Willow Flycatcher and Yellow Warbler response to cattle grazing

Dramatic population increases in these two species coincide with a reduction in cattle grazing and the elimination of willow cutting and spraying.

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WILLOW FLYCATCHERS (*EMPIDONAX traillii*) and Yellow Warblers (*Dendroica petechia*) breed throughout much of western North America (A.O.U. 1983) and both are thought to be suffering population declines. They have consistently been placed on the National Audubon Society's Blue List (Tate 1981, Tate and Tate 1982, Tate 1986), and also the Sensitive Bird Species list of the United States Fish & Wildlife Service, Region One, which encompasses five northwestern states (U.S.F.&W.S. 1982).

Willow Flycatchers and Yellow Warblers nest in upland brush (King 1955, Schroeder 1982), but optimum breeding habitat is probably riparian trees and shrubs (Hand 1941, Bent 1942, Bent 1955, King 1955, Schroeder 1982). This habitat may be in as much jeopardy as the birds. It is estimated that 70% to 90% of all natural riparian habitat within the United States has undergone extensive alteration (Hirsch and Segelquist 1978).

There are many human activities that can adversely affect riparian areas (damming, dredging, urbanization). In the northwestern states livestock use is a major cause of habitat disturbance in riparian areas (Mosconi and Hutto 1981). Here we show how populations of these two species, and the willow habitat in which they nest, recover with a reduction in cattle use and associated disturbances.

History of study areas

Malheur National Wildlife Refuge (hereafter, Malheur N.W.R.) and the lower Blitzen River valley in Harney County, southeastern Oregon, comprise the study area. Malheur N.W.R. was first established in 1908. It is one of the nation's largest refuges, covering over 183,000 acres. The north end of the refuge encompasses Malheur Lake, a huge Tule marsh. The south end of the refuge consists primarily of fenced and irrigated wet meadows and fields, with brushy stringers of Coyote Willows (*Salix exigua*) and other *Salix* spp. along various waterways, including the Blitzen River. This river feeds Malheur Lake. Portions were channelized near the turn of the century, providing a shoreline of similar topography.

In the late 1930s the number of cattle on Malheur N.W.R. was relatively low, averaging approximately 40,000 Animal Unit Months (hereafter, AUM) annually. One AUM is equal to one cow grazing for one month. AUMs began increasing on the refuge beginning with World War II, and by 1951 had reached over 101,000. Cattle use reached a plateau on the refuge by the early 1960s, averaging 118,000 AUMs annually over a 9-year period beginning in 1964. During this time the refuge had cattle foraging on virtually every available acre every year (Management Briefing Statement, Malheur N.W.R., unpub. report 1976). Refuge personnel also removed some willows with herbicides

and manual cutting in order to increase the amount of forage available for livestock (S. Thompson *pers. comm.*). After a peak of over 126,000 AUMs on the refuge in 1973, cattle use began declining steadily and had dropped to 31,550 by 1982 (Malheur N.W.R., unpub. data).

Methods

One set of data comes from a series of United States Fish & Wildlife Service Breeding Bird Surveys (hereafter, B B.S.) conducted by Littlefield from 1972 to 1982 (except 1975). A B.B.S. consists of three-minute counts of all birds, taken at each of 50 fixed stations which are 0.8 kilometers (0.5 mile) apart on a calm, clear morning during the height of the breeding season. A Breeding Bird Survey began on Malheur N.W.R. at Benson Pond, and terminated off the refuge on Steen's Mountain at Lily Lake. No Willow Flycatchers were recorded off the refuge. Usually one or two Yellow Warblers were recorded at Lily Lake, but the remainder were on the refuge.

Another set of data comes from a study of the passerine bird communities on nine transects along the Blitzen River conducted by Taylor in May-June of 1981 and 1982 (Taylor 1984). Of the five transects located on the refuge, one (FF) has been fenced and undisturbed since 1940 (J. Scharff *pers. comm.*). The other four transects were subjected to extensive annual cattle use until at least 1973, then placed on various management regimes (Table 1). Along one of these transects (BF) the river had extensive dredging in 1978 and 1979. The four transects off the refuge had identical histories of cattle use for several decades, until 1970, when EP and WP were fenced. The other two transects (WB and EB) continued to be heavily grazed by cattle until they were fenced in 1980 (G. Sheeter *pers. comm.*). The EP transect was adjacent to a campground and received heavy human use

Yellow Warblers, Willow Flycatchers, and other passerines were counted along the transects using a Strip Survey Method (Mikol 1980). All singing males within 37 meters of the river's shoreline were recorded. Each transect was counted three times both summers (except twice only on one transect in 1981). The number of Yellow Warblers and Willow Flycatchers for each transect was estimated by averaging the three counts. Because transects were unequal in length, the number of birds per 500 meters was used for comparison between transects (Table 2).

Vegetation data on the transects were gathered by laying a 50 meter tape parallel to the river, then recording each vegetative category as it was encountered. These categories were: bare ground, herb/grass, willow, and on rare occasions another species of tree or shrub. Each shrub and tree within 37 meters of the river was measured to the nearest meter for its width, length, and height. If a shrub clump varied by more than one meter in any of these dimensions, it was divided into subunits. From these data estimates of shrub volume/100 meters were made for each transect (Table 2).

Table 1. Grazing histories of nine transects on the Blitzen River in Oregon. The transects are ranked on the basis of present vegetation (see Table 2, shrub volume).

Transect	*History*
BF	Extensive annual cattle use through 1974; only hayed in 1977; winter grazed 1976–1977, 1980–1981, 1981–1982; dredged in 1978 and 1979
EB	Extensive annual grazing until 1980
DF	Extensive annual cattle use through 1977–1978; undisturbed next three seasons; winter grazed 1981–1982
WB	Extensive annual grazing until 1980
EP	Extensive annual grazing until 1970, then fenced off; part of an active campground
WR	Cattle use beginning July 15, 1979, and through 1979–1980
WP	Extensive annual grazing until 1970, then fenced off
OR	Winter cattle use in 1976–1977
FF	Fenced and undisturbed since 1940

Table 2. Nine transects on the Blitzen River showing transect length (meters), the number of Yellow Warblers and Willow Flycatchers per 500 meters, and the shrub volume (m^3) per 100 meters. The transects are ranked on the basis of present vegetation.

	Yellow Warbler (per 500 m)		*Willow Flycatcher (per 500 m)*		*Shrub Volume (m^3)*		
Transect	*1981*	*1982*	*1981*	*1982*	*1981*	*1982*	*Transect Length in meters*
BF	0.0	0.3	0.0	0.0	52	62	1550
EB	0.6	0.0	0.0	0.0	66	146	585
DF	1.5	1.7	1.3	1.6	168	220	1550
WB	0.9	0.6	0.0	0.0	179	240	585
EP	1.7	0.3	0.0	0.0	454	384	585
WR	1.3	1.6	0.6	0.3	427	548	1150
WP	4.5	2.0	0.0	0.0	715	957	585
OR	3.3	4.4	4.0	3.4	859	1038	1550
FF	7.7	5.9	5.8	4.6	1800*	2550	1550

* *may be underestimated*

Results

Breeding Bird Survey data show Yellow Warblers steadily increasing on Malheur N.W.R., with only seven birds in 1972 increasing to 56 birds by 1982 Grazing intensity (AUMs) decreased by a factor of four over the same period (Fig. 1). Willow Flycatchers were absent the first several years of the B.B.S., then began increasing in 1978, after AUMs had decreased by one-half (Fig. 1) By 1982, 30 flycatchers were recorded on the B.B.S.

Data from the transects show the same trends. In 1981 and 1982, the transects had a negative correlation between shrub volume and the frequency of cattle use on an annual basis ($r = -0.79$ in 1981, $r = -0.76$ in 1982)

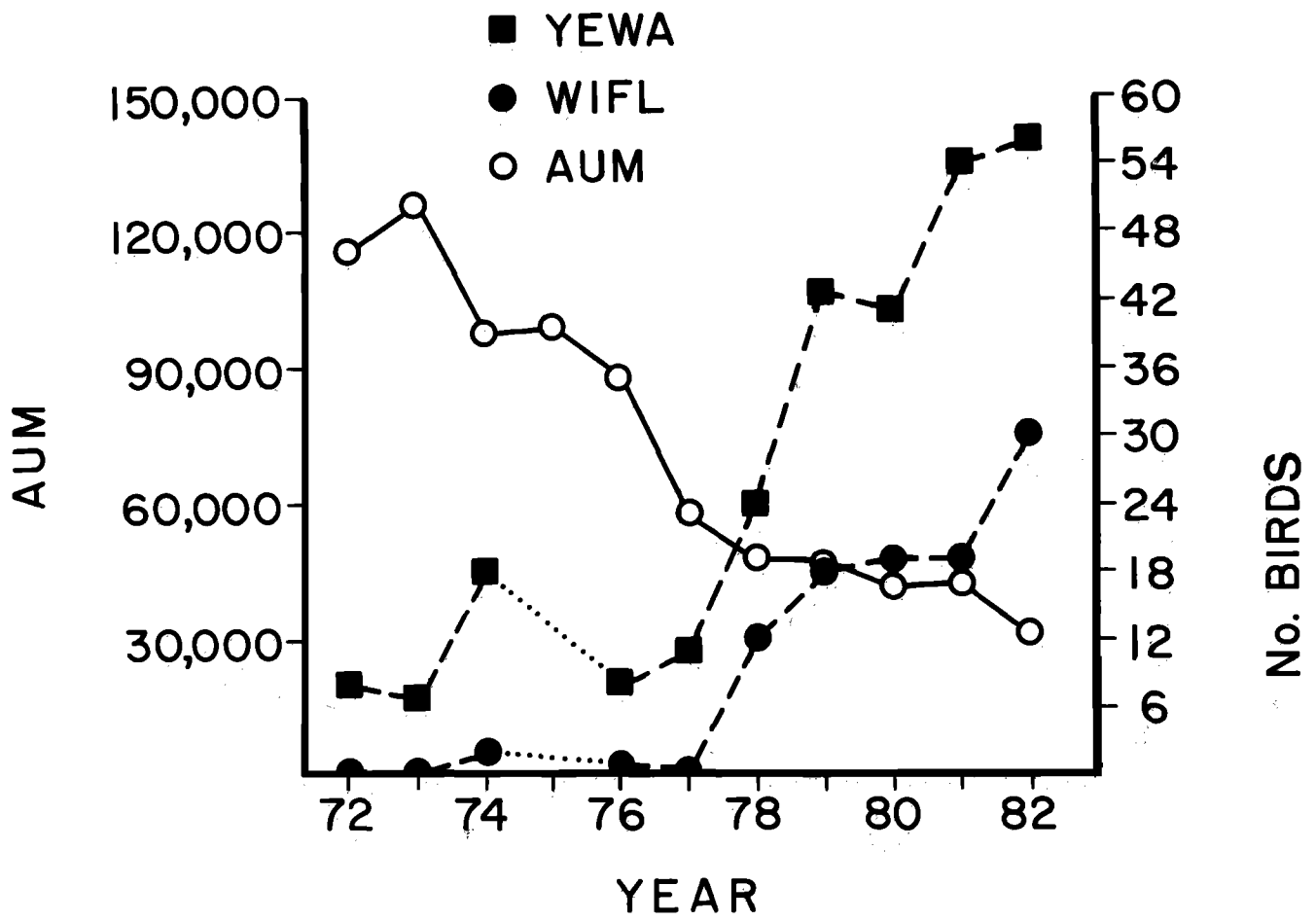

Figure 1. *The number of Yellow Warblers (YEWA) and Willow Flycatchers (WIFL) on Breeding Bird Surveys* versus *the amount of cattle grazing as measured by Animal Unit Months (AUM) on Malheur N.W.R. from 1972 to 1982.*

In both years the time since a transect was last grazed by cattle was positively correlated with shrub volume ($r = 0.87$ in 1981, $r = 0.97$ in 1982).

Photographic evidence substantiates improvement in riparian vegetation when protected from cattle. Note the striking difference between the amount of willow on WP (undisturbed since 1970) compared to WB (heavily grazed through 1980) (Fig. 2). Two photographs taken by refuge personnel of transect OR in 1974–1975, which was subjected to extensive annual grazing up to that time, show banks of the Blitzen River either totally devoid of or with scattered patches of willow severely "notched" and decadent (Fig. 3a and b). Since 1974–1975, this field has not been used for cattle except in the winter of 1976–1977. By 1982, this transect was characterized by a thick belt of willows for most of its length, with at least an herbaceous layer covering the bank (Fig. 3c and d).

Yellow Warblers were more numerous on transects with abundant willow and little or no cattle than on transects with heavy cattle use and low shrub volume. When seven of these transects were ranked for the frequency of cattle grazing on an annual basis (BF and EP were excluded owing to dredging and camper use, respectively), there was a negative correlation with numbers of Yellow Warblers ($r_s = -0.82$ in 1982). Transect FF, undisturbed since 1940, had about 10 times as many Yellow Warblers as transects WB and EB (the latter were subjected to extensive cattle use through 1980), and about 20 times as many warblers as transect BF (which was almost completely devoid of willows due to the combined disturbances of cattle grazing and dredging).

Willow Flycatchers were found in high numbers only on transects with high shrub volume and which were either undisturbed or rarely used by cattle. They were in low numbers or absent on transects with low shrub volume and heavy cattle use, although they were also absent from transect WP with numerous willows and little cattle use. When seven transects were ranked for frequency of cattle grazing on an annual basis (BF and EP were excluded) there was a negative correlation with numbers of Willow Flycatchers.

Discussion

B.B.S. data indicated a dramatic population increase for both Yellow Warblers and Willow Flycatchers on Malheur N.W.R. from 1972 to 1982 This contrasted sharply with other B.B.S.s in Oregon, where both species have decreased steadily for several years However, Willow Flycatchers have increased the last few years on some B.B.S.s west of the Cascade Mountains, where recent clear-cutting has provided upland brush habitat (H. Nehls *pers*

Figure 2. *Effects of cattle grazing on willows on the Blitzen River. WB, the area above the fence (arrow) was subjected to extensive annual grazing through 1980, and is characterized by a bank devoid of willows. The area below the fence (WP) has been protected since 1970, and has a healthy stand of willows. Photographed in 1981. Photo/Daniel M. Taylor.*

3a. Photo/Joseph P. Mazzoni.

3b. Photo/Eldon McLaury.

Figure 3 *(a–d). Photographs of Transect OR; a and b were taken in 1974–1975 along a stretch of the Blitzen River that had been subjected to extensive annual grazing. Photographs c and d were taken in 1982, after this field was grazed only once (in winter 1976–1977) since 1974–1975.*

comm.). The Yellow Warbler and Willow Flycatcher population increases on Malheur N.W.R. coincide with a dramatic decrease in cattle on the refuge and the elimination of willow cutting and spraying.

The transect data show that the high numbers of both species are correlated with the amounts of healthy willows, which are used for nesting sites. Willows are found on transects with little or no grazing. Studies in Washington (Rickard and Cushing 1982), Utah (Duff 1979), and Oregon (Winegar 1977), have documented willow riparian habitat becoming established along streams after being protected by fencing from cattle.

Willow Flycatchers nest within two meters of the ground (Bent 1942, Walkinshaw 1966, Serena 1982). Grazing causes "notched" or "highlined" willows that are top-heavy with high branches but with few live branches underneath. This condition was noted in the Sierra Nevada Mountains in California (Serena 1982), where Willow Flycatchers were conspicuously absent from what otherwise appeared to be suitable habitat—although Yellow Warblers were sometimes noted in such areas.

Our data indicate actions that improve riparian brush habitat in the temperate latitudes can increase the populations of these species. One such measure is a 1981 law passed by the Oregon state legislature granting tax advantages to private land owners willing to enhance and protect riparian areas. Other states should be encouraged to adopt similar legislation. Of at least

3c. Photo/Daniel M. Taylor.

3d. Photo/Daniel M. Taylor.

equal importance is the protection of the more than 1.6 million kilometers of streams on public lands in the 11 western states. Bird and conservation oriented groups and individuals need to "watchdog" our federal land agencies to assure that there is not excessive grazing and other destructive practices occurring in riparian zones under their jurisdiction.

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LITERATURE CITED

AMERICAN ORNITHOLOGISTS' UNION. 1983. Check-list of North American Birds, 6th ed. Lawrence, Kansas.

BENT, A. C. 1942. Life histories of North American flycatchers, larks, swallows, and their allies. U.S. Natl. Mus. Bull. 179.

——, 1955. Life histories of North American wood warblers, part 1. U.S. Natl. Mus. Bull. 203.

DUFF, D. A. 1979. Riparian habitat recovery on Big Creek, Rich County, Utah. pp. 91–92 *In* Forum, grazing and riparian/stream ecosystems. O. B. Cope, ed., Trout Unlimited, Denver, Colo.

HAND, R. S. 1941. Birds of the St. Joe National Forest, Idaho. *Condor* 43:220–232.

HIRSCH, A. and C. A. SEGELQUIST. 1978. Protection and management of riparian ecosystems: activities and views of the U.S. Fish and Wildlife Service. pp. 344–352 *In* Johnson, R. R. and J. F. McCormick (Tech. coords.), Strategies for the protection and management of floodplain wetlands and other riparian ecosystems. U.S.D.A. For. Ser. Gen. Tech. Rep. WO-12.

KING, J. R. 1955. Notes on the life history of Traill's Flycatcher (*Empidonax traillii*) in southeastern Washington. *Auk* 77: 148–175.

MIKOL, S. A. 1980. Field guidelines for using transects to sample non-game bird populations. Office Bio. Ser., U.S.F.&W.S., Washington, D.C.

MOSCONI, S. L., and R. L. HUTTO. 1981. The effect of grazing on the land birds of a western Montana riparian habitat. pp. 221–233 *In* Proceedings of the wildlife-livestock relationships symposium. Forestry, Wildlife, and Range Exper. Sta., Univ. Idaho, Moscow, Ida.

RICKARD, W. H., and C. E. CUSHING. 1982. Recovery of streamside woody vegetation after exclusion of livestock grazing. *Jour. Range Mang.* 35:360–361.

SCHROEDER, R. L. 1982. Habitat suitability index models: Yellow Warbler. Office Biol. Serv., U.S.F.&W.S., Washington, D.C.

SERENA, M. 1982. The status and distribution of the Willow Flycatcher (*Empidonax traillii*) in selected portions of the Sierra Nevada. Admin. Rept. 82-5, Wildl. Mang. Branch Dept. Fish and Game, CA.

TATE, J., JR. 1981. The Blue List: the first ten years. *Am. Birds* 35:1–9.

——. 1986. The Blue List for 1986. *Am. Birds* 40:227–236.

——, and D. J. TATE. 1982. The Blue List for 1982. *Am. Birds* 36:126–135.

TAYLOR, D. M. 1984. The effects of cattle grazing and other factors on passerine birds nesting in willow riparian habitat. M.S. Thesis, Idaho State Univ., Pocatello, Ida. ix + 48 pp.

U.S. FISH & WILDLIFE SERVICE. 1982. Sensitive Bird species, Region One, U.S.F.&W.S., Portland, Oreg., July 1982, 18 pp.

WALKINSHAW, L. H. 1966. Summer biology of Traill's Flycatcher. *Wilson Bull.* 78:31–46.

WINEGAR, H. H. 1977. Camp Creek channel fencing—plant, wildlife, soil, and water response. *Rangeman's Jour.* 4:10–12.

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