# 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:	
FINA	L SITE SELECTION; 30	SITES; 1996			#SPP.	Tot. Dens. (Pr/Ha)
*	Site Name	Habitat	Yr. Estab.	Elev		
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
105	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 wdla	1995	1965	26	11.46
18	Timbered Is. 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 avifuana.

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 NATIONA	L PARK MONITORING SITES SPECI	ES LIST 1996
PELECANIDAE		
PELECKINIDAE	White Pelican	Pelecanus erythrortynchus
ARDEIDAE		The state of the s
	Great Blue Heron	Ardea herodias
GRUIDAE		
ANATIDAE	Sandhill Crane	Grus canadensis
ATATIONE	Trumpeter Swan	Cygnus buccinator
	Canada Goose	Brania canadensis
	Mallard	Anas plasvrhynchos
	Gadwall	Anas strepera
	American Wigeon Cinnamon Teal	Anas americana Anas cyanoptera
	Green-winged Teal	Anas crecca
	Blue-winged Teal	Anas discors
	Reuhead	Aythya americana
	Ring-necked Duck	Aythya collaris
	Lesser Scaup	Avihva affinis
	Common Merganser Common Goldeneye	Mergus serrator  Bucephala clangula
RALLIDAE	Collabor Coldensys	висернам станува
	Virginia Rail	Rallus limicola
	Sora	Portana carolina
CILLE DAME T	American Coot	Fulica americana
CHARADRIIDAE	Kildeer	Charadrius vociferus
	Willet	Catoptrophorus semipalmatus
SCOLOPACIDAE		Caropinopian is remiputated
	Long-billed Curlew	Numenius americanus
	Spotted Sandpiper	Actitis macularia
	Wilson's phalarope	Phlaropus tricolor
LARIDAE	Common Snipe	Gallinago gallinago
LAKIDAE	Franklin's Gull	Larus pipixcan
	California Gull	Larus californicus
ACCIPITRIDAE		
	Golden Eagle	Aquila chrysaetos
	Bald Eagel	Haliaeetus leucocephalus
	Northern Harrier Red-tailed Hawk	Buteo jamaicensis
	Swainson's Hawk	Buteo swainsoni
	Osprey	Pandion haliaetus
	Sharp-shinned Hawk	Accipiter striatus
	Cooper's Hawk	Accipiter cooperi
0.1.00.00.0	Northern Goshawk	Accipiter gentilis
FALCONIDAE	American Kestrel	Falco tinnunculus
	Prairie Falcon	Falco mexicanus
PHASIANIDAE		
	Ruffed Grouse	Bonasa umbellus
	Blue Grouse	Dendrogapus obscurus
COLUMNIDAE	Sage Grouse	Centrocercus urophasianus
COLUMBIDAE	Mourning Dove	Zeneadura cacroura
STRIGIDAE	Moduling Dove	Zenetatura cocroura
	Great Gray Owl	Strix nebulosa
	Great Horned Owl	Bubo virginianus
	Long-eared Owl	Asio orus
CAPRIMULGIDAE	Ci-bibb	Phalaenopiilus nuttaili
TROCHILIDAE	Common nighthawk	Рнагаенориция ништаци
TROCINEDAL	Calliope Hummingbird	Stellula caliope
	Broad-t. Hummingbird	Selasphorus plarvoercus
	Rufous hummingbird	Selasphorus rufus
ALCENIDAE	25.18.61	Cervle alcvon
PICIDAE	Belted Kingfisher	Ceryle alcyon
FICIONE	Northern Flicker	Colaptes auratus
	Williamson's Sapsucker	Sphyrapicus thyroides
	Red-naped Sapsucker	Sphyrapicus nuchalis
	Downy Woodpecker	Picoides pubescens
	Hairy Woodpecker	Picoides villosus Picoides tridactylus
	Three-toed Woodpecker  Black-b. Woodpecker	Picoides arcticus
TYRANNIDAE	Black-0. Woodpocker	THE STATE OF LITTER
	Western Wood Pewes	Contopus sordidulus
	Olive-sided Flycatcher	Nuttallornis borealis
	Say's Phoebe	Sayornis saya
	Dusky Flycatcher	Empidonax oberholseri Empidonax hammondii
	Hammond's Flycatcher  Least Flycatcher	Empidonax traillii
	Willow Flycatcher	Empidonax difficilis

TABLE 2 (cont) HIRUNDINIDAE		
MIDINDINIDAE		1
HIKONDINIDAE		
	Tree Swallow	Tachycinesa bicolor
	Violet-green swallow	Tachycineta thalassina
	Rough-winged Swallow Cliff Swallow	Stelgidopteryx serripennis
	Barn Swallow	Hirundo pyrrhonota  Hirundo rustica
	Bank Swallow	Riparia riparia
CORVIDAE	DAMA SWEIGH	прана прана
	Steller's Jay	Cyanosina stelleri
	Gray Jay	Perisoreus canadensis
	Clark's Nutcracker	Nucifraga columniana
	Black-billed Magpie	Pica pica
	American Crow	Cornus brachyrhynchos
	Common Raven	Corrus corax
PARIDAE		
	Black-capped Chickadee	Parus atricapillus
	Mountain Chiickadee	Parus gambeli
CERTHIDAE		
	Brown Creeper	Certhia americana
SITTIDAE		
	White-br. Nuthatch	Sitta carolinensis
TROCLODYTTO LE	Red-breasted Nuthatch	Sitta canadensis
TROGLODYTIDAE	34 198	
	Marsh Wren	Cistothorus palustris
	Rock Wren	Salpincies obsoletus
MUSCICAPIDAE	House Wrea	Troglodyses aedon
Sylviinae	C-14	<del>-  </del>
Sylvinae	Golden-crowned Kinglet	Regulus satrapa
Turdinae	Ruby-cr. Kinglet	Regulus calendula
1 erothac	Mountain Bluebird	Sialia currucoides
	Townsend's Solitaire	Myadestes townsendi
	Veery	Casharus fuscescens
	Hermit Thrush	Catharus guttatus
	Swainson's Thrush	Catharus ustulatus
MIMIDAE	American Robin	Turdus migratorius
MIMIDAE		
	Gray Cathird	Dumasella carolinensis
MOTACILLIDAE	Sage Thrasher	Oreoscopies montanus
MOTACILLIDAE		
CINCLIDAE	Water Pipit	Anthus spinoletta
CINCLIDAE		
BOMBYCILLIDAE	American Dipper	Cinclus mexicanus
BOMBICILLIDAE		
STURNIDAE	Cedar Waxwing	Bombycilla cedrorum
STURNIDAE		
VIREONIDAE	European Starling	Sturnus vulgaris
VIKEUNIDAE		12 / /
	Solitary Vireo	Vireo solitarius
EMBERIZIO AF	Warbling Vireo	Vireo gilvus
EMBERIZIDAE	1 1 1 1 1 1	- N
Parulinae	Orange-crowned Warbler	Vermivora celasa
	Yellow-r. Warbler	Dendroica coronala
	Yellow Warbler MacGillivray's Warbler	Dendroica petechia
	MACGILLIVIAY'S WARDIER	Oporornis solmiei
	Wilson's Warbler	Wilsonia pusilla
	Wilson's Warbler Northern Waterthrush	Seiurus novaboracensis
	Wilson's Warbler Northern Waterthrush Common Yellowthroat	Seiurus novaboracensis Geothlypis trichas
	Wilson's Warbler Northern Waterthrush Common Yellowthroat American Redstart	Seiurus novaboracensis Geothhypis trichas Setophaga nuicilla
Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthroat American Redstart Black-heuded Grosbeak	Seiurus novaboracensis Geothbyis trichas Setophaga ruticilla Pheuticus melanocephalus
Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Redstart Black-headed Grosbeak Lazuli Bunting	Seiurus novaboracensis Geothhypis trichas Serophaga rulicilla Pheuricus melanocephalus Passerina amoena
Emberizin≗e	Wilson's Warbler Northern Waterthrush Common Yellowthroat American Rodstart Black-heasted Grosbeak Lazuli Bunting Groen-stailed Towbee	Seiurus novaboracensis Geothlypis trichas Setophaga ruticilla Pheuticus melanocephalus Passerina amoena Pipilo Chlorurus
Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Redatart Black-headed Groebeak Lazuli Bunting Groen-stalled Towboe Veeper Sparrow	Seiurus novaboracensis Ceothhpis trichas Setophaga ruticilla Phewicus melanocephalus Pasterina amoena Pipilo Chlorurus Poocetes gramineus
Emberiinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Redstart Black-beaded Grosbeak Lazali Bunting Green-sailed Towboo Veeper Sparrow Savannah Sparrow	Seiurus novaboracensis Geothhyis trichas Setophaga rusicilia Pheuticus melanocephalus Passerina amoena Pipilo Chlorurus Poocettas gramineus Passerculus sandovichensis
Emberizinae	Wilson's Warbler Northern Waterhrush Common Yellowthrost American Redstart Black-headed Grosbeak Lazali Bunting Groen-tailed Towhos Vesper Sparrow Savanah Sparrow Song Sparrow	Seiurus novaboracensis Geothiypis trichas Setophaga rusicilla Pheusicus melanocephalus Passerina amoena Pipilo Chlorurus Pooceetas gramineus Passerculus sandwichensis Melaspita melodia
Emberizinas	Wilson's Warbler Northern Watershrush Common Yellowshrost American Rodstart Black-beaded Grosbeak Lazuli Bunting Green-tailed Towboe Vesper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow	Seiurus novaboracensis Geothhpis trichas Setophaga rulicilla Phewicus melanocephalus Passerina amoena Pipio Chlorurus Poocettes gramineus Passerculus sandwichensis Melospita melodia Melospita incolnil
Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Redstart Black-beaded Groebeak Lazali Bunting Green-tailed Towboe Vesper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow Fon Sparrow	Seiurus novaboracensis Geothhypis trichas Setophaga rusicilia Pheuricus melanocephalus Passerina amoena Pipilo Chlorurus Pooceetas gramineus Passereculus sandwichensis Melospita melodia Melospita lincolnii Passerella ililacus
Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Redstart Black-headed Groebeak Lazuli Bunting Green-tailed Towbee Vesper Sparrow Savannah Sparrow Lincoln's Sparrow Fox Sparrow Lark Sparrow Lark Sparrow	Seiurus novaboracensis Geothlypis trichas Setophaga rusicilia Pheuricus melanocephalus Passerina amoena Pipilo Chlorurus Poocettas gramineus Passerculus sandwichensis Melaspita melodia Melaspita lincolnii Passerella iliacus Chondatas grammacus
Emberizinas	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Rodstart Black-beaded Grosbeak Lazuli Bunting Green-tailed Towboe Vosper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow Fox Sparrow Lark Sparrow Chipping Sparrow	Seiurus novaboracensis Geothhyis trichas Setophaga rusicilia Pheusicus melanocephalus Passerina amoena Pipilo Chlorurus Poocetes gramineus Passerecius sandwichensis Melaspita melodia Melaspita lincolail Passerella iliacus Chondastes grammacus Spitella paserina Spitella paserina
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Emberizinae	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Rodstart Black-beaded Grosbeak Lazuli Bunting Green-tailed Towboe Vesper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow Lark Sparrow Chipping Sparrow Clav-colored Sparrow Clave-solored Sparrow Brewer's Sparrow Dark-eyed Jusco	Seiurus novaboracensis Geothhyis trichas Setophoga rusicilia Pheuticus melanocephalus Passerina amocna Pipilo Chlorurus Pooceetas gramineus Possereculus sandwichensis Melaspita melodia Melaspita lincolnii Passerella iliacus Chondestes grammacus Spitella paserina Spitella pasterina Spitella pasterina Spitella paliida Spitella paliida
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	Wilson's Warbler Northern Waterthrush Common Yellowthroat American Redatart Black-headed Groebeak Lazuli Bunting Green-tailed Towhee Vesper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow Lincoln's Sparrow Chipping Sparrow Clay-colored Sparrow Brewer's Sparrow Dark-eyed Junco White-cr. sparrow Bobolink Western Meadowlark	Seiurus novaboracensis Geothlypis trichas Setophaga rusicilla Pheuricus melanocephalus Passerina amocna Pipilo Chlorurus Pooceetes gramineus Pastereculus sandwichensis Melaspita meladia Melaspita lincolnii Pasterella iliacus Chondestes grammacus Spitella pasterina Spitella paliida Spitella peliida Spitella breweri Junco hvemalis Zonostrichia leucophrys Dolichomz oryzivorus Surmella neglecta
	Wilson's Warbler Northern Waterthrush Common Yellowthrost American Rodstart Black-beaded Grosbeak Lazuli Bunting Groen-stailed Towboe Vesper Sparrow Savannah Sparrow Song Sparrow Lincolin's Sparrow Fox Sparrow Chipping Sparrow Chipping Sparrow Clay-colored Sparrow Dark-eyed Jusco White-Cr. sparrow Brewer's Sparrow Dark-eyed Jusco White-Cr. sparrow	Seiurus novaboracensis Geothhyis trichas Seophoga ruicilia Phewicus melanocephalus Passerina amoena Pipilo Chlorurus Poocettas gramineus Passereilus sandwichensis Melaspita melodia Melaspita lincolail Passerella iliacus Chondestes grammacus Spitella paserina Spitella paserina Spitella paserina Spitella breweri Junco hyemalis Zonotrichia leucophrys Dolichoma orytivorus Ssumella neglecta Xanthocephalus zanthocephalus
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ICTERIDAE	Wilson's Warbler  Northern Waterthrush Common Yellowthroat American Redatart Black-headed Grosbeak Lazuli Bunting Groen-tailed Towbee Vesper Sparrow Savannah Sparrow Song Sparrow Lincoln's Sparrow Lincoln's Sparrow Chyping Sparrow Chyping Sparrow Dark-eyed Junco White-r, sparrow Dark-eyed Junco White-r, sparrow White-r, sparrow Dark-eyed Junco White-r, sparrow Red-owlark Yellow-beaded Blackbird Brown-beaded Cowbird Common Grackle Western Tanager Pine siskin American Goldfinch Red Crossbill Pine Grosbeak Roey Finch	Seiurus novaboracensis Geothhybi strichas Setophaga rusicilia Pheuticus melanocephalus Passerina amocna Pipilo Chlorurus Pooceetes gramineus Passerecilus sandwichensis Melaspita melodia Melaspita melodia Melaspita lincolnii Passerella iliacus Chondestes grammacus Spitella paserina Spitella paserina Spitella paserina Spitella paserina Spitella paserina Junco hyemalis Zonosrichia leucophrys Dolichoma oryzlvorus Sturnella neglecta Xanihocephalus xanhocephalus Agelaius phoeniceus Euphagus cyanocephalus Molothru ater Quiscalus quiscula Piranga ludoviciana Carduelis pinus Carduelis ristis Latia curvirortra Latia curvirortra Latia curvirortra Latia curvirortra Pinicola enucleator Leucosticte aretoa Carpodacus cassinii

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.

	COONSA CK	WILLOW FLATS	RKO WILLOWS	ONAHU CK
SPECIES (PR/HA)	GNP 1996	GTNP 1996	GTNP 1996	RMNP 199
Nectarivores:				
Calliope humming		0.18	0.00	
Rufous humming	0.10			
Broad-tailed hummingbird		0.05	0.00	0.2
Foliage insectivores:				
Yellowthroat	0.60	2.70	0.50	0.0
Yellow warbler	1.80	2.70	1.67	0.00
Wilson's warbler	0.05	1.17	0.00	1.77
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:			7.00	
Savannah sparrow	0.08	0.03	0.00	0.0
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	0.00	0.14
Black-headed grosbeak		0.00	0.00	
Dark-eyed junco		3,00	0.00	
Cassin's finch			0.00	
Pine siskin			0.00	
Am. goldfinch	0.05		0.00	
Flycatchers:				
Willow flycatcher	0.31	0.61	0.35	0.27
Dusky flycatcher		0.01	0.38	0.19
Aerial foragers:			0.50	0.17
Tree swallow	0.05	0.25	0.11	0.00
Rough-w. swallow	0.05	0.00	0.04	0.00
Violet-gr. swallow	0.05	0.00	0.04	0.15
Cliff swallow	0.03	0.25		0.00
Bank swallow		0.25		0.00
Barn swallow	0.03	0.2		0.00
Waterbirds:	0.03			0.00
Great blue heron		0.01	0.01	0.00
Blue-winged teal		0.01	0.01	0.00
Mallard			0.04	0.01
Gadwall		0.30	0.04	
Bufflehead		0.00		
Kingfisher		0.00		0.10

TABLE 3 (cont) Virginia rail	1	0.00		
Sora Sora	0.05	0.00	0.13	
American coot	0.03	0.00	0.13	
	1	0.00	0.33	0.15
Snipe	0.38	0.31	0.33	0.13
Marsh wren		0.14		0.00
Red-wing, blbird	0.35			
Incidentals:				
Sandhill crane			0.00	
Kildeer			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	Marie II
Red-breasted sapsucker			0.00	
Downy woodpker	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
Cathird	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.