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PRIORITY NEOTROPICAL MIGRANTS IN NEW MEXICO

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Neotropical migrants, generally defined as those bird species that breed in North America and winter south of the U.S.-Mexico border, have received much attention recently owing to widespread population declines and to the nature of the threats they face on their breeding and wintering grounds and at migration stopover points (Robbins et al. 1989, Terborgh 1989, Finch 1991, Bohning-Gaese et al. 1993). The Partners in Flight program was formed in direct response to these declines to serve as a vehicle for addressing this large-scale, multinational problem in a coherent fashion by involving as many organizations and individuals as possible (National Fish and Wildlife Foundation 1990). One component of Partners in Flight's activities is the development of a prioritized list of neotropical migratory species for each state (or other administrative area).

Carter and Barker (1993) recently compiled such a list of neotropical migrants for all western states. This prioritization scheme uses criteria developed by Partners in Flight over a number of years and relies on a variety of existing species ranking programs (Pashley et al. 1992, Carter and Barker 1993, Hunter et al. 1993). In brief, the system ranks each migratory species by seven threat or endangerment criteria which are then used to compute an average rank which indicates the relative priority of the species. The specific criteria used are: global abundance of the species, degree of threat on the breeding grounds, degree of threat on the wintering grounds, size of breeding range, size of wintering range, importance of the area under consideration (in this case, New Mexico) to the species as a whole, and the population trend of the species in the area under consideration during the last 10 years. The highest rank a species receives under this system is 4.00 and the lowest rank 1.14. All prioritization systems, including this one, are subject to uncertainty as to exactly how a particular species should be ranked; results should be regarded as base lists which can be modified as more information becomes available.

For this paper, we extracted the species listed for New Mexico from the master database compiled by Carter and Barker (1993). Several species omitted by those authors that are known or strongly suspected to breed in New Mexico and are thought to be migratory in some or all of the state (such as Black Phoebe, *Sayornis nigricans*, and Rock Wren, *Salpinctes obsoletus*) were included in this list and ranked as appropriate. Each species was assigned to one of three migrant classes following the scheme used by Partners in Flight: A, breeds in North America, winters primarily south of the U.S.-Mexico border; B, breeds and winters in North America, with some populations wintering south of the U.S.Mexico border; and C, breeds primarily south of the U.S.-Mexico border. Each species (except for Turkey Vulture, *Cathartes aura*, Long-eared Owl, *Asio otus*, and American Pipit, *Anthus rubescens*) was also assigned to one or more habitat categories based primarily on its breeding habitat preference in New Mexico. The habitat categories used are listed in Table 1. We sorted the species list by priority rank, ranging from 4.00 for highest priority to 1.14 for lowest, and then split the list into three parts to indicate neotropical migrant species of high, moderate, and low priority.

Species are listed taxonomically within the three priority levels in Appendix I. Readers are cautioned that the ranking process used is an approximate one and that many factors are combined with equal weight to make a given species of higher or lower priority. For example, species for which New Mexico comprises a very small portion of their breeding range (such as Costa's Hummingbird, *Calypte costae*, and Thick-billed Kingbird, *Tyrannus crassirostris*) receive a lower rank than might be expected. Other species, such as Red-naped Sapsucker (*Sphyrapicus nuchalis*), Bendire's Thrasher (*Toxostoma bendirei*), and Virginia's Warbler (*Vermivora virginiae*), receive higher than expected ranks since their breeding and winter ranges are relatively small. In particular, the population trend of the species in New Mexico is a critical component of the ranking criteria, but is generally not known with confidence for any but the most common and widespread species. The recent expansion of Breeding Bird Survey routes will help remedy this problem, but reliable results will not be available for several years. It is also important to note that only species that

breed in New Mexico and are migratory in at least part of their range within the state are included in the list (the one exception being Baird's Sparrow, *Ammodramus bairdii*). This results in the exclusion of a few species (such as Abert's Towhee, *Pipilo aberti*) that are of some conservation concern in the state.

Despite these deficiencies, some overall trends emerge from this classification. Species in migrant classes A and C had higher priority ranks than those in class B (Table 2). This suggests that highly migratory species are more at risk from all causes than those having populations wintering at least partly in the U.S. Classified by habitat, species inhabiting grassland had the highest priority ranks, followed by pinyon-juniper/oak, shrubland, ponderosa/mixed conifer, and riparian (Table 1). This supports repeated observations that grassland birds are particularly threatened across the continent. Note, however, that the riparian habitat classification had by far the highest number of species (Table 1), stressing the overall importance of this habitat type to bird species in New Mexico. The highest priority species in each habitat type are also listed in Table 1.

High priority species are of concern for a variety of reasons. Many, such as Mountain Plover (*Charadrius montanus*), Black Swift (*Cypseloides niger*), Gray Vireo (*Vireo vicinior*), Lucy's Warbler (*Vermivora luciae*), and Baird's Sparrow have relatively small breeding and/or wintering ranges, making them particularly vulnerable. Others, for example Burrowing Owl (*Athene cunicularia*), Willow Flycatcher (*Empidonax traillii*), Loggerhead Shrike (*Lanius ludovicianus*), and Bell's Vireo (*Vireo bellii*), have particular threats on the breeding and/or wintering grounds that make them vulnerable. Many species are of concern because of general vulnerability in most or alI of the ranking criteria.

This prioritized species list can be used in a variety of ways. Species in the high priority category should be looked for in appropriate habitat within the normal range of the species in New Mexico. Attention should be paid to land use and management activities that affect these species (positively or negatively). A particular need for most species is monitoring information that helps to determine or verify current population trends. Given time, advance warning, and some degree of forethought, perhaps we can ensure that these migratory species remain a component of New Mexico's avifauna.

Acknowledgements

Michael Carter supplied a copy of the master database from which most of the ranking information was obtained. Two anonymous reviewers provided helpful comments on the manuscript. Patricia Mehlhop and Kathleen Milne provided assistance of various kinds in assembling the New Mexico list.

Literature Cited

Bohning-Gaese, K., M.L. Taper, and J.H. Brown, 1993, Are declines in North American insectivorous songbirds due to causes on the breeding range? Conservation Biology 7(1):76-86.

Carter, M.F., and K. Barker, 1993, An interactive database for setting conservation priorities for western neotropical migrants. Pages 120-144 in D.M. Finch and P.W. Stangel, editors. Status and management of neotropical migratory birds. USDA Forest Service, General Technical Report RM-229.

Finch, D.M. 1991. Population ecology, habitat requirements, and conservation of neotropical migratory birds. USDA Forest Service, General Technical Report RM-205.

Hunter, W.C., M.F. Carter, D.N. Pashley, and K. Barker. 1993. The Partners in Flight species prioritization scheme. Pages 109-119 in D.M. Finch and P. W. Stangel, editors. Status and management of neotropical migratory birds. USDA Forest Service, General Technical Report RM-229.

National Fish and Wildlife Foundation. 1990. Partners in flight: neotropical migratory bird conservation program. National Fish and Wildlife Foundation, Washington, DC.

Pashley, D., C. Hunter, and M. Carter. 1992. Species prioritization scheme. Partners in Flight 2(3): 1,21-22.

Robbins, C.S., J.R. Sauer, R.S. Greenberg, and S. Droege. 1989. Population declines in North American birds that migrate to the neotropics. Proceedings of the National Academy of Sciences USA 86:7658-7662.

Terborgh, J. 1989. Where have all the birds gone? Princeton University Press, Princeton, NJ.

Table 1. Mean neotropical migrant priority rank by habitat and number of species in each habitat for New Mexico. A species may occur in more than one habitat type. Priority rankings range from 1.14 (lowest) to 4.00 (highest).

Habitat	Mean Rank	Number of Species	Species with highest priority
Riparian/Wetland	2.47	80	Black Swift, Lucy's Warbler
Grassland	2.74	20	Mountain Plover, Baird's Sparrow
Shrubland	2.57	30	Cassin's Sparrow, Bendire's Thrasher
Pinyon-Juniper/Oak	2.62	14	Gray Flycatcher, Gray Vireo
Ponderosa/Mixed Conifer	2.52	54	Whip-poor-will, Virginia's Warbler

Table 2. Mean neotropical migrant priority rank by Partners in Flight migrant class and number of species in each class for New Mexico.

Class	Mean Rank	Number of Species
A	2.75	79
B	2.31	58
C	2.77	20

Appendix I. Prioritized list of neotropical migrant species in New Mexico. Species are listed in taxonomic order within the three priority groups along with their estimated rank. High priority indicates those species with a high degree of threat or endangerment.

Species	Rank	Species	Rank
High Priority (ranks 3.14-4.00)			
Ferruginous Hawk	3.14	Bendire's Thrasher	3.43
Mountain Plover	3.86	Loggerhead Shrike	3.14
Long-billed Curlew	3.29	Bell's Vireo	3.43
Band-tailed Pigeon	3.14	Gray Vireo	4.00
Elf Owl	3.14	Virginia's Warbler	3.43
Burrowing Owl	3.43	Lucy's Warbler	3.57
Whip-poor-will	3.43	Black-throated Gray Warbler	3.29
Black Swift	3.57	Grace's Warbler	3.29
Red-naped Sapsucker	3.14	MacGillivray's Warbler	3.14
Olive-sided Flycatcher	3.29	Red-faced Warbler	3.29
Willow Flycatcher	3.14	Cassin's Sparrow	3.43
Hammond's Flycatcher	3.14	Sage Sparrow	3.14
Gray Flycatcher	3.57	Baird's Sparrow	3.86
Cave Swallow	3.14	Scott's Oriole	3.14
Moderate Priority (ranks 2.57-3.00)			
Mississippi Kite	3.00	Western Bluebird	2.86
Northern Harrier	2.57	Mountain Bluebird	2.71
Cooper's Hawk	2.57	Townsend's Solitaire	2.86
Northern Goshawk	2.71	Veery	2.57
Common Black-Hawk	3.00	Swainson's Thrush	2.71
Zone-tailed Hawk	2.57	Hermit Thrush	2.57
Peregrine Falcon	3.00	Sage Thrasher	2.57
Prairie Falcon	3.00	Phainopepla	2.71
Yellow-billed Cuckoo	3.00	Solitary Vireo	2.86
Flammulated Owl	2.71	Warbling Vireo	2.57
Common Poorwill	2.71	Orange-crowned Warbler	2.57
White-throated Swift	2.57	Wilson's Warbler	2.71
Broad-billed Hummingbird	2.71	Painted Redstart	3.00
Violet-crowned Hummingbd	2.86	Yellow-breasted Chat	2.57
Magnificent Hummingbird	2.57	Olive Warbler	3.00
Lucifer Hummingbird	2.86	Hepatic Tanager	3.00
Black-chinned Hummingbird	2.71	Summer Tanager	2.86
Costa's Hummingbird	2.86	Western Tanager	2.57
Broad-tailed Hummingbird	2.86	Black-headed Grosbeak	2.57
Lewis's Woodpecker	3.00	Lazuli Bunting	2.71
Williamson's Sapsucker	3.00	Varied Bunting	2.71
No. Beardless-Tyrannulet	2.57	Painted Bunting	2.86
Greater Pewee	2.57	Dickcissel	2.71
Dusky Flycatcher	3.00	Green-tailed Towhee	2.86
Cordilleran Flycatcher	3.00	Brewer's Sparrow	2.86
Say's Phoebe	2.71	Black-chinned Sparrow	3.00
Cassin's Kingbird	2.86	Lark Sparrow	2.57
Thick-billed Kingbird	3.00	Black-throated Sparrow	2.86
Western Kingbird	2.57	Lark Bunting	3.00
Scissor-tailed Flycatcher	2.86	Grasshopper Sparrow	2.57
Purple Martin	2.57	Yellow-headed Blackbird	3.00
Rock Wren	2.71	Orchard Oriole	2.71
Marsh Wren	2.57	Lesser Goldfinch	2.57
Golden-crowned Kinglet	2.57		

Appendix 1 (cont.).

Species	Rank	Species	Rank
Low Priority (ranks 1.14-2.43)			
Turkey Vulture	1.57	House Wren	1.43
Osprey	2.29	Ruby-crowned Kinglet	2.29
Sharp-shinned Hawk	2.43	Blue-gray Gnatcatcher	2.43
Swainson's Hawk	2.29	Eastern Bluebird	2.43
Red-tailed Hawk	1.29	American Robin	1.14
Golden Eagle	2.29	Gray Catbird	2.14
American Kestrel	1.14	Northern Mockingbird	1.57
Killdeer	1.43	American Pipit	2.43
White-winged Dove	2.00	Yellow Warbler	1.86
Mourning Dove	1.57	Yellow-rumped Warbler	1.71
Long-eared Owl	2.14	Common Yellowthroat	2.00
Lesser Nighthawk	2.29	Blue Grosbeak	2.43
Common Nighthawk	2.29	Indigo Bunting	2.29
Belted Kingfisher	2.00	Rufous-sided Towhee	2.29
Northern Flicker	1.57	Chipping Sparrow	2.14
Western Wood-Pewee	2.43	Vesper Sparrow	2.43
Black Phoebe	2.43	Savannah Sparrow	2.43
Eastern Phoebe	2.29	Song Sparrow	1.57
Vermilion Flycatcher	2.00	Lincoln's Sparrow	2.14
Dusky-capped Flycatcher	2.43	White-crowned Sparrow	2.00
Ash-throated Flycatcher	2.29	Dark-eyed Junco	1.57
Brown-crested Flycatcher	2.43	Red-winged Blackbird	1.71
Eastern Kingbird	2.43	Eastern Meadowlark	2.00
Horned Lark	1.43	Western Meadowlark	2.29
Tree Swallow	2.29	Brewer's Blackbird	2.29
Violet-green Swallow	2.29	Bronzed Cowbird	2.29
No. Rough-winged Swallow	2.43	Brown-headed Cowbird	1.71
Bank Swallow	2.43	Hooded Oriole	2.29
Cliff Swallow	2.00	Northern Oriole	2.43
Barn Swallow	1.29	Cassin's Finch	2.43
Brown Creeper	1.86	Pine Siskin	1.57

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Song of the Montane White-crowned Sparrow in New Mexico

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The montane form of the White-crowned Sparrow *(Zonotrichia leucophrys oriantha)* breeds in high-altitude mountain meadows and riparian areas from Alberta in Canada south to northern New Mexico in the Rocky Mountains. It is the breeding White-crowned Sparrow of the Sierra Nevada and other isolated ranges in California and Oregon. Suitable habitat is scattered and scarce with consequent disjunct populations. Song mapping has revealed song dialects associated with local populations. The song structure of different individuals is relatively homogeneous within a population, but differs between populations. Dialect discrimination is based on differences in syntax, i.e., the ordering of the components of the song, and the morphology of the syllables that make up the components.

The black-lored Z. *I. oriantha* is the only race of White-crowned Sparrow that summers in New Mexico. It breeds locally in the San Juan and Sangre de Cristo Mountains in New Mexico (Hubbard, 1978). Sites from which breeding has been reported are the Wheeler Peak amphitheater, Pecos Baldy, Santa Fe Baldy (Bailey 1928), and Mount Taylor (NMOS). Other likely breeding areas are the Truchas peaks, Culebra Range, and Lagunitas Campground area in the San Juan Mountains. The white-lored Z. *I. gambelii* is common in winter and during migration throughout the state. Only a small fraction of wintering White-crowned Sparrows are Z. *I. oriantha.*

I discovered breeding montane White-crowned Sparrows in Aspen Basin below Lake Peak in the Sangre de Cristo Mountains, NM while mist-netting birds along the stream that drains the basin. I caught and banded one adult and three juveniles on September 1, 1964. A question of interest is how the song of this isolated population relates to the dialects found in other geographical regions. I began recording songs in 1982, then returned to record again in 1989, 1991, and 1993. The population remained reasonably stable, probably never greater than 12 pairs during this time. For comparison, I recorded White-crowned Sparrow song at two other localities in northern New Mexico: Nambe Lake in 1993 near Aspen Basin and Williams Lake in the Wheeler Peak amphitheater in 1994.

The purpose of this study is to characterize the dialect of the Aspen Basin White-crowned Sparrows, to determine its persistence in time, and to show its relationship to song of Z. *I. oriantha* in other regions.

METHODS

The Aspen Basin breeding population occupied a shallow valley bounded by mixed conifer forest at an elevation ranging from 10,600 to 11,200 feet. Territorial males were spaced linearly along the lower part of the stream, in a small meadow about half way up, and beside two small spring-fed ponds near the top. The vegetation consisted of thick stands and patches of willow and scattered scrubby conifers with open grassy areas. Two ski runs in the Santa Fe Ski Area, which is the primary occupant of the basin, provided most of the open space. The sparrow breeding grounds were immediately south of the northernmost ski lift. Work on the lift and ski runs, which caused local changes in habitat, resulted in shifts in territory locations from year to year.

I recorded songs of five territorial males in Aspen Basin on 18 July 1982, five on 12 July 1989, eight on 9 July 1991, and five on 8 July 1993 with a Uher 4400 Report tape recorder (in 1982) at 3.5 in. per sec and a Sony Professional cassette recorder WM-D6C (in later years) using a Dan Gibson 18-in. parabolic reflector and microphone. Each year I attempted to locate every singing male and record a representative song sample from each. Recording was done between 6:00 and 11:00 am. Stream noise was a pervasive problem in getting reasonable quality recordings.

On 7 July 1993 I recorded the song of one White-crowned Sparrow at Nambe lake, which lies on the other side of a 12,000-foot ridge, 1.1-km northeast of Aspen Basin, and on 30 June 1994 I recorded one at

Williams lake below Mount Wheeler, NM. Recordings were made with the Sony cassette recorder.

A recording of a single individual from southern Colorado was provided by a colleague. It was recorded on an inexpensive tape recorder at Wolf Creek Pass, Mineral County on 4 July 1983. This site is located 210 km NNW of Aspen Basin.

The location of Aspen Basin and other localities where the songs of Z. *I. oriantha* have been studied are shown on the map of Fig. I.

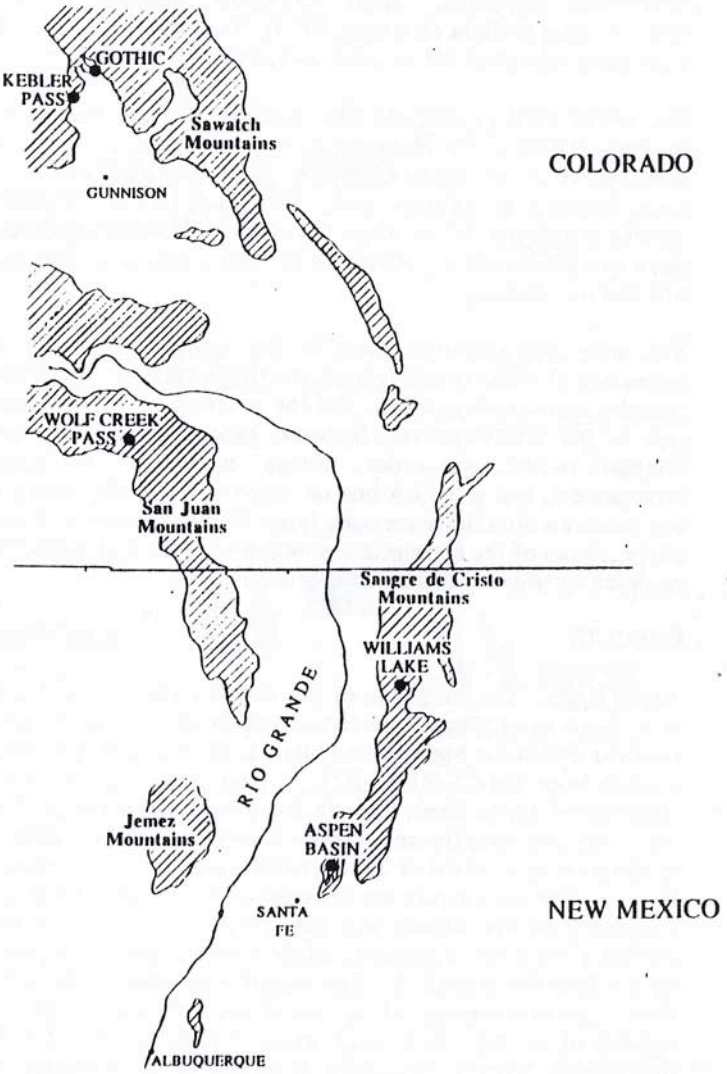

Fig. 1. Localities ( ) where song of *Zonotrichia leucophrys oriantha* has been studied. Nambé Lake lies next to Aspen Basin. The shaded areas represent principal mountain ranges.

I made sonograms of songs from every recorded individual using the Cornell Bioacoustics Workstation CANARY Version 1.1with a Macintosh Model IIsi computer. Since individual variation in White-crowned Sparrow song is slight (Baptista, 1977), I selected one of the clearest songs from each individual for detailed analysis and reproduction.

The terms used to describe the song as seen on the sonogram follow Baptista (1977): l) Note--any continuous trace, 2) Whistle (W)--a continuous trace at constant pitch, 3) Complex syllable (CS)--four or more notes forming a coherent unit, 4) Buzz (B)--a frequency-modulated whistle containing 30 or more pulses/sec, 5) Simple syllable (S)--two or three notes forming a coherent unit, often repeated, forming a terminal trill in some dialects.

The song characteristics used in the analysis were the duration and frequency of whistles and buzzes, the shape and number of elements in the complex and simple syllables, and the ordering of the components. A song type of the White-crowned Sparrow generally has the same components arranged in the same order. Songs which have the same component arrangement, but in which one or more of these characters are different, are themes within the same song type. In my discussion, I use descriptions of the shapes of the appropriate sonogram traces to describe the simple and complex syllables of different individuals.

RESULTS

Aspen Basin. The song type of the Aspen Basin White-crowned Sparrows is a fixed arrangement of five components consisting of a whistle, a complex syllable, a high-pitched buzz, a set of simple syllables, and a lower pitched buzz (W -CS-B1-SS-B2). Two song themes were used. Both persisted at Aspen Basin through the years of the study. Each individual used only one song theme. Theme l was predominant every year. It was used by 16 of the total of 24 individuals studied. Sonograms are shown in Fig. 2. The two themes are distinguished primarily by differences in the frequency of the whistle and the morphology of the complex syllable. Theme l has a lower-pitched whistle with a nominal frequency of 3.8 kHz vs 4.4 kHz for Theme 2. The complex syllable of Theme 1 consists of three connected pairs of up-and-down strokes, whereas the complex syllable of Theme 2 is a rapid series of downsweeps. The frequencies of the whistle, buzz 1, and buzz 2, obtained by averaging the frequency measurements from eight individuals for each theme, are given in Table 1.

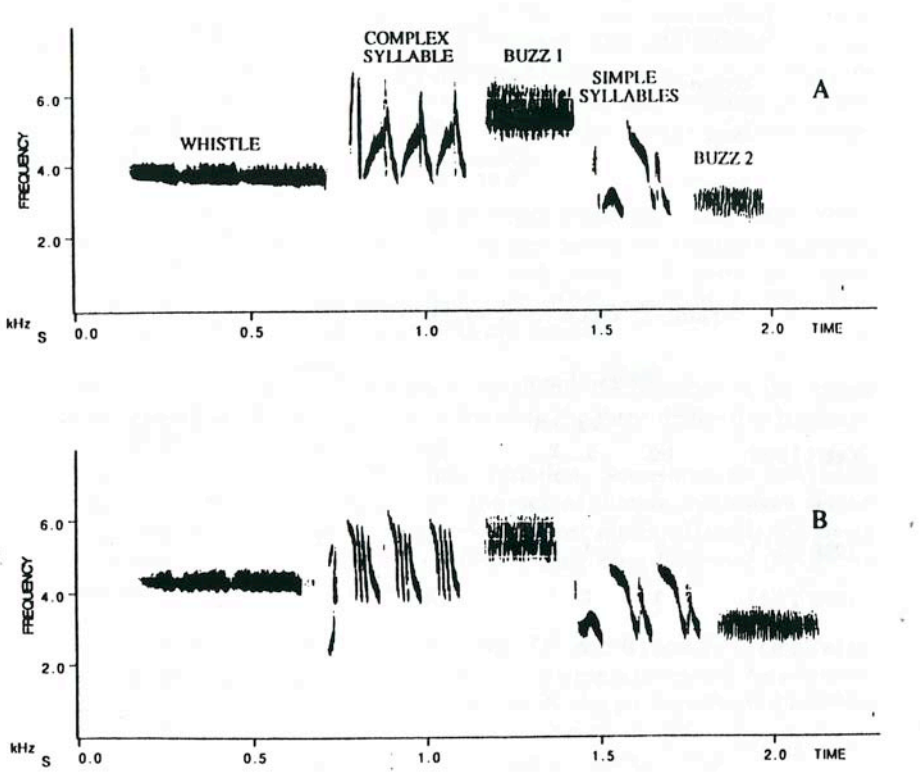

Fig. 2. Sample sonograms of montane White-crowned Sparrow song from Aspen Basin, New Mexico, 9 July 1991

A. Theme 1 B. Theme 2

Table 1. Song Components of Aspen Basin White-crowned Sparrows

Frequency in kHz (mean, standard deviation)

Components	Theme 1	Theme 2
Whistle	3.77 + 0.14	4.42 + 0.14
Buzz 1	5.27 + 0.17	5.26 + 0.13
Buzz 2	2.97 + 0.13	2.95 + 0.08

Table 2. Occurrence of Theme Variants

	Theme 1			Theme 2			
		Variant			Variant	CS Strokes	
Year (Total)	No.	1	2	No.	1 2	3 4 5 6	
Aspen Basin							
1982 (5*)	3	1	2	2	0 2	1 0 1 0	
1989 (5*)	3	2	1	2	1 1	0 1 1 0	
1991 (8)	6	2	4	2	0 2	0 2 0 0	
1993 (5*)	3	1	2	2	0 2	0 1 0 1	
Nambé Lake							
1993 (1)	1	0	1	–	– –	– – – –	
Total	16	6	10	8	1 7	1 4 2 1	

* Includes one not shown in Fig. 3 - 12.

Each individual sang only his variant of one of the themes. The variants differ principally in two ways: Variants of Theme 2 have a complex syllable with a different number of downsweeps (3, 4, 5, or 6) and both themes have variants with either one or two of the single-stroke simple syllables (called Variant 1 or 2 respectively). The distribution of these variants is shown in Table 2. The third and fifth columns give the number of individuals singing either Variant 1 or 2; the sixth column gives the number of individuals singing the variant with the number of downsweeps in the complex syllable given in the heading.

Examples of sonograms of songs from Aspen Basin for 1982, 1989, 1991, and 1993 are shown in Fig. 3-12. They are paired by location--meadow, upper ponds, and lower stream--for each year. Because of poor reproduction quality, sonograms from one of the meadow individuals in each of the years 1982. 1989, and 1993 are omitted.

There appears to be no local pattern in theme distribution in the Aspen Basin population. Both themes were found in the three distinctive habitats.

The songs of an individual had little variation. Sometimes an individual omitted the final buzz, and rarely, the set of simple syllables. These shorter versions were sung infrequently by most males. Usually the songs of neighbors were distinguishable. Either they sang different themes or different variants of the same theme.

In two cases, close neighbors in 1991 (Fig. 7 A and B) and 1993 (Fig. 11 A and B) sang the same variant of Theme 1. By placing myself between the neighbors, I could swing the microphone from one to the other and record each equally well. In both cases the sonograms of the pair vary in minor ways. Typically the distance between neighbors was such that I could often hear a neighbor only faintly.

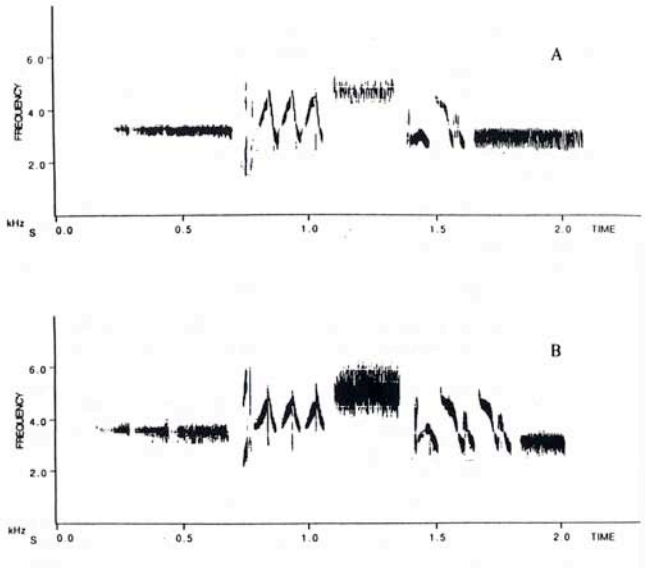

Fig. 3. Sonograms of White-crowned Sparrow song from the meadow Aspen Basin, NM, 7 July 1982.

A. Theme 1, Variant 1.
B. Theme 1, Variant 2.

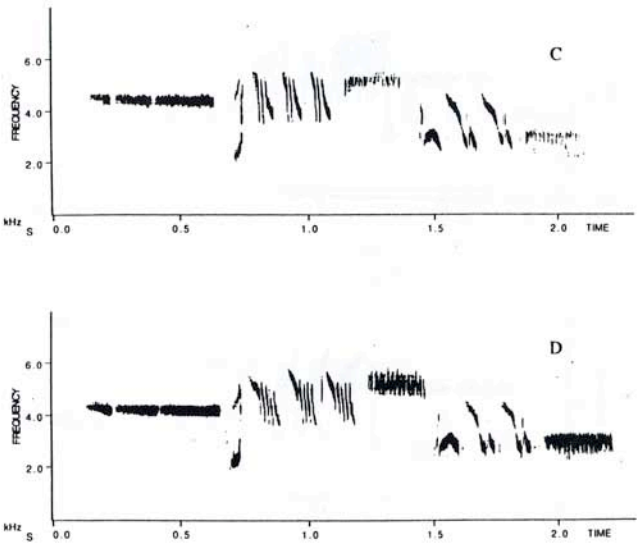

Fig. 4. Additional sonograms of White-crowned Sparrow song from Aspen Basin, NM, 7 July 82.

C. Theme 2, Variant 2 with 3 strokes in CS.
D. Theme 2, Variant 2 with 6 strokes in CS.

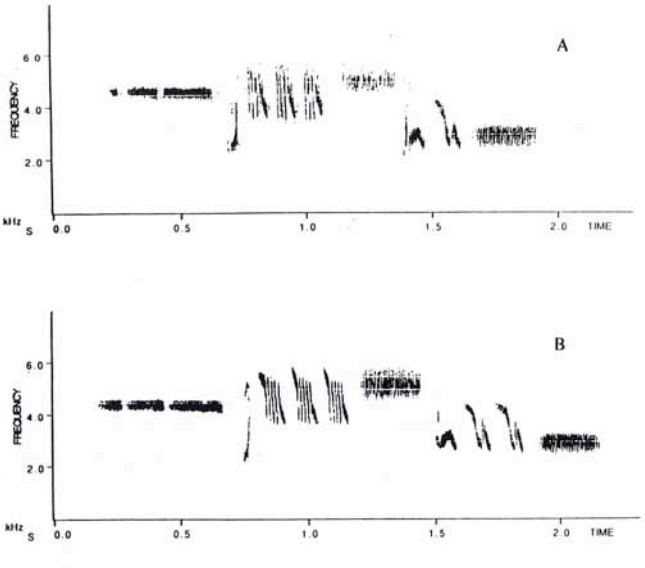

Fig. 5. Sonograms of White-crowned Sparrow song from the meadow Aspen Basin, NM, 12 July 1989.

A. Theme 2, Variant 1 with 4 strokes in CS.
B. Theme 2, Variant 2 with 5 strokes in CS.

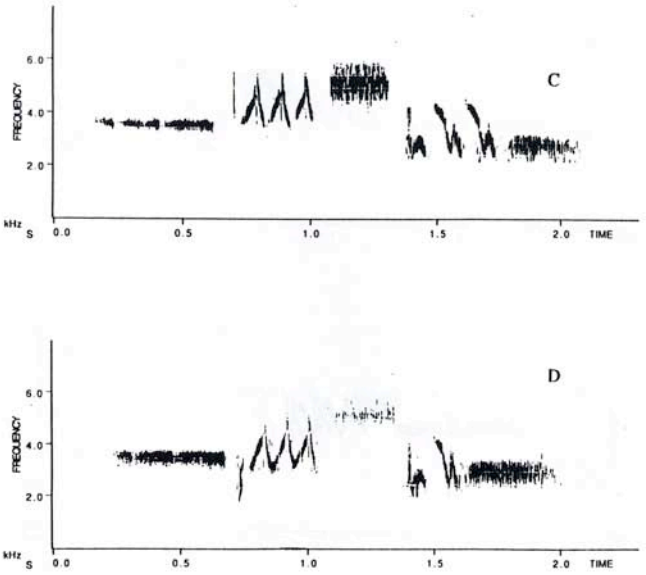

Fig. 6. Additional sonograms of White-crowned Sparrow song from Aspen Basin, NM, 12 July 1989.

C. Meadow: Theme 1, Variant 2.
D. Pond 1: Theme 1, Variant 1.

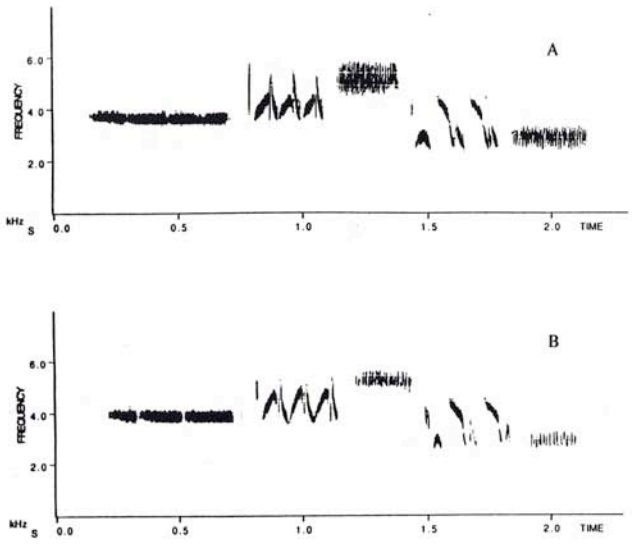

Fig. 7. Sonograms of White-crowned Sparrow song from the meadow Aspen Basin, NM, 7 July 1991.

A. Theme 1, Variant 2.
B. Theme 1, Variant 2.

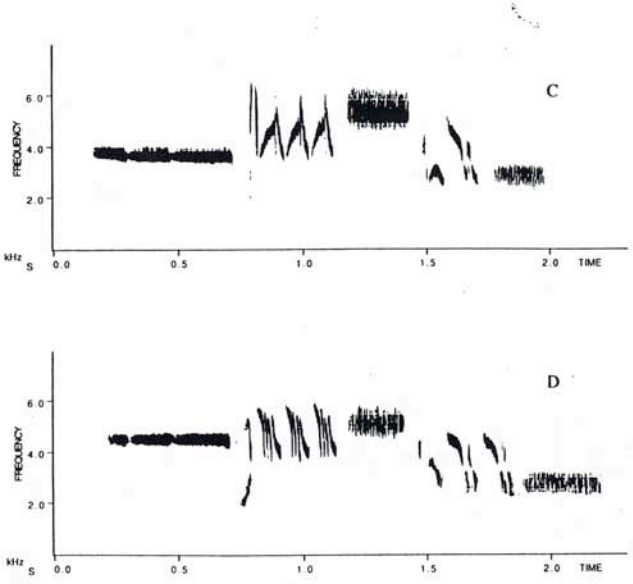

Fig. 8. Additional sonograms of White-crowned Sparrow song from Aspen Basin, NM, 7 July 1991.

C. Stream entering meadow: Theme 1, Variant 1.
D. Stream leaving meadow: Theme 2, Variant 2.

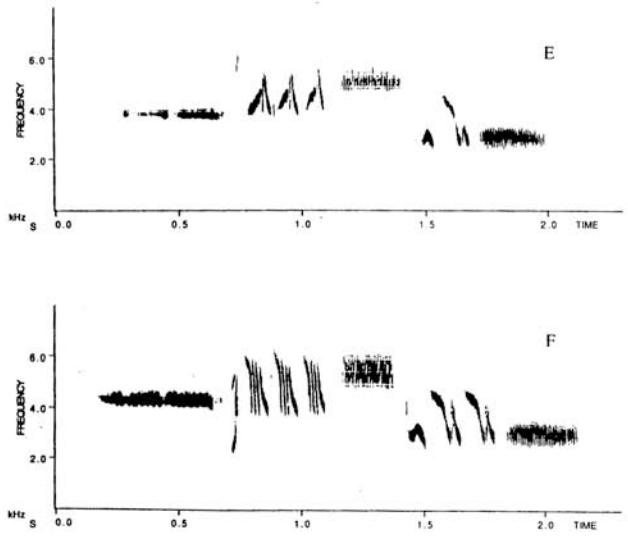

Fig. 9. Additional sonograms of White-crowned Sparrow song from Aspen Basin, NM, 7 July 1991.

E. Pond 1: Theme 1, Variant 1.
F. Pond 2: Theme 2, Variant 2 with 4 strokes in CS.

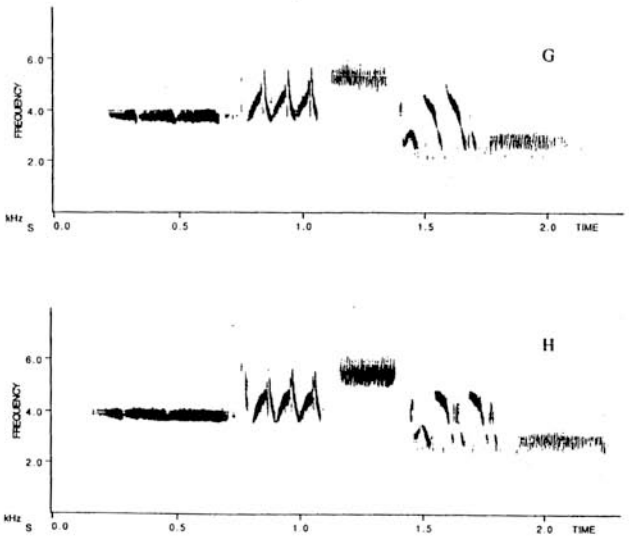

Fig. 10. Sonograms of White-crowned Sparrow song from the lower stream willow thicket, Aspen Basin, NM, 7 July 1991.

G and H: Theme 1, Variant 2.

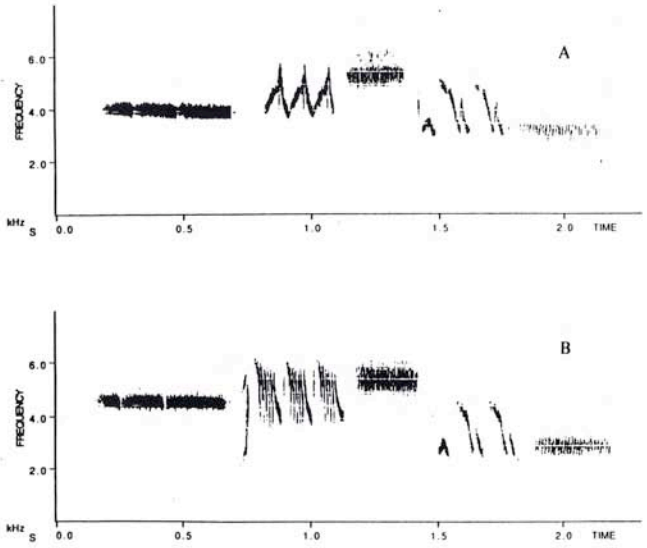

Fig. 11. Sonograms of White-crowned Sparrow song from the meadow Aspen Basin, NM, 8 July 1993.

A. Theme 1, Variant 2.
B. Theme 2, Variant 2 with 6 strokes in CS

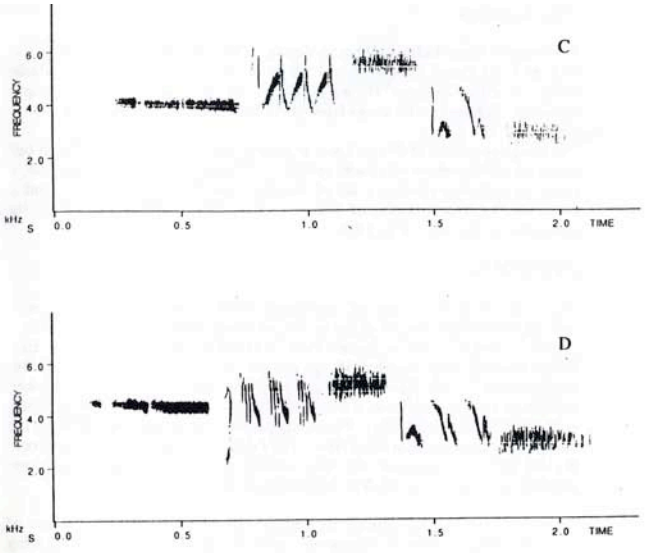

Fig. 12. Additional sonograms of White-crowned Sparrow song from Aspen Basin, NM, 8 July 1993.

C. Pond 2: Theme 1, Variant 1.
D. Stream entering meadow: Theme 2, Variant 2 with 4 strokes in CS.

Other Localities

The Nambe Lake individual sang Variant 2 of Theme **I.** The song of the bird at Wolf Creek Pass also had the same song type as the Aspen Basin birds. It differed from Theme 1 only in the morphology of the simple syllables. Sonograms of songs from these localities are shown in Fig. 13.

The song type from Williams Lake is nearly like that from Aspen Basin but it has an additional set of simple syllables. It consists of a broken whistle, a complex syllable, a buzz, a set of simple syllables, a second buzz, and a final set of simple syllables of different shape (W -CS-B I-SS I-B2-SS2). Its sonogram is shown in Fig. 14 A.

DISCUSSION

The nearest populations of montane White-crowned Sparrows with published descriptions of dialects are in south-central Colorado. Baker (1975) recorded songs at Kebler Pass in Gunnison County and in the East River drainage near Gothic 16 km to the northeast. Gothic is 360 km NNW from Aspen Basin. The Kebler Pass song consisted of a broken whistle, a complex syllable, a buzz, a simple syllable, a second buzz, and a trill (W-CS-Bl-SS-B2-SS). The song pattern, shown in Fig 14B, is the same as the Aspen Basin song type. The Gothic song was like the one from Kehler Pass, but without the first simple syllable and with a different ending trill (W-CS-BI-B2-SS). Its sonogram is shown in Fig. 15A.

In a study in which songs of 18 geographically separated populations of montane White-crowned Sparrows were sampled, Baptista and King (1980) distinguished six song types based primarily on syntax. Within each population they recognized from one to five themes based on the morphology of the complex syllables in the middle portions of the songs. They recorded songs from three sites in the Northern and Central Rocky Mountains: an individual from each of two Wyoming localities (Pinedale and Medicine Bow) and from 23 in the Front Range. Boulder County, Colorado. The song type of the Wyoming birds was like that of the Gothic population: W-CS-B-B-SS, but the songs recorded in the Front Range were of an entirely different song type: W -B-CS-SS (See Fig. 15B).

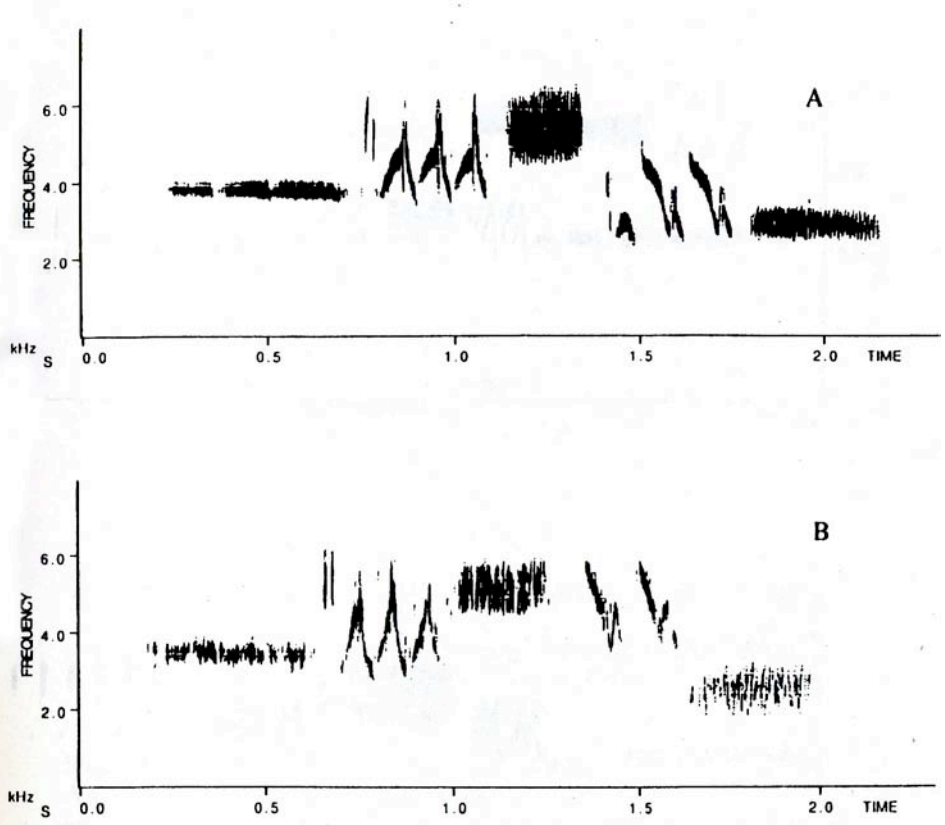

Fig. 13. Sonograms of White-crowned Sparrow song from:

A. Nambé Lake, NM, 7 July 1993; Theme 1, Variant 2.
B. Wolf Creek Pass, Colorado, 4 July 1983; Theme 1, Variant 2.

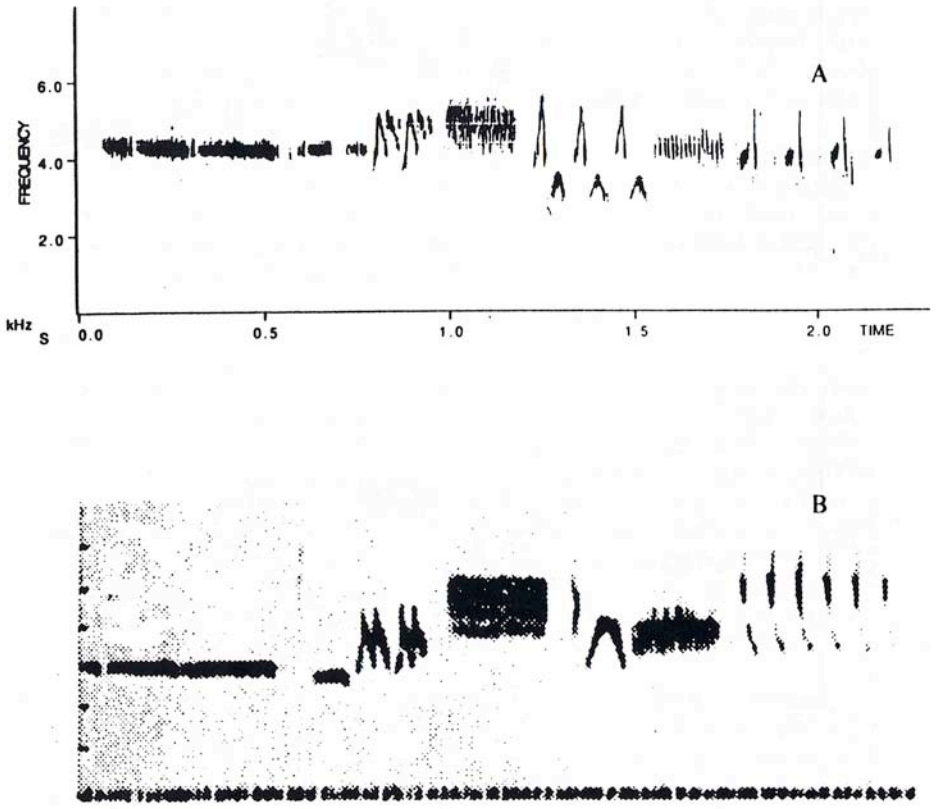

Fig. 14. Sonograms of White-crowned Sparrow song from:

A. Williams Lake, NM, 7 July 1994.
B. Kebler Pass, Colorado (Baker 1975).

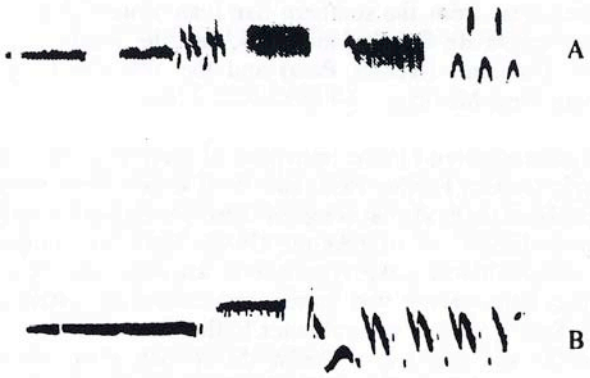

Fig. 15. Sonograms of White-crowned Sparrow song from:

A. Gothic, Gunnison County, Colorado (Baker 1975).
B. Front Range, Boulder County, Colorado (Baptista and King 1980).

Since none of the song types described above is like the song type from Aspen Basin, I conclude that the songs from the Aspen Basin, Nambe Lake, and Wolf Creek Pass populations are from a different dialect than those recognized by Baker (1975) or Baptista and King (1980).

The song type from Williams Lake, however, is the same as the one from Kebler Pass, namely W -CS-B I-SS I-B2-SS2. The songs differ in a significant way in the shape of the complex syllable and the shape and number of simple syllables used.

Thus, four dialects can be recognized for the montane White-crowned Sparrow in the Central and Southern Rocky Mountains. Their geographical limits are as yet undefined because of limited data, but one ranges from western and central Wyoming to central Colorado (Gothic), a second is found in the Front Range in Colorado, a third includes areas from the southern San Juan Mountains and the southern end of the Sangre de Cristo Mountains, and the fourth includes areas from central Colorado (Kebler Pass) and the Wheeler Peak amphitheater in northern New Mexico.

The systematic trend in the transition of song types moving from Wyoming through Gothic, Kebler Pass, and Wolf Creek Pass to Williams Lake and Aspen Basin suggests that songs of these populations may be derived from a common dialect. If we take the Gothic form for comparison, the Kebler Pass and Williams Lake type inserts an additional component (a simple syllable) between the two buzzes and ends with different trills, the Wolf Creek Pass type adds several notes to the inserted simple syllable and drops the trill, and the Aspen Basin theme has a modified simple syllable component and drops the trill.

Taking a broader view, perhaps all of these song types, except the one from the Front Range in Colorado, are variations (i. e. themes) of a single dialect common to some part of the southern Rocky Mountains. Additional data are needed to resolve the question.

LITERATURE CITED

Bailey, F. M. 1928. *The Birds of New Mexico.* New Mexico Department of Game and Fish.

Baker, M.C. 1975. Song dialects and genetic differences in White-crowned Sparrows *(Zonotrichia leucophrys).* Evolution 29:226-241.

Baptista, L. F. 1977. Geographic variation in song and dialects of the Puget Sound White-crowned Sparrow. Condor 79:356-370.

Baptista, L. F. and J. R. King. 1980. Geographical variation in song and song dialects of montane White-crowned Sparrows. Condor 82:267-284.

Hubbard, J. P. 1978. *Revised Check-list of the Birds of New Mexico,* New Mexico Ornithological Society.

New Mexico Ornithological Society Field Notes. 1983. Vol. 21-2.

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