

## DIETS OF NESTLING SAGE SPARROWS AND BREWER'S SPARROWS IN AN IDAHO SAGEBRUSH COMMUNITY

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The Sage Sparrow (*Amphispiza belli*) and Brewer's Sparrow (*Spizella breweri*) are 2 of the most common passerines breeding in the vast sagebrush-dominated areas of the Great Basin (Wiens and Rotenberry 1981). In recent years, several aspects of these species' breeding ecology have been investigated (e.g., adult diet: Rotenberry 1980, Wiens and Rotenberry 1979; nest-site selection: Petersen and Best 1985a,b; and nestling growth: Petersen et al. 1986), but no information on the food habits of their young has been published. We, therefore, sought to quantify Sage and Brewer's sparrow nestling diets and to identify factors influencing them in a sagebrush-dominated community. Specifically, we asked: What foods are important to these species? Do nestling diets vary seasonally or from year to year? Does nestling age or brood size influence diet? What is the effect of habitat alteration on nestling foods? Answers to these questions contribute to our knowledge of nestling diet dynamics. Moreover, such information may be useful to resource managers when giving consideration to these species.

### STUDY AREA AND METHODS

Our study area was on the Idaho National Engineering Laboratory (INEL) site, 11 km south of Howe, Butte County, Idaho. The site lies at an elevation of about 1500 m, and annual precipitation averages nearly 20 cm (Anderson and Holte 1981). Vegetation was dominated by big sagebrush (*Artemisia tridentata*) (about 25% coverage); green rabbitbrush (*Chrysothamnus viscidiflorus*) was another common shrub. Predominant grasses were bluebunch wheatgrass (*Agropyron spicatum*), Indian rice grass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*). Total herbaceous plant coverage was about 10%.

Data were collected in the breeding seasons of 1980-1983. Two 6.25-ha plots were established on a prescribed burn area and 2 on an adjacent area of similar (preburn) vegetational composition. All plots were searched systematically for nests at least twice each breeding season by using a rope-drag technique (Petersen and Best 1985a) that flushed attending adults from their nests. Many other nests were discovered incidental to our other field activities.

Active nests were visited every other day. At visits after hatching, each nestling was fitted with a constrictive neck ligature of enameled copper wire (Johnson et al. 1980). Ligatures were left in place for about 1 h, after which food was removed from the nestlings' throats and stored in 70% ethanol. We sampled over a 2-4 h interval each day, and the entire sampling effort was nearly evenly distributed between 0900 and 1800.

We obtained 312 collections from 200 Sage Sparrow nestlings in 80 nests and 218 collections from 147 Brewer's Sparrow nestlings in 59 nests. The food obtained from 1 nestling in 1 h represented one collection.

Food items were identified to order, and their volumes measured by water displacement. Some adults occasionally delivered many small items at once in a large bolus. For example, a mass of 49 tiny dipterans was removed from 1 Sage Sparrow nestling, but nearly all other collections with similar-sized dipterans contained only 1–2 individuals. Such anomalies tended to exaggerate the importance of some orders (and food sizes) in the diet. Thus, we considered the occurrence of a particular order (or food size) in a collection as 1 item in all analyses. Although this procedure reduced apparent sample sizes, we believe that the data treated in this manner more accurately represent the diet of each species.

Chi-square analyses were used on taxonomic data; *t*-tests and analyses of variance (ANOVA) on mensural data. We used multi-way ANOVAs to test for interactions among annual, seasonal, nestling-age, and brood-size effects on food size, and we performed a series of chi-square tests for similar effects on taxonomic composition of diets. In the case of the latter, we analyzed each variable within individual classes of a second variable (e.g., seasonal effects in separate years, brood-size effects in separate seasons). We found evidence of interaction only between the effects of brood size and nestling age on food size. Accordingly, we report the results of 2-way ANOVAs for those 2 factors, but we present only single-effect analyses for other factors. In many cases, data were not normally distributed, and/or variances were heterogeneous. Such data were log-transformed, and the results of tests reported herein are from the transformed data. All means are reported plus or minus 1 standard deviation, and statistical significance was set at  $P \leq 0.05$ .

#### RESULTS AND DISCUSSION

*General diet composition.*—Adults of both species fed their young a broad range of arthropods (Table 1). (One seed of Indian rice grass was collected from a Sage Sparrow nestling.) In addition to the 9 major orders listed in Table 1, Sage Sparrows occasionally took representatives from 5 other orders and Brewer's Sparrows from 3. Robins (1971) and Maher (1979) also documented substantial nestling diet breadth in several rangeland passerines. Lepidopterans (90% larvae), araneans, hemipterans, and homopterans numerically accounted for 72% of the Brewer's Sparrow diet and 59% of the Sage Sparrow diet. Because Sage Sparrows used more arthropod orders than Brewer's Sparrows and because Sage Sparrow food items were more evenly distributed among the orders, Sage Sparrows were more generalized than Brewer's Sparrows with respect to nestling foods. Correspondingly, Winter (1984) observed that Sage Sparrows were more generalized than Brewer's Sparrows in their choice of foraging substrates. Overall, the 2 species' diets differed significantly ( $\chi^2 = 44.7$ ,  $df = 9$ ,  $P < 0.001$ ). The greatest differences were in the use of dipterans and orthopterans.

TABLE 1. Composition of nestling Sage and Brewer's sparrow diets. Values represent percentages of the total number or volume of items.

Order	Sage Sparrow		Brewer's Sparrow	
	Number (687) <sup>a</sup>	Volume (cm <sup>3</sup> ) (37.5) <sup>b</sup>	Number (538)	Volume (cm <sup>3</sup> ) (16.2)
Araneae	19	13	19	22
Lepidoptera	18	25	24	36
Hemiptera	11	4	15	7
Homoptera	11	11	14	8
Diptera	10	17	4	8
Orthoptera	9	17	3	6
Hymenoptera	6	4	7	7
Coleoptera	6	6	4	2
Psocoptera	5	1	5	1
Other <sup>c</sup>	5	3	5	3

<sup>a</sup> Total number of food items collected. The occurrence of a particular order in a collection (collection = the food obtained from 1 nestling in 1 h) was considered as 1 item.

<sup>b</sup> Total volume of food items collected.

<sup>c</sup> Sage Sparrow: Acarina, Ephemeroptera, Neuroptera, Plecoptera, Scorpionida; Brewer's Sparrow: Acarina, Ephemeroptera, Neuroptera.

Volumetrically, Lepidoptera contributed most to the 2 sparrows' diets (Table 1). Araneans were important, particularly for Brewer's Sparrows, and dipterans and orthopterans contributed substantially to the total volume of the Sage Sparrow diet. Lepidoptera, Diptera, and Orthoptera composed much more of the sparrows' diets volumetrically than numerically. Conversely, hemipterans were numerically important, but contributed little to the total volume of the diets. Homopterans also were much less important volumetrically than numerically in the Brewer's Sparrow diet.

Lepidopterans are important nestling foods for many bird species in a broad range of habitats (e.g., Best 1977, Fischer and Bolen 1981, Gibb and Betts 1963, Pinkowski 1978, Royama 1970). This may reflect their abundance in the environment (e.g., Winter 1984, but see Meunier and Bédard 1984) and (or) the ease with which they (especially larvae) can be captured, prepared, and digested (Herlugson 1982). Interestingly, lepidopterans were unimportant in the nestling diets of Western Meadowlarks (*Sturnella neglecta*) (Orians and Horn 1969) and bluebirds (*Sialia* spp.) (Herlugson 1982) using habitats similar to that on our study site.

Wiens and Rotenberry (1979) and Rotenberry (1980) found that breeding adult Sage Sparrows in a Washington sagebrush community ate mostly coleopterans, orthopterans, and lepidopteran larvae. In a Montana sagebrush-grassland, adult Brewer's Sparrows ate primarily hemipterans, coleopterans, and orthopterans (Best 1972). Adults may avoid feeding their young some food groups they eat themselves (e.g., Coleoptera) and selectively feed nestlings others (e.g., Araneae). It should

be noted, however, that arthropod availability in Washington and Montana may have been much different from that on our site. Evans (1964) documented diets for both adults and nestlings of 3 sparrow species in Michigan and showed that nestlings consumed significantly more araneans, lepidopterans, and dipterans than did adults.

We did not sample available arthropods, but Winter (1984) did so in 1983 on a partly burned site 1 km from our study area. In general, the occurrence of most taxa in the nestling diets we sampled was proportional to availability on Winter's site. But Araneae, a major nestling food group, contributed little to Winter's samples, whereas Hymenoptera, a minor food, contributed greatly. Thus, Sage and Brewer's sparrows may have selectively used araneans and avoided hymenopterans.

Most items fed to Sage and Brewer's sparrow nestlings were small (SS:  $\bar{x} = 0.046 \pm 0.070 \text{ cm}^3$ , range = 0.001–0.420; BS:  $\bar{x} = 0.023 \pm 0.035$ , range = 0.001–0.280); 73% of all Sage Sparrow and 87% of all Brewer's Sparrow food items were less than  $0.05 \text{ cm}^3$ . That Sage Sparrows took larger foods than Brewer's Sparrows ( $t = 7.0$ ,  $df = 1225$ ,  $P < 0.001$ ) is not surprising because adults and young of the former are larger (Petersen et al. 1986, Wiens and Rotenberry 1980). The smallest items used by Sage Sparrows, however, were as small as those taken by Brewer's Sparrows, again indicating greater generalization in the former.

*Annual variation.*—The taxonomic composition of Sage Sparrow nestling diets varied significantly among years ( $\chi^2 = 66.0$ ,  $df = 27$ ,  $P < 0.001$ , Fig. 1). The contributions of the numerically dominant orders (Araneae, Lepidoptera, Hemiptera, Homoptera) to the diet were relatively constant from year to year, accounting for only 15% of the overall chi-square statistic. Variations in Diptera, Orthoptera, Psocoptera, and Coleoptera contributed 69% of the chi-square statistic. Brewer's Sparrow diet composition also varied significantly annually ( $\chi^2 = 41.3$ ,  $df = 27$ ,  $P = 0.04$ , Fig. 1), but changes in Psocoptera alone accounted for 52% of the chi-square value. Of the remaining orders, only Homoptera (10%) contributed more than 8%. Thus, although both species' diets fluctuated annually, most of the variation occurred in orders of little importance, and supplies of major foods probably were quite constant from year to year. Possible exceptions might have been the contributions of Diptera and Orthoptera (volumetrically important foods) to Sage Sparrow diets.

The dietetic variations that did occur likely resulted from yearly fluctuations in availabilities of the arthropod taxa such that the sparrows opportunistically exploited temporarily abundant foods (see also Meunier and Bédard 1984, Pitts 1978, Wiens and Rotenberry 1979). Walsh (1978) and Pinkowski (1978) believed annual dietetic variations to be related to climatic fluctuations. In particular, Pinkowski noted that the occurrence of some orders in nestling Eastern Bluebird (*Sialia sialis*) diets seemed to be inversely (Orthoptera) or directly (Lepidoptera) related to precipitation. We found no significant relationships between April–July precipitation and the occurrence of any arthropod order in the sparrows' diets (National Oceanic and Atmospheric Administration 1980–1983).

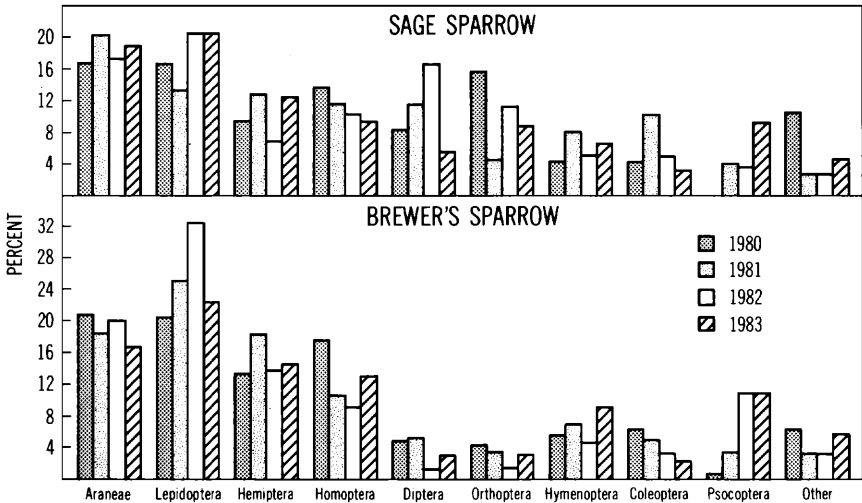


FIGURE 1. Annual variation in composition of nestling sparrow diets. Each bar represents the contribution of a given order to the total number of items (see Table 1) collected in a given year. For 1980, 1981, 1982, and 1983, respectively,  $N = 95, 223, 157,$  and  $212$  items for the Sage Sparrow;  $N = 192, 142, 65,$  and  $139$  items for the Brewer's Sparrow.

But mean April–July temperature was positively correlated with the contribution of Homoptera (Pearson  $r = 0.98$ ,  $df = 2$ ,  $P = 0.02$ ) to the total number of items in the Sage Sparrow diet and with the contributions of Diptera ( $r = 0.95$ ,  $df = 2$ ,  $P = 0.05$ ) and Orthoptera ( $r = 0.95$ ,  $df = 2$ ,  $P = 0.05$ ) to the Brewer's Sparrow diet. The occurrence of Psocoptera in Brewer's Sparrow foods was negatively related to mean April–July temperature ( $r = -0.98$ ,  $df = 2$ ,  $P = 0.02$ ).

Mean size of nestling food items differed significantly among years for Sage Sparrows [ $F(3, 692) = 2.9$ ,  $P = 0.03$ ; Table 2], but not for Brewer's Sparrows [ $F(3, 537) = 0.6$ ,  $P = 0.60$ ]. Sage Sparrow food items were largest in 1980, possibly reflecting the relatively strong contribution of orthopterans to the diet that year (Fig. 1). Orthopterans were, on the average, the largest foods eaten. Additionally, some of the annual variation in Sage Sparrow food size likely was attributable to weather; mean food item size was highly correlated with mean April–July temperature ( $r = 0.99$ ,  $df = 2$ ,  $P = 0.01$ ).

*Seasonal variation.*—Taxonomically, Sage Sparrow nestling diets varied significantly among semimonthly periods (1–15 June, 16–30 June, etc.) of the breeding season ( $\chi^2 = 76.8$ ,  $df = 27$ ,  $P < 0.001$ ; Fig. 2). Araneae and Lepidoptera, the 2 dominant orders in the diet, varied little seasonally, accounting for only 2% of the total chi-square. Diet components varying most were Diptera, Orthoptera, Coleoptera, Hemiptera, and Psocoptera (77% of the total chi-square). The seasonal increase in

TABLE 2. Annual variation in the size (cm<sup>3</sup>) of nestling Sage and Brewer's sparrow food items.

Year	Sage Sparrow			Brewer's Sparrow		
	N <sup>a</sup>	$\bar{x} \pm SD$	Range	N	$\bar{x} \pm SD$	Range
1980	98	0.059 $\pm$ 0.074 A <sup>b</sup>	0.002-0.400	195	0.022 $\pm$ 0.030 A	0.002-0.200
1981	222	0.053 $\pm$ 0.084 AB	0.002-0.420	134	0.030 $\pm$ 0.051 A	0.002-0.280
1982	152	0.040 $\pm$ 0.058 B	0.001-0.400	66	0.015 $\pm$ 0.019 A	0.002-0.100
1983	224	0.038 $\pm$ 0.058 B	0.001-0.370	146	0.020 $\pm$ 0.027 A	0.001-0.200

<sup>a</sup> Number of food items collected. The occurrence of a particular food size in a collection was considered as 1 item.

<sup>b</sup> Means in the same column followed by different letters are significantly different (Duncan's multiple range test).

Orthoptera is consistent with the pattern documented by others (e.g., Best 1977, Fischer 1983, Maher 1979, Pitts 1978). In the studies of Pitts and Maher, increases in availability paralleled dietetic increases, but Fischer recorded a late-season decline in Orthoptera availability. Brewer's Sparrow diets did not vary significantly throughout the breeding season ( $\chi^2 = 25.9$ ,  $df = 18$ ,  $P = 0.10$ ), but virtually all Brewer's Sparrow nesting was completed before late July. Thus, within a given breeding season, the supply of potential foods likely was more constant for Brewer's than for Sage Sparrows.

Despite the taxonomic shifts in nestling Sage Sparrow diets, food item size remained nearly constant throughout the breeding season [ANOVA among semimonthly periods:  $F(3, 692) = 0.6$ ,  $P = 0.60$ ]. Similarly, Brewer's Sparrow foods did not vary significantly in size among the semimonthly periods [ $F(2, 538) = 1.6$ ,  $P = 0.21$ ].

*Effects of nestling age and brood size.*—Changes in diet composition as nestlings age have been documented often (e.g., Best 1977, Meunier and Bédard 1984, Pinkowski 1978). We found significant, overall dietetic shifts with age for Sage Sparrow nestlings ( $\chi^2 = 46.4$ ,  $df = 27$ ,  $P = 0.01$ ; Fig. 3) but not for Brewer's Sparrows ( $\chi^2 = 29.8$ ,  $df = 27$ ,  $P = 0.36$ ). Only the contributions of araneans and dipterans to the Sage Sparrow diet varied greatly, however; araneans decreased sharply in the food of the oldest nestlings, whereas dipterans increased gradually as nestlings aged. These variations did not result from seasonal change in diets because the average age of nestlings sampled in late July ( $3.9 \pm 2.3$  d old,  $N = 88$ ) was not statistically different from that of nestlings sampled in early June ( $3.6 \pm 2.1$  d,  $N = 143$ ;  $t = 1.0$ ,  $P = 0.33$ ).

Shifts in nestling diet with age often may be attributed to changing requirements of the developing young, as, for example, with the onset of endothermy (Breitwisch et al. 1984). The reduction in araneans fed to older nestling Sage Sparrows is of particular interest because a similar trend has been noted for several other species (Best 1977, Betts 1955, Pinkowski 1978, Pitts 1978, Royama 1970). Moreover, although the diet

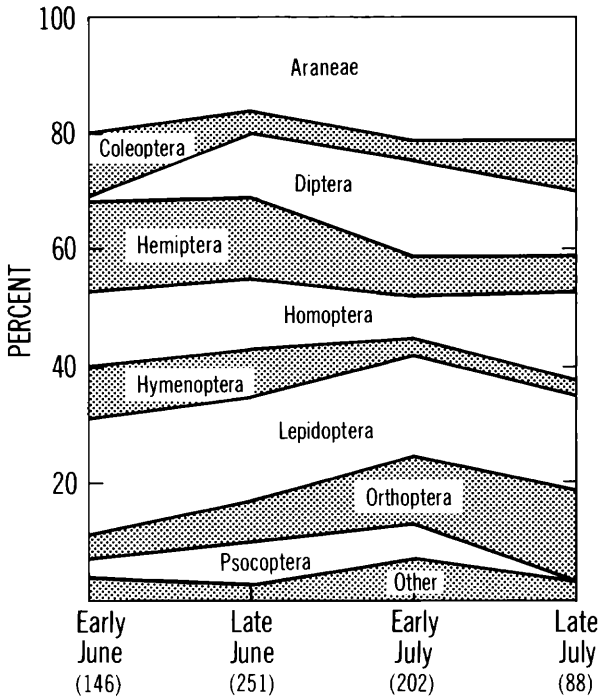


FIGURE 2. Seasonal variation in composition of nestling Sage Sparrow diets. The figure presents contributions of each order to the total number of items (see Table 1) collected (in parentheses) in a given semimonthly period (1-15 June, 16-30 June, etc.).

of Brewer's Sparrow nestlings did not vary overall with nestling age, variations in the contribution of araneans to the diet (0-1 d old nestlings, 28% araneans; 2-3 d, 18%; 4-5 d, 18%; > 5 d, 7%) approached statistical significance ( $\chi^2 = 7.1$ ,  $df = 3$ ,  $P = 0.07$ ). Royama (1970) suggested that spiders might have special nutritional value of particular importance for early nestling growth. Pinkowski (1978) noted that spiders generally are small, have soft abdomens, and lack coarse appendages, thereby facilitating feeding them to young nestlings.

Biermann and Sealy (1982) and Meunier and Bédard (1984) were able to demonstrate a significant effect of brood size on diet composition in Yellow Warbler (*Dendroica petechia*) and Savannah Sparrow (*Passerculus sandwichensis*) nestlings, respectively. In contrast, we found no significant variation among broods of 2, 3, and 4 in taxonomic composition of diets (SS:  $\chi^2 = 15.0$ ,  $df = 18$ ,  $P = 0.64$ ; BS:  $\chi^2 = 23.7$ ,  $df = 18$ ,  $P = 0.20$ ).

For Brewer's Sparrows, the effect of nestling age on the size of food items was significant (Table 3); older nestlings ate larger foods (0-1 d old:  $\bar{x} = 0.013 \pm 0.012$  cm<sup>3</sup>,  $N = 85$  items; 2-3 d:  $\bar{x} = 0.018 \pm 0.024$ ,

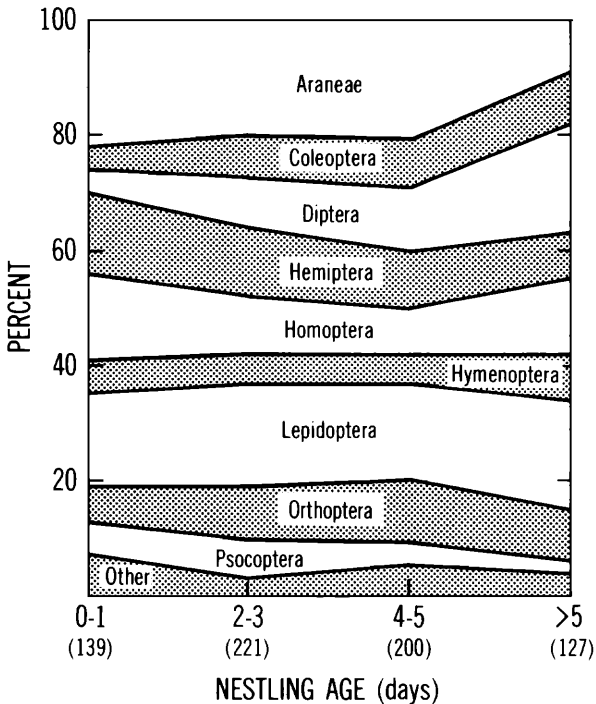


FIGURE 3. Effects of nestling age on composition of nestling Sage Sparrow diets. The figure presents contributions of each order to the total number of items (see Table 1) collected (in parentheses) for a given age interval.

$N = 209$ ; 4-5 d:  $\bar{x} = 0.030 \pm 0.041$ ,  $N = 213$ ; >5 d:  $\bar{x} = 0.039 \pm 0.069$ ,  $N = 34$ ). Brood size, however, was not significantly related to food item size, nor did brood size interact statistically with age. For Sage Sparrows, food size was related to both nestling age and brood size, and the 2 factors interacted significantly (Table 3, Fig. 4). Food item size increased with nestling age for all brood sizes, although the effect was most pronounced for broods of 4. Mean food item size varied little among different-sized broods when nestlings were young (<4 d old). But for nestlings greater than 3 d old, broods of 4 ate substantially larger foods than those of 2 or 3 (4 vs. 3:  $t = 4.0$ ,  $df = 269$ ,  $P < 0.001$ ; 4 vs. 2:  $t = 2.2$ ,  $df = 140$ ,  $P = 0.03$ ; 3 vs. 2:  $t = 1.6$ ,  $df = 293$ ,  $P = 0.11$ ).

As nestlings develop, their greater metabolic demands must be met by increasing the quantity of food fed to them. Adults may increase the frequency of food deliveries (e.g., Johnson and Best 1982, Robins 1971, Royama 1966) and (or) supply larger food items (e.g., Betts 1955, Johnson et al. 1980, Pitts 1978, this study). Energetic considerations aside, young nestlings may not eat large foods simply because they are difficult to ingest (Best, pers. obs.; Meunier and Bédard 1984; Pitts 1978).



TABLE 3. Results of 2-way analyses of variance of nestling Sage and Brewer's sparrow food item<sup>a</sup> size in relation to nestling age and brood size.

Source	Sage Sparrow			Brewer's Sparrow		
	df	F	P	df	F	P
Nestling age	3	17.59	<0.001	3	4.65	0.003
Brood size	2	4.18	0.016	2	0.04	0.964
Age × brood size	6	3.75	0.001	6	1.70	0.119
Residual	684			529		

<sup>a</sup> The total number of food items was determined as in Table 2.

Adult sparrows continued to feed their young some very small items throughout the nestling period; the minimum food size was either 0.001 or 0.002 cm<sup>3</sup> for each age class of each species (see also Best 1977, Betts 1955, Johnson et al. 1980). Best suggested that feeding small foods may persist from foraging habits or searching images developed early in the nestling period, may result from opportunistic foraging where small foods are plentiful, or may be due to certain nutritional needs satisfied only by small items.

As with greater nestling age, larger broods require adults to make more foraging trips (e.g., Johnson and Best 1982) or to procure larger foods (e.g., Meunier and Bédard 1984). The increased requirements of larger Brewer's Sparrow broods probably were satisfied by adjusting feeding frequency. Best (1977) documented this for the Field Sparrow (*Spizella pusilla*), a congener of the Brewer's Sparrow. Similarly, for young Sage Sparrow nestlings, the increased demands of large broods likely can be met by increasing feeding rate. But the combination of older nestlings and large brood size in Sage Sparrows may represent a demand so great that food size as well as delivery rate must be increased.

*Effects of habitat alteration.*—A prescribed burn occurred on 2 of our study plots in September 1981. The fire produced a "fine-grained" mosaic of burned (approximately 45%) and unburned patches (Petersen and Best, in press) within which both sparrows continued to nest. We compared nestling diets on the 2 burned plots with those on the 2 unburned controls. The fire altered vegetation composition (Petersen and Best, in press) but did not significantly affect composition of the nestling diet (SS:  $\chi^2 = 14.4$ , df = 9,  $P = 0.12$ ; BS:  $\chi^2 = 4.9$ , df = 9,  $P = 0.83$ ) or mean size of food items (SS:  $t = 0.6$ , df = 374,  $P = 0.55$ ; BS:  $t = 1.4$ , df = 210,  $P = 0.17$ ). Winter (1984) documented substantial differences between the arthropod communities occupying burned and unburned patches on a nearby site after a similar fire. If such an effect occurred on our study area, one would expect fire to have influenced nestling diets as well. But Winter also found that adult Sage and Brewer's sparrows foraged extensively in unburned as well as burned patches. Foraging in unaltered habitat would lessen the impact of fire on nestling diets.

*Conclusions.*—Our results supplement those of many other nestling

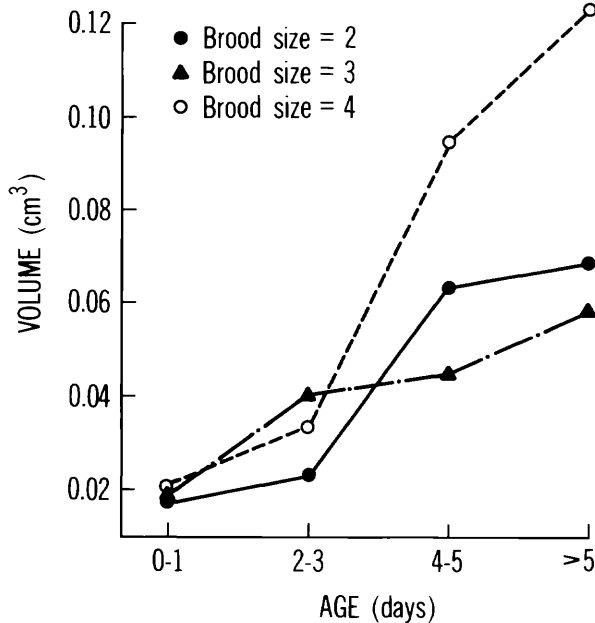


FIGURE 4. The relationship between Sage Sparrow nestling age and the mean size of nestling food items for 3 brood sizes. Average sample size is 58 items for the plotted means. The total number of items was determined as in Table 2.

food studies and add a dimension to our understanding of the breeding ecology of 2 common western passerines. Many factors can influence nestling diets; we documented annual, seasonal, nestling-age, and brood-size effects. Sage Sparrow nestling foods were related to all 4 of these factors, those of Brewer's Sparrows only to year and nestling age. Sage and Brewer's sparrow nestling diets are broad, and these species likely exploit most potential foods in an opportunistic fashion. However, certain groups (e.g., Araneae, Hymenoptera) may be selectively used or avoided. Future work should include measurements of the availability of arthropods as well as their occurrence in the diet. Some degree of opportunism is to be expected in a variable environment, but natural selection also might favor selective use of food types and sizes that best sustain nestling vigor and promote rapid growth.

#### SUMMARY

Diets of nestling Sage Sparrows and Brewer's Sparrows were sampled from 1980 through 1983 in a southeastern Idaho sagebrush community. Both species utilized a broad range of arthropod orders; Lepidoptera, Araneae, Hemiptera, and Homoptera dominated the diets. Diptera and Orthoptera also were important in Sage Sparrow diets. Taxonomic composition of Sage Sparrow diets varied significantly from year to year and seasonally within years; Brewer's Sparrow diets varied annually but not

seasonally. Size of items fed to nestlings varied significantly among years for Sage Sparrows but not for Brewer's Sparrows. As nestlings of both species grew, they were fed fewer araneans; also, older nestlings ate larger items. Brood size did not influence taxonomic composition of diets, but, late in nestling development, broods of 4 Sage Sparrow young were fed larger items than smaller broods. A prescribed fire, which altered a portion of the study area, did not affect diet composition or food size.

#### ACKNOWLEDGMENTS

We thank Paul Sievert and Linda Erickson-Eastwood for assisting with field work and Sharon Nordman for helping identify arthropods. Edward H. Burt Jr., John T. Rotenberry, and an anonymous reviewer provided helpful comments on an earlier draft of the manuscript. This study was supported by the Office of Health and Environmental Research, U.S. Department of Energy, and is a contribution from the INEL Radioecology-Ecology Program. Funds were administered through the Iowa Cooperative Wildlife Research Unit, U. S. Fish and Wildlife Service. This is Journal Paper No. J-11990 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa, Project No. 2468.

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## NOTES AND NEWS

The **NORTH AMERICAN LOON FUND (NALF)** announces the availability of two grant programs for support of new or current research, management, or education projects that may yield useful information for Common Loon conservation in North America.

The first of these programs, the Robert J. Lurtsema Research Award, consists of a \$1000 stipend available annually for a suitable research project focused on a member of the Family Gaviidae. Preference will be given to students and independent researchers with limited availability of other funding.

The second program offers modest grants in support of research, management, or educational projects directly related to the conservation of Common Loons as a breeding species. Proposals in the range of \$500 to \$3000 are most likely to be considered for funding.

Further guidelines for prospective applicants are available upon request from the NALF Grants Committee. Deadline for submission of proposals is **January 31, 1987**. Funding awards will be announced by March 15th.

Please submit guideline requests to:

*North American Loon Fund Grants Committee  
North American Loon Fund  
Main St.  
Meredith, NH 03253*