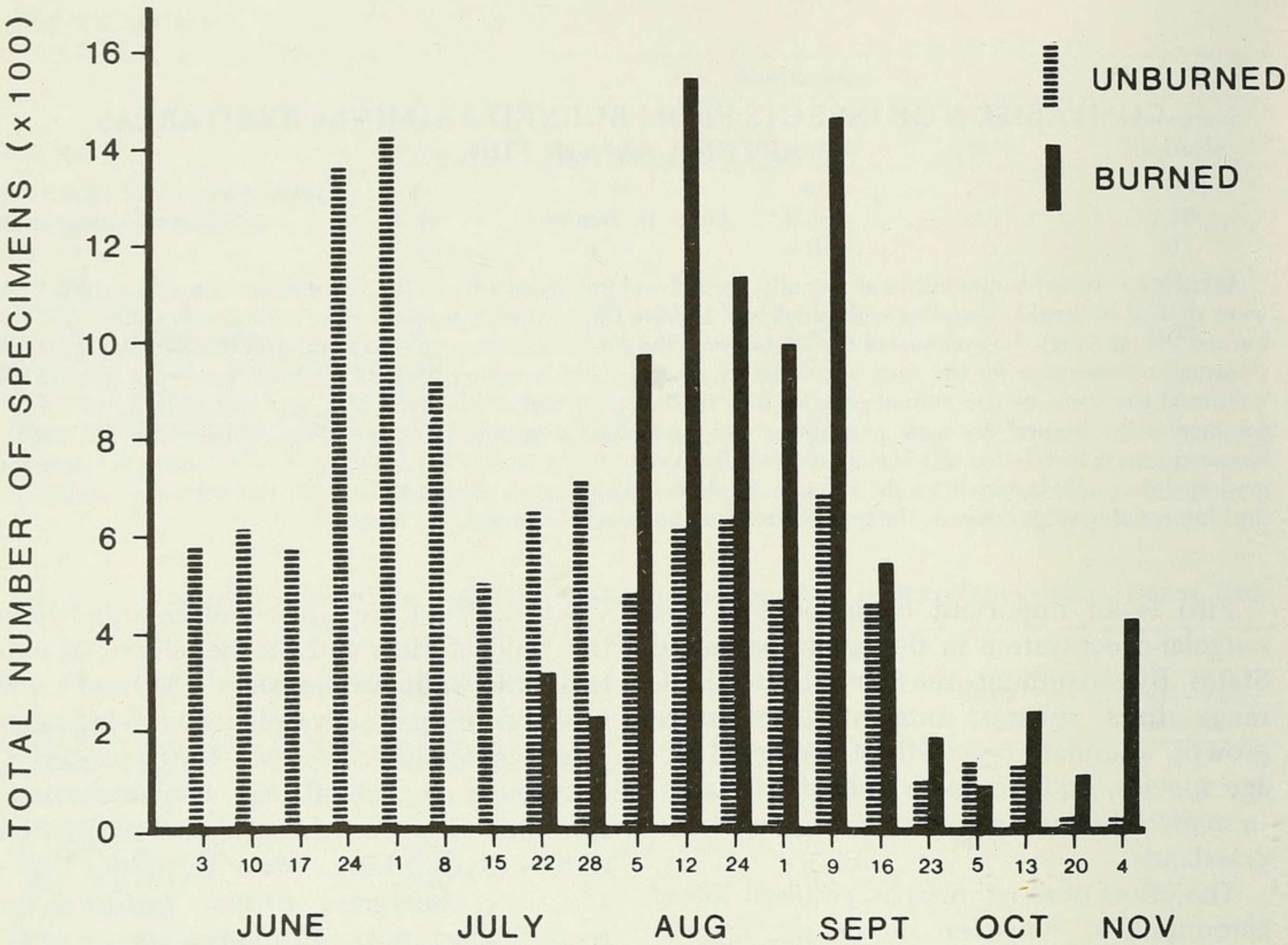

Fig. 1. The number of specimens in weekly Malaise trap collections from unburned site and burned sites in Box Elder County, Utah, during 1983.

terial, square in configuration with four central vanes, and each topped with a clear acrylic collecting tube. The traps were purchased from BioQuip Products (P. O. Box 61, Santa Monica, California 90406).[2] A trap was placed in the grassy area of the unburned site and another at the burned site.

Pitfall traps were used to sample ground inhabiting insects. The trap, similar to that described by Morrill (1975), was composed of a 4-oz plastic cup that collected specimens that fell through a funnel made of a 7-oz tapered plastic cup with the bottom cut out. This whole unit was housed in a 16-oz plastic cup and buried to surface level. At the unburned site, seven traps were arranged on a linear transect ca 20 m apart in the shrubby area; additional pitfalls were placed under and near the Malaise trap. At the burned site, 10 traps were ca 10 m apart along a linear transect near the Malaise trap.

Specimens from Malaise and pitfall traps were collected weekly from the establishment of study sites until 4 November 1983. Collections were not made during the weeks of 19 August and 27 October because of severe rain.

Insects were identified at least to the family level and separated by morphospecies (Janzen and Schoener 1968, Allan et al. 1975). Genus and, when possible, species were determined for abundant specimens. Moths could not be segregated into families because of the poor condition of samples from the Malaise traps.

RESULTS

Althought the fire severely damaged vegetation, regrowth was evident by 29 July. In early September cheatgrass was plentiful and averaged ca 5 mm in height; sagebrush and rabbitbrush also recovered. In the following months, western wheatgrass became the dominant grass for the remaining sampling period.

Collection data from the Malaise traps showed that the number of specimens col-

[2]Mention of trade name is for identification only and does not imply an endorsement to the exclusion of other products that may be suitable.

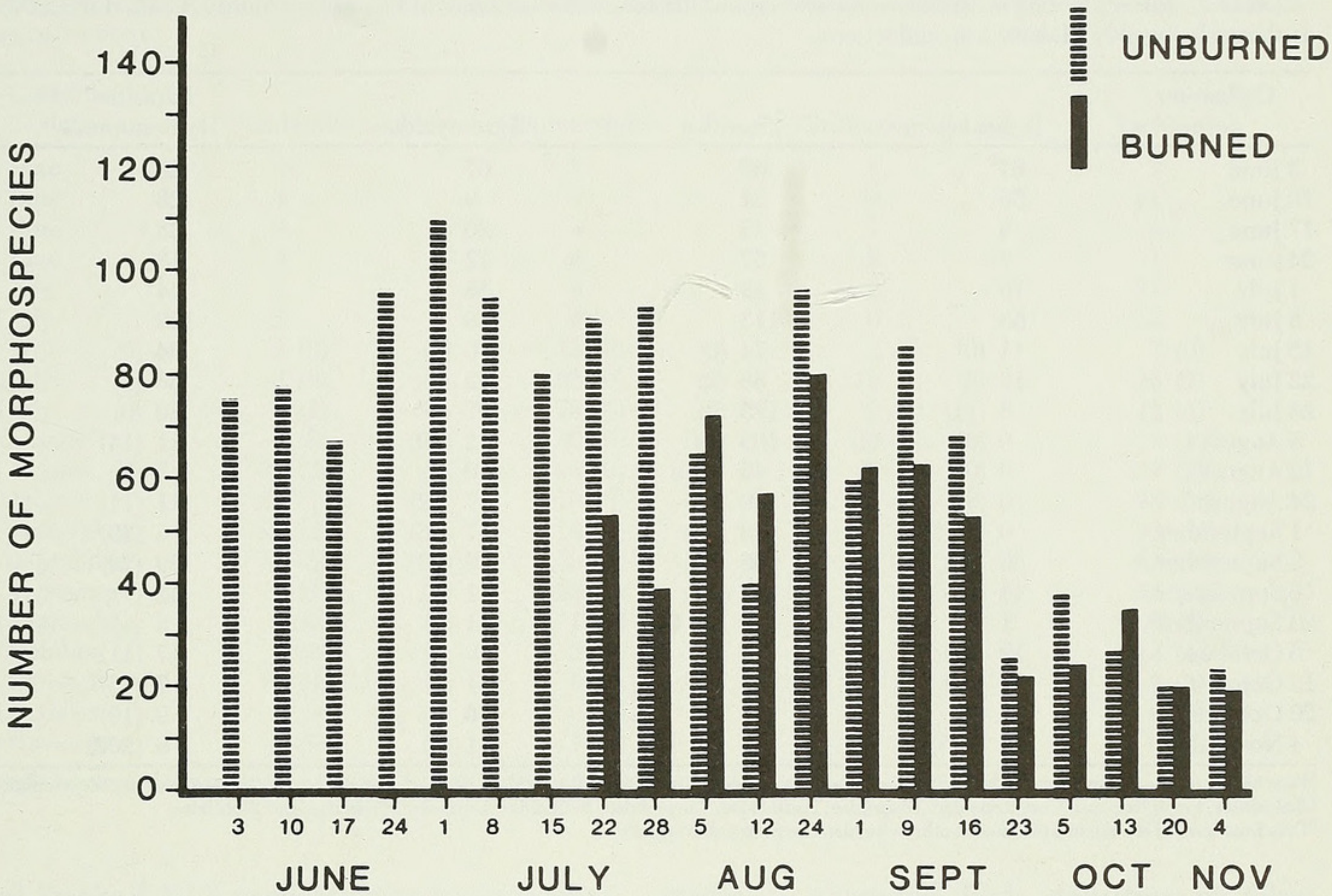

Fig. 2. The number of morphospecies identified from weekly Malaise trap collections either from an unburned site or a burned site in Box Elder County, Utah, during 1983.

lected at the unburned site peaked during the last two weeks in June and was higher than the burned site in the first two collections after the fire (Fig. 1). More specimens were consistently collected at the burned site, with the greatest amount in August and September. Numbers declined from mid-September through the fall.

Nearly all the specimens collected by the Malaise traps were adults from the winged orders (Homoptera, Hemiptera, Lepidoptera, Diptera, and Hymenoptera). Abundant families, however, were arranged by species. The number of species collected at the unburned site remained about the same before and three weeks after the fire (Fig. 2). Similar numbers of species were then collected at the burned site from August onward. Numbers at both sites decreased during fall.

To determine site preference, the collection data were grouped taxonomically. Most specimens were sorted to family only because of insufficient numbers at the morphospecies level. Abundant families, however, were arranged by species. Although Malaise traps were not intended to measure population density, they do indicate relative abundance. Major families, determined by the number of specimens, were grouped into three classes: those showing no preference or those clearly preferring either of the sites. Hymenoptera were clumped into two groups. Parasitic Hymenoptera contained Braconidae, Ichneumonidae, Mymaridae, Eulophidae, Encyrtidae, Eupelmidae, Eucharitidae, Pteromalidae, Eurytomidae, Chalcididae, Proctotrupidae, Ceraphronidae, Diapriidae, Scelionidae, Chrysididae, Bethylidae, Dryinidae, Tiphiidae, and Mutillidae. Predaceous Hymenoptera contained mainly pompilid and sphecid wasps.

Insects having no site preference were Sciaridae (mostly *Lycoriella* spp.), four unidentified species of Phoridae, 16 species of Agromyzidae, and many parasitic Hymenoptera (Table 1). Those preferring the unburned site were 15 species of Bombyliidae, 3 species of Pipunculidae (most were *Pipunculus* sp. and *Prothecus* sp.), 6 species of Chamaemyiidae, and 39 species of Tachinidae (with *Hyalomya aldrichii* Townsend and *Paradidyma singularis* Townsend the most

TABLE 1. Insects having no preference between unburned and burned sites in Box Elder County, Utah, during 1983 as shown by weekly Malaise trap collections.

Collection date	Sciaridae	Phoridae	Agromyzidae	Parasitic[1] Hymenoptera
3 June	67[2]	68	67	26
10 June	55	31	9	28
17 June	5	15	20	38
24 June	7	57	72	18
1 July	70	48	58	74
8 July	53	113	39	159
15 July	11 (0)	74 (0)	0 (0)	34 (0)
22 July	16 (2)	88 (2)	43 (3)	38 (8)
28 July	6 (11)	125 (3)	97 (4)	20 (0)
5 August	0 (0)	109 (48)	12 (10)	11 (14)
12 August	0 (0)	45 (140)	0 (0)	5 (8)
24 August	0 (9)	109 (60)	7 (12)	11 (11)
1 September	6 (6)	19 (36)	17 (46)	6 (39)
9 September	80 (65)	56 (25)	9 (23)	29 (29)
16 September	44 (5)	22 (41)	1 (6)	42 (7)
23 September	1 (6)	0 (0)	11 (2)	8 (4)
5 October	19 (12)	0 (0)	0 (0)	17 (11)
13 October	37 (45)	0 (0)	1 (0)	7 (76)
20 October	3 (3)	1 (2)	0 (0)	9 (19)
4 November	4 (175)	1 (4)	1 (1)	6 (202)

[1]Parasitic Hymenoptera are Braconidae, Ichneumonidae, Mymaridae, Eulophidae, Encyrtidae, Eupelmidae, Eucharitidae, Pteromalidae, Eurytomidae, Chalcididae, Proctotrupidae, Ceraphronidae, Diapriidae, Scelionidae, Chrysididae, Bethylidae, Dryinidae, Tiphiidae, and Mutillidae.
[2]Data from burned site are in parentheses; otherwise, data are from unburned site.

common) (Table 2). Insects that preferred the burned site were Lygaeidae (almost all were the false chinch bug, *Nysius raphanus* Howard, plus some western bigeyed bugs, *Geocoris pallens* Stål), 31 species of Cicadellidae (dominated by *Empoasca aspera* Gillette & Baker, *Dikraneura carneola* [Stål], and *Parabolocratus viridis* Uhler), moths (mainly *Euxoa* spp., other Noctuidae, and microlepidopterans), three species of Culicidae [*Aedes dorsalis* (Meigen), *Culiseta inornata* (Williston), and *Culex tarsalis* (Coquillett)], and two families of predaceous wasps (Pompilidae and Sphecidae) (Table 3).

Specimens of certain families were collected in sufficient numbers to denote seasonal trends in adult abundance. Leafhoppers (Table 3) reached the highest levels at the end of June, decreased throughout the summer, but then increased at the burned site during the first week of September. Bombyliids (Table 2) were very rare until August, when numbers increased dramatically at the unburned site and remained at abundant levels through the first part of September. Phorids (Table 1) generally maintained their highest levels at the unburned site through July and August, although fewer were collected at the other site during this period. Chamaemyiids (Table 2) increased rapidly through July to peak at the end of August, then were gone by the end of September. Agromyzids had the highest peak in late July at the unburned site, then another lesser peak at the burned site during the last week of August.

Flying insects collected from pitfall traps were disregarded and only ground dwellers recorded. Specimens from the first collection at the burned site included *Stenopelmatus fuscus* Haldeman (Orthoptera: Gryllacrididae), several species of carabids, *Acmaeodera immaculata* Horn (Coleoptera: Buprestidae), some tenebrionids (mainly *Eleodes* spp.), and ants. Silphids (mostly *Nicrophorus* spp.) were taken two weeks later. All except *S. fuscus* and *A. immaculata* were also collected at the unburned site.

DISCUSSION

Malaise traps were not designed to accurately estimate population densities. The traps are valuable, however, in detecting relative abundance, seasonal changes in numbers, species diversity, and flight activity and efficiently obtaining specimens of major pterygote orders (Evans and Owen 1965, Matthews and Matthews 1971). Cancelado

TABLE 2. Insects preferring the unburned site in Box Elder County, Utah during 1983 as shown by weekly Malaise trap collections.

Collection date	Bombyliidae	Pipunculidae	Chamaemyiidae	Tachinidae
3 June	6[1]	6	1	7
10 June	4	4	0	21
17 June	0	4	1	6
24 June	3	4	1	11
1 July	0	2	1	21
8 July	2	0	0	13
15 July	2 (0)	15 (0)	2 (0)	7 (0)
22 July	3 (0)	103 (0)	19 (2)	36 (3)
28 July	8 (1)	78 (0)	0 (0)	12 (5)
5 August	9 (0)	30 (0)	30 (3)	7 (17)
12 August	32 (2)	34 (0)	0 (0)	97 (2)
24 August	24 (17)	10 (0)	43 (2)	28 (56)
1 September	18 (2)	16 (0)	0 (1)	95 (26)
9 September	18 (5)	19 (0)	1 (4)	64 (15)
16 September	4 (2)	55 (0)	21 (1)	61 (17)
23 September	0 (0)	1 (1)	1 (0)	9 (8)
5 October	0 (0)	3 (0)	0 (0)	13 (4)
13 October	0 (0)	0 (0)	0 (0)	2 (3)
20 October	0 (0)	0 (0)	0 (0)	0 (0)
4 November	0 (0)	1 (0)	0 (0)	0 (0)

[1]Data from burned site are in parentheses; otherwise, data are from unburned site.

and Yonke (1970) used Malaise traps to measure taxonomic differences in insect communities between burned and unburned areas of a Missouri prairie.

Malaise trap data from the unburned site showed seasonal patterns of adult insects (Fig. 2). Although more species were found at the end of June, the number of species fluctuated moderately at both sites, then decreased in mid-September. Seasonal environmental changes influenced species abundance. Grasses completed flowering by July and started senescing later that month, thus reducing the food supply for grass-feeding insects. Rabbitbrush, which started to bloom at the end of August and retained flowers until mid-October, provided food for many insects during the last part of the season. Evans and Murdoch (1968), by sampling a Michigan grassland with sweep nets and a Malaise trap, related the period of maximum species to the greatest availability of flowers. Food sources required to maintain the species richness level during midsummer were not apparent.

The largest weekly collections were from the burned site (Fig. 1). Many specimens were potential herbivorous colonizers (Table 3). Large numbers of false chinch bugs, which attack forbs and shrubs, may characterize areas disturbed by fire. In the same year as this study, I observed high densities of false chinch bugs (estimated at greater than 200 insects/m^2) after a large range fire (ca 4,400 ha) in Skull Valley, Utah. Cancelado and Yonke (1970) also reported collecting significantly more lygaeids from a burned area, but they did not identify the species.

Most leafhoppers were found just before the fire; numbers peaked again at the burned site the first week of September. At their grassland site, Murdoch et al. (1972) collected the largest number of Homoptera in June and July and found that insect diversity was highly correlated with both plant diversity and plant structure. Hawkins and Cross (1982), however, found no correlation between plant community parameters and insect diversity on reclaimed coal mine spoils in Alabama even though insect species richness seemed related to the densities of several plant species.

After the fire, more leafhoppers were collected from the burned site; other researchers reported similar observations (Cancelado and Yonke 1970, Nagel 1973). Major leafhoppers *D. carneola* and *P. viridus* were probably grass feeders (Thomas and Werner 1981), whereas *E. aspera* probably attacked forbs and shrubs. Hewitt and Burleson (1976) frequently found *D. carneola* on unburned rangeland in Montana.

TABLE 3. Insects preferring the burned site in Box Elder County, Utah, during 1983 as shown by weekly Malaise trap collections.

Collection date	Lygaeidae	Cicadellidae	Lepidoptera	Culicidae	Predaceous[1] Hymenoptera
3 June	0[2]	27	42	0	0
10 June	0	122	93	0	0
17 June	1	208	104	0	0
24 June	4	881	34	0	0
1 July	2	922	24	2	1
8 July	2	234	38	4	1
15 July	4 (0)	194 (0)	18 (0)	0 (0)	6 (0)
22 July	0 (0)	145 (19)	34 (94)	1 (123)	4 (6)
28 July	4 (2)	122 (56)	91 (2)	3 (94)	11 (0)
5 August	15 (324)	73 (203)	23 (174)	0 (7)	2 (33)
12 August	67 (1040)	100 (63)	101 (98)	0 (0)	3 (42)
24 August	148 (451)	53 (239)	36 (134)	1 (9)	3 (16)
1 September	37 (91)	94 (127)	43 (481)	61 (77)	1 (6)
9 September	154 (263)	107 (291)	40 (445)	19 (239)	8 (2)
16 September	36 (153)	79 (95)	33 (129)	6 (48)	2 (6)
23 September	10 (33)	23 (54)	9 (60)	1 (0)	0 (1)
5 October	11 (25)	25 (20)	2 (5)	0 (1)	0 (0)
13 October	21 (49)	11 (2)	5 (17)	0 (2)	0 (0)
20 October	1 (44)	1 (2)	2 (5)	0 (9)	0 (0)
4 November	1 (5)	0 (2)	2 (3)	0 (9)	0 (0)

[1]Predaceous Hymenoptera are Pompilidae and Sphecidae.
[2]Data from burned site are in parentheses; otherwise, data are from unburned site.

Many of the moths taken at the burn site were *Euxoa* spp. The larvae, called cutworms, have a wide host range yet are rarely encountered because they inhabit soil.

Agromyzids were common at both sites (Table 1). They are an important component of rangeland because their larvae mine leaves and stems of grasses, forbs, and shrubs. Yet, agromyzids were at the burn site even though vegetation was poorly developed when the flies were collected.

Parasitic hymenopterans were regularly collected at both sites. Chalcids were never abundant, yet they represented ca 30 species in eight families. Mutillids, external parasites of larvae and pupae of various wasps and bees, were collected more often at the burned site. Later in the season, braconids and ichneumonids also were more common at the burned site; they parasitize caterpillars, beetle and sawfly larvae, maggots, various bugs, aphids, spiders, and other wasps. Other hymenopterans more abundant in the burned site were pompilids, which are spider-hunting wasps, and sphecids, which are predators of aphids, bugs, grasshoppers, planthoppers, leafhoppers, flies, caterpillars, beetles, bees, and spiders. Adults of all these entomophagous wasps are attracted to flowers. Flowers, prey, and potential hosts presumably were scarce at the burned site, yet wasps were common there.

Pipunculids were found only at the unburned site (Table 2). Their larvae are solitary internal parasites of nymphs and adults of Homoptera, particularly leafhoppers. Nevertheless, the burned site Malaise trap collections contained many potential hosts. Pipunculid biology, however, is poorly known and factors other than food supply may have influenced the flies to avoid the burned area. These flies may be good indicators of undisturbed areas because they were consistently absent from the burned site.

Cursorial insects were collected with pitfall traps. Although pitfall traps are limited in effectiveness (Greenslade 1964, Luff 1975), they have been successfully used to collect and compare surface arthropods from different sites (Fitcher 1941, Morrill 1975). The traps indicate that ants and ground-dwelling beetles survived the fire, probably escaping the heat by being below the ground surface. The fire did not destroy all organic material, such as brome seeds, so that food resources were available for ants to maintain their colonies and for the polyphagous beetles. Other studies have verified that ground insect populations are unharmed by fire or changes in vegetative architecture. Rice (1932) collected more ants on burned prairie in Illinois than on nearby control sites. Removal of shrubs from a shrub-steppe site in Wyoming did not adversely affect the abundance of tenebrionids and carabids (Parmenter and MacMahon 1984).

The collection data suggested that *A. immaculata* is attracted to stressed environments because specimens were only found in pitfall traps on the burned site. Many buprestid species are sensitive to smoke and heat, and the beetles may have been attracted by volatiles from burned winterfat, the host plant for the larvae. Furthermore, larvae may survive by feeding on the roots of damaged plants.

Pitfall traps commonly collected two other types of insects. Silphids may have entered pitfall traps to feed on the dead bodies of other insects. No apparent reason explained why the omnivorous Jerusalem crickets, *S. fuscus*, were not collected at the unburned site.

The present study raises several questions about the relationship between fire and the insect community. For example, why were so many predaceous and parasitic hymenopterans in the burned area (Table 3), especially when so few flowers and, presumably, potential hosts were present? Why did parasitic flies avoid the burned site that contained abundant potential hosts? Some groups, particularly leafhoppers and moths, apparently are attracted to burned areas, but unfortunately their means of orientation are not well known. Although only adults were examined in this study, this is the main life stage at which many insects disperse into various habitats.

Although fire is a common management tool for rangeland, this study raises important considerations of its use. Herbivorous insects seem very attracted to burned sites, yet their natural enemies, particularly parasitic flies, avoid those locations. Consequently, vegetative regrowth is highly susceptible to plant feeders and may be so severely stressed as to inhibit stand reestablishment. The abundance of insect herbivores also presents a danger to reseeding programs. Young vegetation is often highly susceptible to insect herbivory. Obviously, more research is needed to determine the long-term effects of range fires on insect and plant communities.

ACKNOWLEDGMENTS

Appreciation is extended to: D. C. Nielson, C. L. Nowak, and S. F. Parker for their assistance; W. J. Hanson, G. E. Bohart, and F. D. Parker for identifying specimens; and USDI, Bureau of Land Management for use of study sites.

This research was the result of cooperative investigations of the USDA-ARS and the Utah Agricultural Experiment Station, Logan, Utah 84322. Approved as Journal Paper No. 3027.

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SIZE, STRUCTURE, AND HABITAT CHARACTERISTICS OF POPULATIONS OF *BRAYA HUMILIS* VAR. *HUMILIS* (BRASSICACEAE): AN ALPINE DISJUNCT FROM COLORADO

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ABSTRACT.—Size, structure, and habitat characteristics were studied in three populations of *Braya humilis* var. *humilis* (C. A. Meyer) Robins. in Gray & Wats. (Brassicaceae), a small, herbaceous perennial of the alpine tundra in central Colorado. There was a significant association between numbers of reproductive, juvenile, and seedling individuals and population location. Plant size within reproductive, juvenile, and seedling size classes varied significantly among three populations. Plots containing *Braya* had significantly lower total plant cover, a different set of dominant plant species, more rock, bare ground, and less litter than plots without *Braya*. *Braya* appears to be restricted to calcareous substrates that experience a moderate level of disturbance, such as solifluction lobes and abandoned roads. Populations are small despite the existence of much potential habitat. Population studies are necessary for active conservation management of *Braya*.

Braya humilis var. *humilis* (C. A. Meyer) Robins. in Gray & Wats. (Brassicaceae) is a small, herbaceous perennial that occurs in the alpine tundra of the Rocky Mountains in central Colorado. It is a rare taxon, disjunct from its nearest relatives in Canada by approximately 1,600 km. The isolated populations in Colorado were previously treated by Rollins (1953) as *B. humilis* ssp. *ventosa*. However, recent monographic work by Harris (1985), based on greenhouse and common garden studies, indicates that the Colorado plants should be treated with *B. humilis* var. *humilis*. In North America *Braya humilis* var. *humilis* occurs from Alaska, south through the northern Rocky Mountains to Alberta and British Columbia, north through the western Canadian Arctic Archipelago, east to Greenland, Newfoundland, Anticosti Island, Vermont, and the north shore of Lake Superior (Harris 1985). Colorado populations of *B. humilis* may represent isolated relicts left behind on small areas of calcareous alpine habitat as glaciers retreated about 12,000 years before present (Harris 1985). Hereinafter, *Braya* will refer to *Braya humilis* var. *humilis*.

In Colorado, *Braya* is restricted to calcareous soils derived from Paleozoic rock formations such as the Mississipian Leadville Limestone and Ordovician Manitou Dolomite (Tweto 1974). The plant commonly grows in association with *Dryas octopetala*, *Carex rupestris*, and *Kobresia myosuroides* on exposed slopes without late-lying snowbanks. It is often found growing in solifluction lobes, on low-angle scree slopes, and on gravel with minor amounts of soil movement, but it also grows on man-made disturbances such as old mining roads and prospects.

In Colorado, *Braya* is known to exist only in 19 small isolated populations at 12 general locations in the Mosquito, Ten Mile, Elk, and Collegiate ranges. At nearly all of its known occurrences in Colorado, *Braya* populations are small despite the existence of much apparent potential habitat. Approximately 3,900 individuals exist in Colorado, based on estimates for each known population. It is a taxon of special concern in Colorado (O'Kane 1986) and is currently a candidate for listing (Category 2) by the U.S. Fish and Wildlife Service under the Endangered Species Act (Fay 1985).

Counts of one population west of Hoosier Pass, Colorado, have varied greatly, suggesting considerable year-to-year fluctuation in numbers (Harmon 1980, Johnston 1984, Neely 1985). Unfortunately, the accuracy of these counts is questionable because the plants are small and easily overlooked. Accurate counts are important for determining the size and dynamics of populations and are fun-

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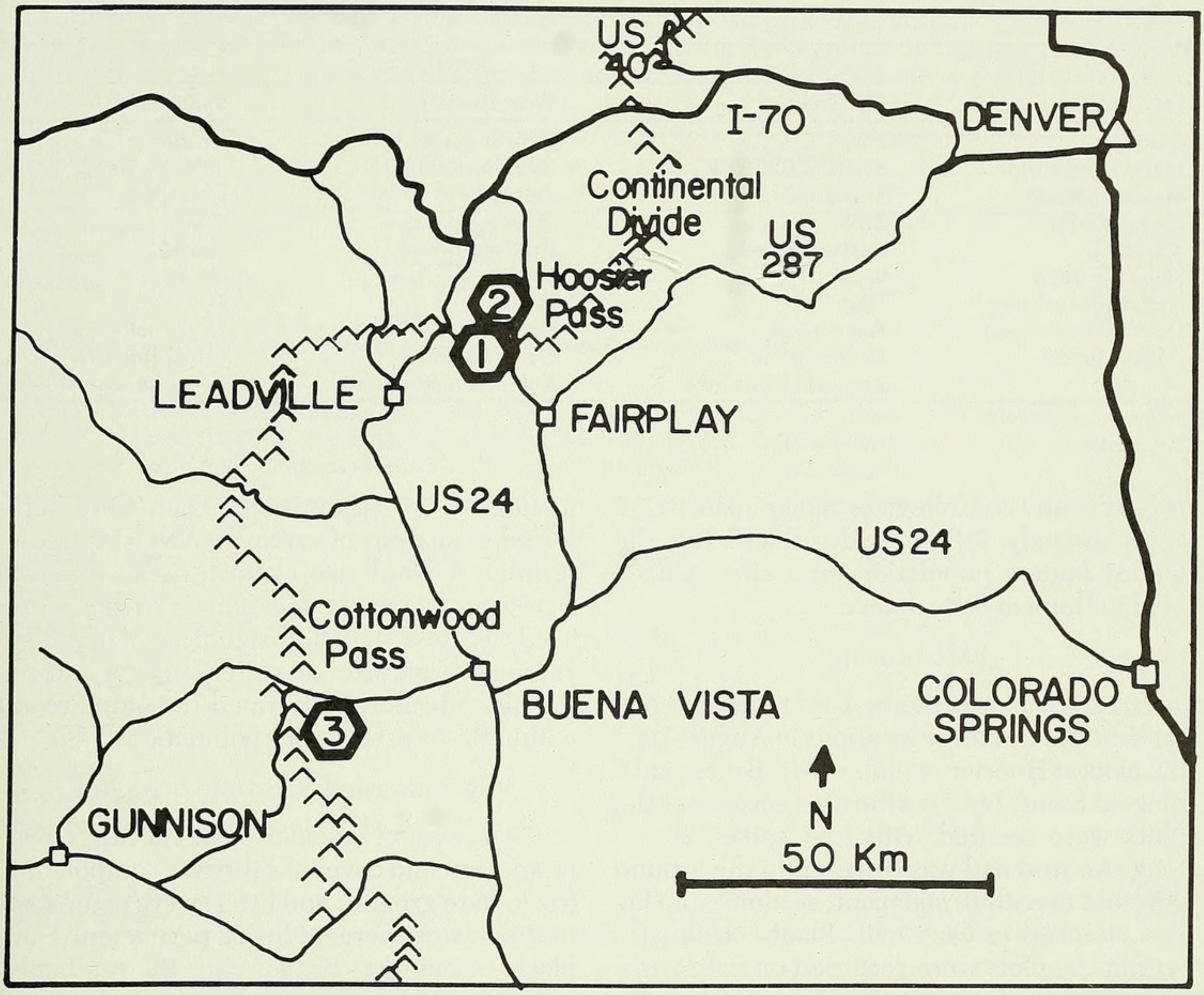

Fig. 1. Locations of the three study sites in central Colorado. 1 = Mt. Bross, 2 = West Hoosier, and 3 = Spout Lake.

damental to the conservation management of the taxon (Bradshaw and Doody 1978).

Relatively few population studies have been undertaken on long-lived perennials, particularly those that are rare. There is increasing recognition by plant conservationists of the need to monitor rare plant populations to determine population structure, flux, and modes of population regulation (Bradshaw and Doody 1978, Whitson and Massey 1981, Kruckeberg and Rabinowitz, unpublished manuscript).

We initiated in 1985 a long-term study of *Braya* population dynamics, selecting three populations in locations that span a gradient from minimal to substantial human disturbance. First-year objectives were to determine if significant variation among and within populations existed for (a) numbers of plants in three size classes and (b) size characteristics of plants. Additional objectives were to determine if vegetation and substrate characteristics at one of the locations differed between (c) microsites containing *Braya* and those that did not, and (d) microsites containing *Braya* on and off an old vehicle track.

METHODS

Three populations were chosen for study (Fig. 1, Table 1). Both the Mt. Bross and West Hoosier sites have experienced great historical mining activity and are dissected by old roads and prospects. Mt. Bross is particularly important because it has the largest known population, with an estimated 1,160 individuals (Johnston 1984). The West Hoosier site is significant because it has the second largest population (approximately 430 individuals). Part of the West Hoosier site is owned and managed as a preserve by The Nature Conservancy. The Spout Lake population, the only

TABLE 1. General location descriptions for three *Braya humilis* var. *humilis* populations in central Colorado.

	Location		
Descriptor	Mt. Bross	West Hoosier	Spout Lake
County	Park	Park/Summit	Chaffee
Latitude/longitude	39°19′N, 106°06′E	39°22′N, 106°05′E	38°47′N, 106°25′E
Mountain range	Mosquito	Ten Mile	Collegiate
Elevation (m)	3758	3695	3750
Aspect	East-southeast	East-southeast	North
Slope (degrees)	0–30	20–30	30–40
Human disturbance	High	High-low	Low
Dominant vascular plant species	*Poa rupicola*, *Draba aurea*, *Arenaria obtusiloba*	*Dryas octopetala*, *Carex rupestris*, *Kobresia myosuroides*	*Dryas octopetala*, *Carex rupestris*, *Kobresia myosuroides*

record from the Collegiate Range, consists of approximately 210 individuals and has the largest known population on a site with no evident human disturbance.

Monitoring

Thirty-two permanent, 1-m^2 plots were established at the three locations in August 1985 (22 plots at Hoosier, 4 plots at Mt. Bross, and 6 plots at Spout Lake). Alternate corners of the plots were marked with iron spikes 25 cm long. An iron nail was driven into the ground adjacent to each *Braya* plant; an aluminum tag was attached to each nail. Plant coordinates within the plots were recorded on data forms to facilitate relocation of individual plants in future years. Measurements of rosette diameter and height and counts of numbers of stems, leaves, flowers and fruits were recorded for all *Braya* individuals within the plots. Sampling methodology was adapted from that used by D. W. Inouye and M. B. Cruzan (personal communication) in central Colorado and was conducted during 10 to 15 August 1985.

Plants were separated into three size classes based on their development; ages could not be determined. Seedlings were defined as nonreproductive plants with five or fewer leaves. Juveniles were plants with more than five leaves but without current year's flowers or fruits. Reproductive individuals had current year's flowers or fruits present.

G-tests were used to test for significant association between numbers of *Braya* plants in the three size classes and location. Plant size data were tested for normality using an algorithm in Minitab (Ryan et al. 1982) and were normalized using logarithmic transformation where appropriate. Data were subjected to analysis of variance (ANOVA) to determine if plant size characteristics differed significantly among locations. T-tests were used to assess statistical significance of differences in plant size characteristics on and off the old vehicle tract (termed the cutoff road) within the West Hoosier population.

Vegetation and Substrate Sampling

Total cover of vascular plant species, cover by species, and cover of substrate components (rock, bare ground, and litter) were estimated to the nearest percent for 22 permanent 1-m^2 plots containing *Braya* and 22 randomly placed 1-m^2 plots that did not contain *Braya* at the West Hoosier location. Similar data were collected for plots containing *Braya* on and off the cutoff road. Data were tested for normality as outlined above, transformed as needed, and analyzed using ANOVA. T-tests were used to assess significance of differences in total vegetal cover, cover of dominant vascular plant species, and substrate cover between plots (a) containing or not containing *Braya* and (b) on or off the cutoff road.

RESULTS

Size Structure of Populations

Size structure of *Braya* populations differed among the three locations with a highly significant association between the number of plants in each size class and location (Table 2). Mt. Bross had the largest proportion of seedlings, whereas West Hoosier had the lowest. West Hoosier had the highest proportion of reproductive individuals. Spout Lake had the same proportion of juveniles as did West