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Changes in the bird community of the lower Truckee River, Nevada, 1868 - 2001

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In the summer of 1868, when the young Robert Ridgway set out to collect birds in the thickets along the lower Truckee River, the possibility that his would be the last inventory before many species disappeared from the area might have seemed unlikely. Yet, his three-week stay produced perhaps the most informative set of data on the magnitude of losses incurred in native bird communities during the early 1900s, the period when western rivers were "tamed." Ridgway documented 107 bird species during his visit, ranking them in abundance from "abundant" to "rare" (Ridgway 1877). Although these ranks were assigned subjectively, the changes that were about to occur were so radical that even subjective estimates would shed light on the restructuring of the bird community that followed.

DEGRADATION OF THE TRUCKEE RIVER ECOSYSTEM

As settlers expanded into the Truckee Meadows in the second half of the 19th century, they began to harvest the riparian forest and converted much of the floodplain into agricultural lands. After the turn of the 20th century, the Newlands water project began to divert much of the Truckee River's flows for agricultural operations in another basin. Frequently, the river bed became dry during the hottest part of the year. In the 1940s, a U.S. Army Corps of Engineers flood control project straightened and deepened the river channel through most of the lower reaches. The river bed became progressively incised and the groundwater table declined during the decades that followed, continuing the degradation of riparian woodlands and floodplain wetlands.

As a result of the groundwater table decline, xeric shrublands and riparian plants with deep root systems, such as old cottonwood (*Populus fremontii*) and willow (*Salix* spp.) trees, now dominate much of the former 100-year floodplain. The cottonwood forests and willow thickets that Ridgway described as almost impenetrable disappeared or were transformed into an open parkland.

For Nevadans of the early 20th century, the most notorious resource loss involved two endemic fish: a unique strain of Lahontan cutthroat trout (*Oncorhyncus clarki henshawi*) and the cui-ui (*Chasmistes cujus*), a lake sucker. Both species were, prior to river impacts, so abundant that they represented a staple food of Native Americans and a significant economic asset for settlers. The fish resided in Pyramid Lake most of the year and depended on high spring flows for their spawning migration upriver. The new dams and diversions all but prevented their access to the river. Lahontan cutthroat trout soon were

extirpated, while cui-ui were reduced to a small population of aging individuals (Scoppettone and Rissler 2000). The species was one of the first to be federally listed when the Endangered Species Act was ratified in 1973, and restoring instream flows during the spawning season was recognized as a key process in recovering the species.

SIGNS OF RECOVERY

In the early 1980s, federal agencies and the Pyramid Lake Paiute Tribe effected an agreement to release supplemental water from upstream reservoirs to recover spawning flows for cui-ui. A series of wet years in the mid-1980s provided particularly ample spring flows, which receded only slowly during supplemental releases. This gave the fish opportunity to migrate and reproduce successfully before returning to the lake. After the first successful spawning events, flows were released on a regular basis to continue to rejuvenate the cui-ui population.

Meanwhile, another phenomenon was observed after spring flows were supplemented. The barren banks of the Truckee River became vegetated with cottonwood and willow seedlings. Cottonwood seedlings germinate best when flows recede slowly after seed dispersal, allowing the growing roots to keep up with the rate of water decline (Rood and Mahoney 1990). After 15 years, these seedlings have now grown into distinct multi-aged riparian woodlands that are beginning to fill point bars and relic oxbows along the corridor. Tree recruitment was so significant during the cui-ui flow releases that it has been included as a planning component in instream flow management.

BIRD POPULATION CHANGES DURING THE TRUCKEE RIVER'S RECENT HISTORY

Robert Ridgway recorded 107 species of birds during his stay at the lower Truckee River in June 1868. Over 100 years later, when impacts to the Truckee River had accumulated and before any mitigation was attempted, a group of researchers resurveyed the river's bird community. In the summers of 1972 - 1976, Klebenow and Oakleaf (1984) could only detect 65 species. This represented a 40 percent loss in species richness since the 1800s. Also, many species that were ranked as "abundant" or "common" by Ridgway had become rare. Overall, Klebenow and Oakleaf's surveys documented an astounding loss of bird diversity over the course of a century.

Birds that experienced the greatest losses were species whose life histories are closely linked to riverine and wetland habitats. For instance, American Widgeon (*Anas americana*), Gadwall (*Anas strepera*), Western and Eared grebes (*Aechmophorus occidentalis* and *Podiceps nigricollis*), American Bittern (*Botaurus lentiginosus*), Long-billed Curlew (*Numenius americanus*), American Avocet (*Recurvirostra americana*), Black-necked Stilt (*Himantopus mexicanus*), Black-chinned Hummingbird (*Archilochus alexandri*), Marsh

Wren (*Cistothorus palustris*), Common Yellowthroat (*Geothlypis trichas*), Yellow-breasted Chat (*Icteria virens*), and Song Sparrow (*Melospiza melodia*) were absent in the 1970s after being ranked "common" or "abundant" in 1868.

Two major studies of birds of the Truckee River have been conducted since the implementation of supplemental flow releases: Morrison (1993) and my surveys of 1998, 2001, and 2002. Here, I compare preliminary results of my 1998 and 2001 surveys with data from previous bird inventories. The objective of the study presented here was the preliminary examination of the hypothesis that some recent bird recoveries are attributable to habitats that began to return after instream flows were managed for cui-ui spawning.

METHODS OF RECENT SURVEYS

In 1998 and 2001, I collected point count survey data at 87 survey points along the middle and lower Truckee River (Truckee Meadows to Nixon). Ten-minute surveys were conducted at each survey point between 6:00 and 10:00 a.m. in fair weather conditions (without high winds or heavy precipitation). Each survey point was visited three times during the peak breeding season of most neotropical migratory landbirds in this region, i.e., May 25 – July 10. I included bird sightings from all distances to match the survey methods used previous studies (Klebenow and Oakleaf 1984, Morrison 1993). Klebenow and Oakleaf (1984) previously speculated that these methods may be the most suitable for simulating the conditions during Ridgway's inventory in 1868.

To compare relative bird abundances among the four inventories, I used the following abundance rankings for each of the two years of my surveys: Absent = never observed during any surveys; Rare = < 3 sightings throughout all surveys; Common = 4 to 79 sightings throughout all surveys; Abundant = > 80 sightings throughout all surveys. These methods were adapted from Klebenow and Oakleaf (1984), and although Ridgway's estimates were qualitative, these rankings are only intended to represent basic abundance patterns rather than more subtle, quantitative effects. Ridgway omitted an "uncommon" rank in his inventory, and all studies since Ridgway also have chosen not to include it to make direct comparisons possible. As a result, several birds that most observers today likely would rank as "uncommon" ended up being ranked as "common."

For a preliminary examination of the hypothesis that recovering birds were associated with habitat types that benefited from recent management of instream flows, I combined riparian and wetland species into the following groups: (1) waterbirds (including waterfowl and other birds of open water), (2) shorebirds, (3) marsh/wet meadow birds, (4) riparian shrubland birds (i.e., birds primarily found in willow shrublands and shrub understory of gallery forests), and (5) canopy birds (i.e., birds primarily found in the upper canopy of the gallery forest). Only those species were included whose natural history and previous data from the Truckee River (E. M. Ammon, unpubl.) indicate that their habitat use is relatively restricted to these habitats during the breeding season.

RECENT STATUS OF THE TRUCKEE RIVER BIRD COMMUNITY

After instream flows were supplemented and early-successional riparian woodlands reappeared along the banks of the Truckee River, bird species richness increased again. Morrison (1993) reported 87 species during surveys in 1993. In 1998 and 2001, I recorded a total of 95 species, or 89 percent of the species richness originally reported in 1868.

These numbers give the appearance of an enormous bird recovery since the ecosystem's presumed low point in the 1970s. However, the composition of today's bird community paints a less optimistic picture. Over 20 species found during the 20th-century surveys were new additions since Ridgway's times. For example, species such as California Quail (*Lophortyx californicus*), Rock Dove (*Columba livia*), European Starling (*Sturnus vulgaris*), Bewick's Wren (*Thryomanes bewickii*), Brewer's Blackbird (*Euphagus cyanocephalus*), Lesser Goldfinch (*Carduelis psaltria*) and House Sparrow (*Passer domesticus*) were not observed in 1868, but they now are common breeders along the Truckee River. Many of these newly added species are commensals of human settlement and agriculture, and they apparently represent a change in wildlife that parallels the transition toward more artificial landscapes.

However, other species truly began to recover since the 1970s. Some returned to the river after having been extirpated, and others recovered in numbers after having been rare. Of 30 recovering breeding birds, eight are associates of riparian shrublands or early-successional woodlands, including species such as Yellow-breasted Chat, Common Yellowthroat, Warbling Vireo (*Vireo gilvus*), Song Sparrow, and Black-headed Grosbeak (*Pheucticus cyanocephalus*). Nine other species are associated primarily with emergent wetlands or active riverine wetlands, including, for example, American Bittern, Double-crested Cormorant (*Phalacrocorax auritus*), Virginia Rail (*Rallus limicola*), Cinnamon Teal (*Anas cyanoptera*), and Marsh Wren. Tables 1–5 list the abundance ranks of waterbirds, shorebirds, marsh/wet meadow birds, riparian shrubland birds, and canopy birds from four breeding bird inventories conducted since settlement of the Truckee River began.

Tables 1–5 indicate that most of the species that have yet to return to the Truckee River are in the waterbird and shorebird groups. Of the shorebirds, only Killdeer and Spotted Sandpiper were common or abundant throughout all studies (Table 2). Both of these species typically inhabit gravel banks of the active river channel (E. M. Ammon, *pers. obs*.). All other shorebirds are more often associated with extensive emergent wetland systems. Complex wetlands still are rare along the middle and lower Truckee River corridor, and only since the flood of 1997 have some been reestablished. However, large sections of the Truckee River still are unable to support extensive wetlands due to channel down-cutting.

The greatest proportion of species that have made recent and notable comebacks are in the riparian shrubland and marsh bird groups (Table 3 and 4). Song Sparrow and Yellow-breasted Chat, for example, are not likely to breed in

areas with low shrub cover, but they readily return once shrub thickets recover. Most of the newly recovered riparian vegetation of the Truckee River consists of early-successional, shrubby cottonwood trees and willows that form dense stands in some places. The Willow Flycatcher presents a conspicuous exception to the recovery pattern observed in other shrub nesters, but its absence may represent a regional trend (Ted Floyd, *pers. comm.*) and thus may not necessarily be due a local lack of habitat. Based on Table 5, canopy birds apparently incurred the fewest losses. Because a proportion of old cottonwood and willow trees survived throughout the period of riparian degradation, this pattern would be predicted. Exceptions to the pattern are Long-eared Owl, Western Tanager, and Western Bluebird.

CONCLUSIONS

The data presented here are correlational and cannot directly address causal relationships between birds and their habitats. However, when reviewing the historic changes of the Truckee River bird community as a whole, patterns of species loss and community restructuring that parallel recent habitat changes become apparent. Many native species were lost when the river and its riparian zone began to be exploited. Other species appeared in the transformed landscape. When river restoration was attempted through instream flow management, several of the lost species began to make a recovery. The information presented here agrees with the hypothesis that species associated with early-successional riparian woodlands benefited the most, so far, from instream flow restoration and the beginning riparian recovery.

Other species may respond more slowly to the changes that are taking place in response to restoring instream flows. For example, wetland complexes may take a long time to develop through geomorphic processes of a river, such as the Truckee, which still shows evidence of significant down-cutting. Until active or passive restoration reverses this trend, populations of shorebirds and wetland birds are expected to stay low.

A complete recovery of the species assemblage encountered by Robert Ridgway in 1868 probably is impossible. However, the data collected along the Truckee River over 14 decades by different generations of ornithologists make a striking case for monitoring biological resources that are precious to us, because it is our only chance at understanding the long-term processes involved in their eventual loss or, alternatively, their recovery.

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Table 1: **Waterbird** abundance throughout the recent history of the Truckee River. Data from Ridgway (1877), Klebenow and Oakleaf (1984), and from this study. Note that these data only include standardized summer survey data, no incidental observations from other times of the year.

		Abundance Rank*			
Species	**Scientific Name**	**1868**	**1972 -1974**	**1998**	**2001**
American Coot	*Fulica americana*	A	-	-	-
American Widgeon	*Anas americana*	A	-	-	-
Blue-winged Teal	*Anas discors*	R	C	-	-
Canvasback	*Aythya valisineria*	R	-	-	-
Cinnamon Teal	*Anas cyanoptera*	C	R	C	R
Common Merganser	*Mergus merganser*	-	C	C	C
Eared Grebe	*Podiceps nigricollis*	C	-	-	-
Gadwall	*Anas strepera*	A	-	-	-
Hooded Merganser	*Lophodytes cucullatus*	R	-	-	-
Mallard	*Anas platyrhynchos*	A	C	C	C
Northern Pintail	*Anas acuta*	R	R	-	-
Northern Shoveler	*Anas clypeata*	C	-	-	-
Pied-billed Grebe	*Podilymbus podiceps*	C	-	-	R
Ruddy Duck	*Oxyura jamaicensis*	R	-	-	-
Western Grebe	*Aechmophorus occidentalis*	A	-	-	R
Wood Duck	*Aix sponsa*	R	C	C	C

* A = abundant, C = common, R = rare, - = absent; see methods for explanation of rankings.

Table 2: **Shorebird** abundance throughout the recent history of the Truckee River. Data from Ridgway (1877), Klebenow and Oakleaf (1984), and from this study. Note that these data only include standardized summer survey data, no incidental observations from other times of the year.

		Abundance Rank*			
Species	**Scientific Name**	**1868**	**1972 -1974**	**1998**	**2001**
American Avocet	*Recurvirostra americana*	C	-	-	-
Baird's Sandpiper	*Calidris bairdii*	R	-	-	-
Black-necked Stilt	*Himantopus mexicanus*	C	-	-	-
Killdeer	*Charadrius vociferus*	C	A	A	A
Least Sandpiper	*Calidris minutilla*	A	-	-	-
Long-billed Curlew	*Numenius americanus*	C	-	-	-
Semipalmated Sandpiper	*Calidris pusilla*	A	-	-	-
Sora	*Porzana carolina*	C	-	-	-
Solitary Sandpiper	*Tringa solitaria*	R	-	-	-
Spotted Sandpiper	*Actitis macularia*	C	R	C	A
White-faced Ibis	*Pledagis chihi*	R	-	-	R
Willet	*Catoptrophorus semipalmatus*	R	-	-	-

* A = abundant, C = common, R = rare, - = absent; see methods for explanation of rankings.

Table 3: **Wetland/marsh/wet meadow bird** abundance throughout the recent history of the Truckee River. Data from Ridgway (1877), Klebenow and Oakleaf (1984), and from this study. Note that these data only include standardized summer survey data, no incidental observations from other times of the year.

		Abundance Rank*			
Species	**Scientific Name**	**1868**	**1972 -1974**	**1998**	**2001**
American Bittern	*Botaurus lentiginosus*	C	-	-	-
Common Yellowthroat	*Geothlypis trichas*	C	-	C	C
Marsh Wren	*Cistothorus palustris*	A	-	-	C
Red-winged Blackbird	*Agelaius phoeniceus*	A	C	A	A
Sandhill Crane	*Grus canadensis*	R	-	-	-
Savannah Sparrow	*Passerculus sandwichensis*	C	-	R	R
Snowy Egret	*Egretta thula*	R	C	C	R
Virginia Rail	*Rallus limicola*	R	-	-	R
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	A	C	C	C

* A = abundant, C = common, R = rare, - = absent; see methods for explanation of rankings.

Table 4: **Riparian shrubland bird** abundance throughout the recent history of the Truckee River. Data from Ridgway (1877), Klebenow and Oakleaf (1984), and from this study. Note that these data only include standardized summer survey data, no incidental observations from other times of the year.

		Abundance Rank*			
Species	**Scientific Name**	**1868**	**1972 -1974**	**1998**	**2001**
Bewick's Wren	*Thryomanes bewickii*	-	C	A	A
Black-chinned Hummingbird	*Archilochus alexandri*	A	-	R	C
Black-headed Grosbeak	*Pheucticus melanocephalus*	C	-	C	R
Lazuli Bunting	*Passerina amoena*	R	R	C	C
Rufous Hummingbird	*Selasphorus rufus*	C	C	-	-
Song Sparrow	*Melospiza melodia*	A	-	C	C
Spotted Towhee	*Pipilo maculatus*	C	-	C	C
Willow Flycatcher	*Empidonax trailli*	A	-	-	-
Yellow Warbler	*Dendroica petechia*	A	C	C	C
Yellow-billed Cuckoo	*Coccyzus americanus*	R	-	-	-
Yellow-breasted Chat	*Icteria virens*	C	-	C	C

* A = abundant, C = common, R = rare, - = absent; see methods for explanation of rankings.

Table 5: **Canopy bird** abundance throughout the recent history of the Truckee River. Data from Ridgway (1877), Klebenow and Oakleaf (1984), and from this study. Note that these data only include standardized summer survey data, no incidental observations from other times of the year.

		Abundance Rank*			
Species	**Scientific Name**	**1868**	**1972 -1974**	**1998**	**2001**
American Kestrel	*Falco sparverius*	A	C	C	C
Bullock's Oriole	*Icterus galbula*	A	C	A	A
Downy Woodpecker	*Picoides pubescens*	-	C	C	C
Great Blue Heron	*Ardea herodias*	A	C	C	C
Great Horned Owl	*Bubo virginianus*	C	R	C	C
House Wren	*Troglodytes aedon*	A	A	A	A
Long-eared Owl	*Asio otus*	C	-	-	-
Northern Flicker	*Colaptes auratus*	A	C	C	C
Warbling Vireo	*Vireo gilvus*	A	R	C	C
Western Wood-pewee	*Contopus sordidulus*	A	R	C	C
Western Tanager	*Piranga ludoviciana*	C	-	C	-
Western Bluebird	*Sialia mexicana*	C	-	R	R

* A = abundant, C = common, R = rare, - = absent; see methods for explanation of rankings.