

MONITORING BREEDING BIRD POPULATIONS IN GRAND TETON NATIONAL PARK

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♦ GOALS

This report covers year 2 of a three year project, 1995-1997 inclusive, to instigate a permanent program of monitoring landbird species composition and densities in a variety of representative habitats within Grand Teton National Park (GTNP). Habitats range from grassland and sagebrush on the valley floor of Jackson Hole (around 1900 m) through a range of scrub, woodland, and tall foothill forest vegetation types to montane sites of subalpine fir and tundra (ca. 3000 m). The monitoring program is intended to provide data on year-to-year fluctuations in breeding bird species and densities, and document longer-term changes (if any) in the local avifauna of resident and migratory species. The data base will document variability in size of breeding populations among years, local shifts in distribution and abundance over habitat types, and potentially form an information source on which management and conservation decisions might be based.

♦ THE 1996 SEASON

In 1996 a) selection of monitoring sites and their mapping and characterization was completed, and b) census methodology and protocols were established in final form.

Table 1 lists the final selection of 30 monitoring sites to be used in the study; it includes a brief description of location and habitat, year of

NPS		TABLE 1				1996 Census Results:	
FINAL SITE SELECTION; 30 SITES; 1996							
#	Site Name	Habitat	Yr. Estab.	Elev	#SPP.	Tot. Dens. (Pr/Ha)	
1	Wolf Ranch	Grazed meadow	1994	2045	10	1.99	
2	Jackson Lake Junction	Grass-sedge meadow	1992	2053	15	1.97	
3	Elk Refuge	Wet meadow	1994	1895	26	4.57	
4	Jackson Lake Junction	Grass-sagebrush	1966	2043	8	2.34	
5B	Antelope Flats	Sage burn	1995	2000	14	1.52	
5U	Antelope Flats	Sage unburned	1995	2000	13	2.43	
6	Jackson Hole Airport	Tall sagebrush	1992	1956	13	5.09	
7	Two-ocean lake Rd.	Forb-meadow	1993	2158	27	5.40	
8	Triangle X	Aspen-scrub	1996	2090	24	8.04	
9	RKO/Snake R. Bottom	Dry willow flats	1992	2003	27	7.65	
10	Jackson Hole Junction	Wet willow flats	1966	2049	24	13.82	
10S	RMNP Onahu Ck	Wet willow flats	1885	2450	18	5.81	
10N	GNP Coonsa Ck	Wet willow flats	1996	2636	32	6.88	
11	Oxbow bend	Willow-aspen	1992	2040	32	9.58	
12	Elk Ranch West	Low aspen woodland	1968	2109	30	7.53	
13	Elk Ranch East	Mid aspen woodland	1968	2152	21	8.20	
14	Cow Lake	Tall aspen woodland	1968	2091	29	10.07	
15	Spread Creek	Cottonwoods	1992	2085	29	9.88	
16	Schwabacher Landing	Cottonwoods	1992	1988	40	11.28	
17	Granite Canyon mouth	Lodgepole-aspen wdis	1995	1965	26	11.46	
18	Timbered ls. Moraine	Lodgepole-spruce	1994	2060	18	7.89	
19	AMK Ranch	Lodgepole pine forest	1991	2055	28	8.56	
20	Taggart Lake burn	Successional lodgepole	1995	2090	22	6.44	
21	Signal Mountain	Lodgepole-fir forest	1992	2258	23	4.71	
22	Spaulding Bay	Douglas fir forest	1995	2121	27	8.54	
23	Lizard Creek	Lodgepole-spruce-fir	1992	2195	23	8.37	
24	Bradley Lake	Spruce-fir forest	1995	2180	31	6.10	
25	Jenny Lake	Spruce-fir forest	1992	2197	26	8.11	
26	Upper Granite Canyon	Spruce forest	1994	2365	16	6.44	
27	Rendezvous Mountain	Subalp. fir-limber pine	1994	2970	16	5.51	
28	Cody Bowl	Arctic-alpine tundra	1994	2900	13	0.47	
29	Heron Pond/Swan Lk	Waterfowl ponds	1995	2052	19		
30	Blacktail Ponds	Aerial forag. survey	1996	2040	6	15 indiv.	

establishment, elevation, and 1996 results in summary form. In this list, maximum use has been made of sites which have a prior history of breeding bird data from previous census work. For example, site #s 10 and 11 were initially surveyed in the 1950's by G. Salt, the three aspen sites (#s 12-14) were utilized by D. Flack in the 1960's, site #s 4 and 10 have been surveyed intermittently by M. Cody since 1966, and overall some 16 sites were established prior to 1994. The last three new sites were established in 1996: site #s 8 and 30 in GTNP,

and site #10S in Glacier National Park (GNP). A summary of populational trends and within-site species interactions, using these sites for which a more extensive time series is available, was recently published (Cody 1996).

The site actually lists 33 sites, as site #5 is tallied as two sections, one burned and one unburned (Antelope Flats burn 1994), and site #10, the Willow Flats site in GTNP, is duplicated (site #s 10S, 10N) in both Rocky Mountain National Park RMNP) and GNP. Apart from the Willows outgroup sites in RMNP and GNP, all census sites are within GTNP with the exceptions of site #s 3 (Elk Refuge) and 28 (Cody Bowl), which are immediately adjacent to GTNP.

The great majority of the monitoring sites in Table 1 are around 5 ha in size and produce census results in terms of the number of breeding bird species present and their densities, expressed as pr/ha. Notable exceptions are a few sites in open habitat (e.g. grasslands) that are larger, up to 10 ha in extent, a waterfowl survey (site #29) that produces data on breeding species but not densities, and an aerial foragers survey (site #30) that produces species numbers but only relative densities.

Censuses are conducted with the aid of a site map, on which conspicuous topographic and other natural feature are represented, the site markers located, and the census transects and pause points indicated. A summary description of the vegetation and floristics of each sites has been completed (see e.g. 1995 Annual Report).

THE BREEDING BIRD SPECIES

The sites in Table 1 form the basis of the permanent monitoring program, and amongst them they cover virtually all habitat types within the park, encompass a full aerial coverage N-S and E-W, and contact all major elements of the avifauna.

To date, 135 bird species have been recorded in the censuses (Table 2; 5 additional species were added in 1977). Not all of these species are recorded each year (e.g., 130/135 species in 1996), and some species are rare or otherwise sporadic as breeding species in our region; several additional species, known to breed locally, may be encountered in future censuses. The censuses do not purport to record accurate breeding

densities for several sorts of guilds, including raptors, waterfowl, larger species (e.g. Sandhill crane, grouse), the notoriously errant fringillids, and aerial foragers (swallows), but for the remaining passerine terrestrial foragers, they do.

TABLE 2

GRAND TETON NATIONAL PARK MONITORING SITES SPECIES LIST 1996

PELECANIDAE	White Pelican	<i>Pelecanus erythrorhynchos</i>
ARDEIDAE	Great Blue Heron	<i>Ardea herodias</i>
GRUIDAE	Sandhill Crane	<i>Grus canadensis</i>
ANATIDAE	Trumpeter Swan	<i>Cygnus buccinator</i>
	Canada Goose	<i>Branta canadensis</i>
	Mallard	<i>Anas platyrhynchos</i>
	Gadwall	<i>Anas strepera</i>
	American Wigeon	<i>Anas americana</i>
	Cinnamon Teal	<i>Anas cyanoptera</i>
	Green-winged Teal	<i>Anas crecca</i>
	Blue-winged Teal	<i>Anas discors</i>
	Railhead	<i>Aythya americana</i>
	Ring-necked Duck	<i>Aythya collaris</i>
	Lesser Scaup	<i>Aythya affinis</i>
	Common Merganser	<i>Mergus serrator</i>
	Common Goldeneye	<i>Bucephala clangula</i>
RALLIDAE	Virginia Rail	<i>Rallus limicola</i>
	Sora	<i>Portzana carolina</i>
	American Coot	<i>Fulica americana</i>
CHARADRIIDAE	Killdeer	<i>Charadrius vociferus</i>
	Willet	<i>Catoptrophorus semipalmatus</i>
SCOLOPACIDAE	Long-billed Curlew	<i>Numenius americanus</i>
	Spotted Sandpiper	<i>Actitis macularia</i>
	Wilson's phalarope	<i>Phalaropus tricolor</i>
	Common Snipe	<i>Gallinago gallinago</i>
LARIDAE	Franklin's Gull	<i>Larus pipiscan</i>
	California Gull	<i>Larus californicus</i>
ACCIPITRIDAE	Golden Eagle	<i>Aquila chrysaetos</i>
	Bald Eagle	<i>Haliaeetus leucocephalus</i>
	Northern Harrier	<i>Circus cyaneus</i>
	Red-tailed Hawk	<i>Buteo jamaicensis</i>
	Swinson's Hawk	<i>Buteo swainsoni</i>
	Osprey	<i>Pandion haliaetus</i>
	Sharp-shinned Hawk	<i>Accipiter striatus</i>
	Cooper's Hawk	<i>Accipiter cooperi</i>
	Northern Goshawk	<i>Accipiter gentilis</i>
FALCONIDAE	American Kestrel	<i>Falco tinnunculus</i>
	Prairie Falcon	<i>Falco mexicanus</i>
PHASIANIDAE	Ruffed Grouse	<i>Bonasa umbellus</i>
	Blue Grouse	<i>Dendragapus obscurus</i>
	Sage Grouse	<i>Centrocercus urophasianus</i>
COLUMBIDAE	Mourning Dove	<i>Zenaidura macroura</i>
STRIGIDAE	Great Gray Owl	<i>Syrinx nebulosa</i>
	Great Horned Owl	<i>Bubo virginianus</i>
	Long-eared Owl	<i>Asio otus</i>
CAPRIMULGIDAE	Common nighthawk	<i>Phalaenoptilus nuttall</i>
TROCHILIDAE	Calliope Hummingbird	<i>Stellula calliope</i>
	Broad-t. Hummingbird	<i>Selasphorus platycercus</i>
	Rufous hummingbird	<i>Selasphorus rufus</i>
ALCENIDAE	Belted Kingfisher	<i>Ceryle alcyon</i>
PICIDAE	Northern Flicker	<i>Colaptes auratus</i>
	Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>
	Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>
	Downy Woodpecker	<i>Picoides pubescens</i>
	Hairy Woodpecker	<i>Picoides villosus</i>
	Three-toed Woodpecker	<i>Picoides tridactylus</i>
	Black-b. Woodpecker	<i>Picoides arcticus</i>
TYRANNIDAE	Western Wood Pewee	<i>Contopus sordidulus</i>
	Olive-sided Flycatcher	<i>Nuttallornis borealis</i>
	Say's Phoebe	<i>Sayornis saya</i>
	Dusky Flycatcher	<i>Empidonax oberholzeri</i>
	Hammond's Flycatcher	<i>Empidonax hammondi</i>
	Least Flycatcher	<i>Empidonax traillii</i>
	Willow Flycatcher	<i>Empidonax difficilis</i>
	Western Flycatcher	<i>Empidonax oberholzeri</i>

TABLE 2 (cont)

HIRUNDINIDAE		
	Tree Swallow	<i>Icthyophaga bicolor</i>
	Violet-green swallow	<i>Icthyophaga thalassina</i>
	Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
	Cliff Swallow	<i>Hirundo pyrrhonota</i>
	Barn Swallow	<i>Hirundo rustica</i>
	Bank Swallow	<i>Riparia riparia</i>
CORVIDAE		
	Steller's Jay	<i>Cyanocitta stelleri</i>
	Gray Jay	<i>Perisoreus canadensis</i>
	Clark's Nutcracker	<i>Nucifraga columbiana</i>
	Black-billed Magpie	<i>Pica pica</i>
	American Crow	<i>Corvus brachyrhynchos</i>
	Common Raven	<i>Corvus corax</i>
PARIDAE		
	Black-capped Chickadee	<i>Parus atricapillus</i>
	Mountain Chickadee	<i>Parus gambeli</i>
CERTHIDAE		
	Brown Creeper	<i>Certhia americana</i>
SITTIDAE		
	White-br. Nuthatch	<i>Sitta carolinensis</i>
	Red-breasted Nuthatch	<i>Sitta canadensis</i>
TROGLODYTIDAE		
	Marsh Wren	<i>Cistothorus palustris</i>
	Rock Wren	<i>Salpinctes obsoletus</i>
	House Wren	<i>Troglodytes aedon</i>
MUSCICAPIDAE		
	Sylviinae	
	Golden-crowned Kinglet	<i>Regulus satrapa</i>
	Ruby-cr. Kinglet	<i>Regulus calendula</i>
	Turdinae	
	Mountain Bluebird	<i>Sialia currucoides</i>
	Townsend's Solitaire	<i>Myadestes townsendi</i>
	Veery	<i>Catharus fuscescens</i>
	Hermit Thrush	<i>Catharus guttatus</i>
	Swainson's Thrush	<i>Catharus ustulatus</i>
	American Robin	<i>Turdus migratorius</i>
MIMIDAE		
	Gray Catbird	<i>Dumetella carolinensis</i>
	Sage Thrasher	<i>Oreoscoptes montanus</i>
MOTACILLIDAE		
	Water Pipit	<i>Anthus spinoletta</i>
CINCLIDAE		
	American Dipper	<i>Cinclus mexicanus</i>
BOMBYCILLIDAE		
	Cedar Waxwing	<i>Bombycilla cedrorum</i>
STURNIDAE		
	European Starling	<i>Sturnus vulgaris</i>
VIREONIDAE		
	Solitary Vireo	<i>Vireo solitarius</i>
	Warbling Vireo	<i>Vireo gilvus</i>
EMBERIZIDAE		
	Parulinae	
	Orange-crowned Warbler	<i>Vermivora celata</i>
	Yellow-r. Warbler	<i>Dendroica coronata</i>
	Yellow Warbler	<i>Dendroica petechia</i>
	MacGillivray's Warbler	<i>Oporornis tolmiei</i>
	Wilson's Warbler	<i>Wilsonia pusilla</i>
	Northern Waterthrush	<i>Seiurus noveboracensis</i>
	Common Yellowthroat	<i>Geothlypis trichas</i>
	American Redstart	<i>Setophaga ruticilla</i>
	Black-headed Grosbeak	<i>Phenicus melanocephalus</i>
	Emberizinae	
	Lutescent Bunting	<i>Passerina amoena</i>
	Green-tailed Towhee	<i>Pipilo chlorurus</i>
	Vesper Sparrow	<i>Pooecetes gramineus</i>
	Savannah Sparrow	<i>Passerculus sandwichensis</i>
	Song Sparrow	<i>Melospiza melodia</i>
	Lincoln's Sparrow	<i>Melospiza lincolni</i>
	Fox Sparrow	<i>Passerella iliaca</i>
	Lark Sparrow	<i>Chondestes grammacus</i>
	Chipping Sparrow	<i>Spizella passerina</i>
	Clay-colored Sparrow	<i>Spizella pallida</i>
	Brewer's Sparrow	<i>Spizella breweri</i>
	Dark-eyed Junco	<i>Junco hyemalis</i>
	White-cr. sparrow	<i>Zonotrichia leucophrys</i>
ICTERIDAE		
	Bobolink	<i>Dolichonyx oryzivorus</i>
	Western Meadowlark	<i>Sturnella neglecta</i>
	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>
	Brown-headed Cowbird	<i>Molothrus ater</i>
	Common Grackle	<i>Quiscalus quiscula</i>
THRAUPIDAE		
	Western Tanager	<i>Piranga ludoviciana</i>
FRINGILLIDAE		
	Pine siskin	<i>Carduelis pinus</i>
	American Goldfinch	<i>Carduelis tristis</i>
	Red Crossbill	<i>Loxia curvirostris</i>
	White-w. Crossbill	<i>Loxia leucoptera</i>
	Pine Grosbeak	<i>Pinicola enucleator</i>
	Rox's Finch	<i>Leucosticte arctica</i>
	Cassin's Finch	<i>Carpodacus cassinii</i>
	House Finch	<i>Carpodacus mexicanus</i>
	Evening Grosbeak	<i>Coccothraustes vespertina</i>
	To Date: 140 species	

The largest numbers of breeding species have been recorded in aspens and cottonwoods (up to 40 spp.; site #16: Schwabacher cottonwoods), are somewhat lower in the tall, mixed conifer forests, and are lower elsewhere. The highest densities are found in willows, aspens and cottonwoods (e.g., Willows, site #10: 13.82 breeding pr.ha), fall in the general range of 5-8 pr/ha in the conifers, and 2-5 pr/ha in grassland and sagebrush.

WILLOWS CENSUSES

Four sites are established in willow scrub: the long-term Willow Flats site (#10) and the more recently initiated Dry Willows site (#9) in GTNP, and the two outgroup willows sites, in RMNP and GNP respectively. Site #9 is also the locus of the two-exclosure experiment that was begun in fall 1996. Table 3 gives 1996 census results for these four willows sites; numbers in the table represent breeding density in pr/ha; zeros indicate that a species has been recorded breeding at the site, but was not breeding there in 1996.

TABLE 3. Breeding Bird Species of Willows Sites

SPECIES (PR/HA)	COONSA CK		WILLOW FLATS		RKO WILLOWS		ONAHU CK	
	GNP	1996	GTNP	1996	GTNP	1996	RMNP	1996
Nectarivores:								
Calliope humming			0.18		0.00			
Rufous humming		0.10						
Broad-tailed hummingbird			0.05		0.00		0.23	
Foliage insectivores:								
Yellowthroat		0.60	2.70		0.50		0.05	
Yellow warbler		1.80	2.70		1.67		0.00	
Wilson's warbler		0.05	1.17		0.00		1.72	
N. Waterthrush		0.55	0.00					
MacGillivray's w.		0.15	0.11					
Orange-cr. warbler		0.15			0.00			
Am. redstart		0.10						
Warbling vireo		0.04	0.03		0.00			
Emberizines:								
Savannah sparrow		0.08	0.03		0.00		0.05	
Vesper sparrow					0.00			
Clay-colored sparrow			0.00					
Brewer's sparrow					0.00			
Chipping sparrow					0.08			
White-cr. sparrow		0.09	0.80		0.83		0.29	
Song sparrow		0.48	1.53		1.42		0.08	
Lincoln's sparrow		0.25	0.92		0.42		1.88	
Fox sparrow		0.20	0.80		0.33		0.14	
Green-tailed towhee					0.00			
Black-headed grosbeak			0.00		0.00			
Dark-eyed junco					0.00			
Cassin's finch					0.00			
Pine siskin					0.00			
Am. goldfinch		0.05						
Flycatchers:								
Willow flycatcher		0.31	0.61		0.35		0.27	
Dusky flycatcher					0.38		0.19	
Aerial foragers:								
Tree swallow		0.05	0.25		0.11		0.00	
Rough-w. swallow		0.05	0.00		0.04			
Violet-gr. swallow		0.05					0.15	
Cliff swallow			0.25				0.00	
Bank swallow			0.25					
Barn swallow		0.03					0.00	
Waterbirds:								
Great blue heron			0.01		0.01		0.00	
Blue-winged teal							0.01	
Mallard					0.04			
Gadwall			0.30					
Bufflehead			0.00					
Kingfisher							0.10	

TABLE 3 (cont)				
Virginia rail		0.00		
Sora	0.05		0.13	
American coot		0.00		
Saige	0.38	0.31	0.33	0.15
Marsh wren		0.14		0.00
Red-wing, blbird	0.35			
Incidentals:				
Sandhill crane			0.00	
Killdeer			0.04	
Mourning dove			0.00	
Raven	0.10	0.10	0.10	0.10
Am. crow	0.10		0.05	
Black-billed magpie		0.15	0.00	
Gray jay	0.02		0.01	0.12
Northern flicker		0.00	0.13	
Red-breasted sapsucker			0.00	
Downy woodpecker	0.15			
Black-capped chickadee		0.08	0.08	0.00
Robin	0.15	0.00	0.42	0.23
Veery	0.23			
Swainson's thrush		0.00		0.00
Mountain bluebird			0.04	0.00
Catbird	0.15			
Cedar waxwing	0.03		0.00	
Brewer's blackbird			0.04	
Br. head. cowbird	0.20	0.31	0.17	0.23
Marsh hawk		0.05		
Red-tailed hawk			0.01	
Swainson's hawk		0.00	0.01	
American kestrel			0.06	
TOT. SPP.:	32.00	25.00	28.00	18.00
PR/HA:	7.09	13.83	7.80	5.99
No. Spp. density > 0.10 (=N)	16.00	18.00	15.00	11.00
Total density of Spp. N	6.11	13.48	6.19	5.46
N's Proportion of tot. density	0.86	0.97	0.78	0.91

In general, species numbers decline N-S, and total bird density is highest in the central (GTNP) site. For those species with densities > 0.1 pr/ha (boldface in the Table), GTNP Willow Flats has the highest count, and the highest breeding density. Species with > 0.1 pr/ha constitute from 78% to 98% of the site total breeding density. Ten of these core species occur in common in at least three of four sites, and an additional four at two sites. Thus there is, despite a rather large number of incidental species that vary over sites, a good deal of concurrence among the censuses.

Despite similarities, there are clear differences related to site geographic position and vegetational characteristics. Some species increase in abundance from S to N (Northern Waterthrush, MacGillivray's Warbler, American Redstart, Gray Catbird, Veery, and Snipe); others decrease in abundance from S to N (Broad-tailed hummingbird, Wilson's Warbler, Lincoln's Sparrow), other species are relatively constant over the geographical area, are highest in abundance at the central (GTNP) site, or show variation not apparently related to geographical position.



LITERATURE CITED

- Cody, M.L. 1996. Bird communities of the Central Rocky Mountains. Ch. 11 in Long-term Studies of Vertebrate Communities, eds. M.L. Cody and J.A. Smallwood, Academic Press, Orlando, FL.