CHARACTERIZATION OF RELICT COMMUNITIES FOR MONITORING PARK ECOSYSTEMS IN GLEN CANYON NATIONAL RECREATION AREA

JACK L. BUTLER • BRIAN S. BICH • CHERYL A. SCHMIDT DEPARTMENT OF BIOLOGY • UNIVERSITY OF SOUTH DAKOTA VERMILLION

PROJECT SUMMARY

All of the field work for the project was completed during the 1991 field season. All of the vegetation data from both field seasons have been entered into the USD mainframe computer in preparation for detailed analysis. The first objective of the 1991 field season was to identify suitable relict and lightly grazed pinyon-juniper sites that could be used as reference points in evaluating the effects of livestock grazing on the pinyon-juniper communities Two sites in western of the Orange Cliffs. Canyonlands National Park were considered in 1990, but they proved to have been either disturbed by livestock in the past or located on a significantly different substrate. Two areas, the North Block and the South Block, were selected during the 1991 field season as potential relict sites.

Permanent vegetation transects which were established in 1990 on the heavily and moderately grazed sites on the Orange Cliffs were revisited in 1991. Overall species richness and plant densities were low on all four sites which may limit our ability to detect trends in the vegetation in response to livestock grazing. The greatest number of species was recorded on the South (25) and North Blocks (21). Sixteen species were recorded on the moderately grazed site on the south end of the Orange Cliffs while 13 species were observed on the heavily grazed site near French's Spring. Only five species were common to all four sites, and these occurred in relatively low abundance (Table 1). Indian ricegrass was observed only on the North Block and the South Block.

Four study sites within the blackbrush/Indian ricegrass vegetation type on Grand Bench that best represented the end product of four grazing regimes were evaluated during the 1990-91 field seasons. Permanent vegetation transects which were established in 1990 were revisited in 1991. Further, vegetation sampling was conducted on two additional randomly selected sites during the 1991 field season.

Preliminary results indicate a shift in composition and abundance for the major species along the grazing gradient (Table 2). The abundance of Indian ricegrass (*Oryzopsis hymenoides*) increased toward the relict site at the south end of Grand Bench in both 1990 and 1991. Galleta grass (*Hilaria jamesii*) and broom snakeweed (*Gutierrezia sarothrae*) both demonstrated a decrease in abundance towards the relict end of the grazing continuum. Hyalineherb (*Hymenopappus filifolius*) and sand dropseed (*Sporobolus cryptandrus*) were rarely encountered during the 1990 field season, but showed a substantial increase in 1991, especially on the heavily grazed site.

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	mairon	Number of Indivi Gra	iduals / m ² zing Gradient		
	Oran	ge Cliffs	North Block	South Block	
Species	Heavy	Moderate	Relict	Relict	
Indian Ricegrass (Oryzopsis hymenoides)	0.0	0.0	0.3	0.5	
Broom Snakeweed (Guterierrezia sarothrae)	0.2	0.9	0.4	0.5	
Lepidium montanum (no common name)	0.2	0.0	0.1	0.2	
Dye Cryptanth (Cryptandra micrantha)	0.1	0.5	1.9	0.5	
Opuntia erinacea (no common name)	0.1	0.1	0.7	0.1	
Streptanthus cordatus (no common name)	0.0	1.4	0.1	0.0	

The resident rodent populations were resampled on the relict and lightly and heavily grazed sites on Grand Bench, and the moderately and heavily grazed sites on the Orange Cliffs. Several individuals that were captured and marked in 1990 were recaptured in 1991 in both vegetation types. Preliminary results indicate that *Perognathus longimembris* responds to livestock grazing as a "decreaser" species while *Peromyscus maniculatus* behaves as an "increaser" (Hanley and Page 1981).

During the 1990 field season, the avian community along the grazing gradient was sampled by walking along a prescribed 1,000 m route within each study site. No attempt was made to estimate actual densities of bird populations during this survey, but the census did provide information on composition (Table 3). A total of 14 species were recorded during the 1990-91 field seasons in the blackbrush/Indian ricegrass communities on Grand Bench while 12 species were observed in the pinyonjuniper communities on the Orange Cliffs for 1990 (Table 3).

Having developed a familiarity with the communities during the 1990 field season, a method of estimating actual population densities was implemented during the 1991 field season on Grand Bench. The method used was the variable-strip method as described by Emlen (1971, 1977). The technique is a widely used censusing method which is rapid and relatively easy to use in large areas and can be used during any season of the year. It was especially useful on Grand Bench where the birds could be easily seen and identified. However, the complex nature of the vegetation structure of the pinyon-juniper communities would have required identification of birds by songs/calls to adequately sample the population. We lacked the skills and time

Table 2.	Density (# of Individuals / m ²) of the major herbaceous species recorded during the 1990-91 fiel	d seasons
	within four Indian ricegrass stands on Grand Bench in Glen Canyon National Recreation Area.	The four
	stands represent a grazing gradient of heavy, moderate, light and no grazing (relict).	

			Numb (er of Ind Grazing C	ividuals / Fradient	m ²		
	Heavy		Moderate		Light		Relict	
Species	1990	1991	1990	1991	1990	1991	1990	1991
Indian Ricegrass (Oryzopsis hymenoides)	0.9	0.6	1.7	0.9	2.8	1.3	4.2	3.6
Galleta Grass (Hilaria jamesii)	10.9	7.7	13.1	13.7	13.6	12.9	1.2	1.8
Sand Dropseed (Sporobolus cryptandrus)	0.0	4.0	0.2	4.7	0.1	0.6	0.0	0.0
Broom Snakeweed (Gutierrezia sarothrae)	1.8	5.2	2.3	2.5	0.1	0.0	0.0	0.1
Sixweeks Fescue (Festuca octoflora)	0.3	0.9	0.0	0.6	0.5	8.7	0.0	13.5
Nelson Globemallow (Spaeralcea parvifolia)	0.1	1.5	0.0	1.0	0.0	1.6	0.7	0.9
Hyalineherb (Hymenopappus filifolius)	0.0	16.6	0.0	0.5	0.0	8.8	0.0	0.0

necessary to accurately identify the birds by sound. Consequently, the variable-strip method was attempted, but not used on the Orange Cliffs.

One avian census site was located at each of the four vegetation and small mammal sampling sites described previously for Grand Bench. Each census site consisted of a single 1 km linear transect. Each transect was walked by a single observer twice a day, just after sunrise and just before sunset, for four days. However, only the morning surveys were used to calculate avian densities.

Analysis of transect data was accomplished by grouping the number of individuals for each species into 5 m bands extending out from the transect line. A distribution curve was generated by plotting the distance from the transect to where the bird was observed on the x-axis and the number of observations on the y-axis. The density value for each species was then determined by counting the number of individuals in the strips on either side of the transect which are proximal to the point of inflection on the distribution curve. In this way, the inflection point designated the lateral boundaries of the specific census strip for the species. These lateral boundary lines and the ends of the transect route defined the areal base for the density estimate (Emlen 1977), which, in this study, was 40 ha.

The black-throated sparrow (Amphispiza bilineata) was the most abundant species recorded at all four sites and tended to decrease in abundance with increasing grazing intensity (Table 4). The house finch (Carpodacus mexicanus) was observed only on the relict site, while horned larks (Eremophila alpestris) were observed only on moderately and lightly grazed sites. These three species may be useful as additional "decreaser" species similar to the rodents described previously.

Table 3. Avian species recorded during the 1990-91 field seasons on Grand Bench and the Orange Cliffs by walking a prescribed 1,000 m route.

Species

Grand Bench (Blackbrush/Indian Ricegrass Community)

Black Throated Sparrow Ash-Throated Flycatcher ¹Say's Phoebe Horned Lark House Finch Brewer's Sparrow Pinyon Jay ¹Rock Wren Common Raven White-Throated Swift Violet-Green Swallow Cliff Swallow ²Gray Vireo ²MacGillivaray's Warbler

³Orange Cliffs (Pinyon-Juniper Community)

Plain Titmouse Black-Throated Gray Warbler Mountain Chickadee Empidonax sp.

Gray Jay Clark's Nutcracker Pinyon Jay Scrub Jay Common Raven Bewick's Wren Mourning Dove Blue-Gray Gnatcatcher

¹Observed only in 1990 ²Identification not 100% positive ³Includes only 1990 observations (Amphispiza bilineata) (Myiarchus cinerascens) (Sayornis saya) (Eremophila alpestris) (Carpodacus mexicanus) (Spizella breweri) (Gymnorhinus cyanocephalus) (Salpinctus obsoletus) (Corvus corax) (Aeronautes saxatalis) (Tachycineta thalassina) (Hirundo pyrrhonota) (Vireo vicinior) (Oporornis tolmiei)

(Parus inornatus) (Denroica nigrescens) (Parus gamebeli) (includes E. wrightii, E. oberholseris and E. hammondii) (Perisoreus canadensis) (Nucifraga columbiana) (Gymnorhinus cyanocephalus) (Aphelocoma coerulescens) (Corvus corax) (Thryomanes bewickii) (Zenaida macroura) (Polioptila caerulea) Table 4. Density (individuals / 40 ha) of the major avian species recorded during the 1991 field season on GrandBench in Glen Canyon National Recreation Area along a grazing gradient of heavy, moderate, light andrelict.

	Number of individuals per 40 ha Grazing Gradient						
Species	Heavy	Moderate	Light	Relict			
Black Throated Sparrow	12	14	16	36			
House Finch	0	0	0	18			
Horned Lark	0	13	9	0			
Brewer's Sparrow	0	7	0	14			

LITERATURE CITED

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