure nesting sites often are more limited in agricultural settings than in managed wetlands. Artificial islands in wetlands provide security from ground predators, such as coyotes *(Canis latrans),* but islands are typically absent from rice fields, and dirt mounds within fields, which may serve the same purpose, are few.

Urban encroachment also directly threatens wetlands and agricultural lands used by shorebirds, particularly in counties such as Placer that are close to expanding urban centers. In such situations, rising real estate prices make it particularly difficult to maintain land in agricultural production or as wildlife habitat. Urbanization continues to reduce agricultural lands in the Central Valley at a rate among the highest in North America (American Farmland Trust 1995, Sorensen et al. 1997), although the effect on shorebirds is unknown. A $17 billion agriculture industry (CASS 2003b) dominates land use in the Central Valley, and its future could tremendously influence shorebird habitat either positively or negatively via shifting cropping patterns and farming practices in response to national or global economic forces and technological advances.

RECOMMENDATIONS

Managers, land use planners, and researchers should work collaboratively to study the ecological requirements of breeding shorebirds in the Sacramento Valley and to implement management practices that suit shorebird needs while maintaining high overall species diversity. We make the following recommendations for the Sacramento Valley, including Placer County:

- Increase the acreage of summer wetland habitat to augment breeding shorebird populations to counter historic wetland loss and potential future loss of other shallow-water habitats (agricultural, municipal) that may be of uncertain reliability because of shifting human needs or may be exposing shorebirds to potential harm from contaminants. The Central Valley Shorebird Working Group has set goals of increasing summer wetland habitat by two times the current amount in the Sacramento Valley.
- Enhance the suitability of established wetlands to breeding shorebirds by providing more barren or sparsely vegetated nesting islands and increasing foraging opportunities by maintaining shallow water and making gradual slopes on pond and island edges.
- Work with rice farmers to enhance the suitability of rice fields to nesting and foraging shorebirds while at the same time maintaining high crop yields. Even if densities of breeding shorebirds remain low in rice fields relative to managed wetlands the former are highly preferable to alternatives such as urban and suburban development. When possible, provide landowners with incentives to keep producing crops that benefit shorebirds and other waterbirds.
- Initiate studies to determine reproductive rates of stilts and avocets in various habitat types in the Sacramento Valley. Where rates are low, do further research to identify factors limiting reproduction (e.g., non-native predators, contaminants, lack of secure nesting islands) and actions that can be taken to increase nesting success.
- Conduct research to identify the features of wetlands that support high densities of breeding shorebirds and high fledging rates of young. Important local factors to consider would be the number, type, and location of nesting islands, extent and height of wetland vegetation, ideal water depths, and diversity of relief in pond bottoms. Also, investigate

landscape features that may influence the size and success of nesting shorebird populations, including the importance of the size of individual wetlands and their proximity to other wetlands, other habitats, or human activities.

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Table 1 ESTIMATED NUMBERS OF BLACK-NECKED STILTS AND AMERICAN AVOCETS BREEDING IN SACRAMENTO VALLEY RICE FIELDS, 5-19 JUNE 2003[a]

County	Hectares Planted Rice[b]	Fields Sampled (*n*)	Black-necked Stilt		American Avocet	
			No. per 100 ha (±SE)[c]	Estimated Numbers (±SE)[c]	No. per 100 ha (±SE)[c]	Estimated Numbers (±SE)[c]
Butte	37,798	52	10.9±4.2	4120±1609	0.0±0.0	0.0±0.0
Colusa	53,580	76	7.1±2.2	3825±1172	1.5±0.7	809±384
Glenn	33,548	76	5.3±2.3	1786±767	0.3±0.3	91±94
Placer	4290	38	13.0±5.7	557±249	0.6±0.4	25±19
Sacramento	3238	52	55.2±27.1	1787±876	0.8±3.4	267±111
Sutter	38,324	86	15.5±6.9	5936±2671	2.7±2.3	1050±900
Yolo	11,635	79	28.1±6.5	3268±760	10.1±3.4	1174±399
Yuba	14,791	38	0.9±0.5	133±72	0.4±0.4	53±54
TOTALS	197,203	497	–	21,412±1408	–	3469±437

[a] Estimates based on a simple random sampling of individual rice fields (see Methods).

[b] Hectares of planted rice by county are the means for 2001 and 2002 because figures for 2003 were not yet available (see Methods). Means for Tehama and Solano counties, which we did not sample for stilts and avocets, were 344 and 142 hectares, respectively. County totals do not include the number of hectares of wild rice and sweet rice, which are much fewer than those for traditional rice.

[c] See Methods for details of calculations.

Table 2 NUMBERS (PERCENTAGE) OF BREEDING BLACK-NECKED STILTS IN VARIOUS HABITAT TYPES BY REGIONS OF THE CENTRAL VALLEY IN 2003

	Sacramento Valley	Delta	San Joaquin Basin	Tulare Basin	Central Valley Total
Managed wetlands	219 (1.0)	4 (2.5)	307 (44.2)	2441 (35.3)	2971 (10.0)
Sewage ponds	133 (0.6)	33 (20.6)	274 (39.4)	1329 (19.2)	1769 (6.0)
Rice fields	21,412 (98.1)	72 (45.0)	26 (3.7)	0 (0.0)	21,510 (72.7)
Water storage facilities	42 (0.2)	0 (0.0)	2 (0.3)	820 (11.8)	864 (2.9)
Miscellaneous	21 (0.1)	51 (31.9)	86 (12.4)	202 (2.9)	360 (1.2)
Evaporation ponds	0 (0.0)	0 (0.0)	0 (0.0)	1170 (16.9)	1170 (4.0)
Agricultural canals	0 (0.0)	0 (0.0)	0 (0.0)	958 (13.8)	958 (3.2)
Totals all habitats	21,827	160	695	6920	29,602

Table 3 NUMBERS (PERCENTAGE) OF BREEDING AMERICAN AVOCETS IN VARIOUS HABITAT TYPES BY REGIONS OF THE CENTRAL VALLEY IN 2003

	Sacramento Valley	Delta	San Joaquin Basin	Tulare Basin	Central Valley Total
Managed wetlands	137 (3.7)	3 (3.4)	395 (54.0)	2890 (48.3)	3425 (32.5)
Sewage ponds	121 (3.2)	12 (13.8)	217 (29.6)	614 (10.3)	964 (9.1)
Rice fields	3469 (92.6)	27 (31.0)	15 (2.0)	0 (0.0)	3511 (33.3)
Water storage facilities	11 (0.3)	0 (0.0)	1 (0.1)	192 (3.2)	204 (1.9)
Miscellaneous	6 (0.2)	45 (51.7)	104 (14.2)	55 (0.9)	210 (2.0)
Evaporation ponds	0 (0.0)	0 (0.0)	0 (0.0)	1538 (25.7)	1538 (14.6)
Agricultural canals	0 (0.0)	0 (0.0)	0 (0.0)	694 (11.6)	694 (6.6)
Totals all habitats	3744	87	732	5983	10,546