V.3 Associations Between Grasshoppers and Plant Communities on the Snake River Plains of Idaho

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A mosaic of vegetation exists across the landscape of the Intermountain region of Idaho (fig. V.3–1). Soils, elevation, and disturbance history strongly influence the mix of plant species growing on a site. Vegetation directly affects watershed functions, suitability of habitat for wildlife, livestock forage, and many recreational uses. Therefore, range managers are very concerned with vegetation management. They try to nurture plant communities that will provide an optimal balance among the multiple demands placed upon America's public rangelands.

The plants growing on a site also provide resources, such as food and shelter, critical to grasshoppers. Because plants define much of a grasshopper's environment, we may expect that different plant communities will harbor different grasshopper species. Our research on the U.S. Department of the Interior, Bureau of Land Management's Shoshone District in south-central Idaho has documented some dominant trends in the associations between grasshoppers and plant communities in the region.

Exotic and Native Plant Communities in Southern Idaho

Compared to some other grassland ecosystems, such as the short-grass prairie of the Great Plains, the sagebrush–grass ecosystem of the Intermountain region is very susceptible to disturbance. Evidence shows that this region did not support heavy concentrations of large, vertebrate herbivores before settlers introduced livestock. (The buffalo [American bison] did not inhabit the Snake River Plains in large numbers.) Grazing, especially during the spring and early summer growing season, easily depletes most of the native perennial grasses in this

Figure V.3–1—Undisturbed Idaho rangeland may contain many native plant species, such as sagebrush and bluebunch wheatgrass. Native plant communities often are host to grasshopper species different from species found in plant communities with introduced grasses. (U.S. Department of the Interior, Bureau of Land Management photo by Mike Pellant.)

region. With the introduction of large numbers of livestock in the 1800's, a substantial decline in the abundance of native perennial grasses occurred over large areas of the region.

Introduced from Eurasia, annual grasses such as cheatgrass *(Bromus tectorum)* and medusahead *(Taeniantherum asperum)* quickly spread through the region. These exotic species are often present in relatively undisturbed plant communities but usually become dominant only on disturbed sites.

Because annual grasses form a continuous, fine fuel that dries out early in the summer fire season, the presence of annual grasses on a site greatly increases the chances of wildfire. Most species of sagebrush are sensitive to fire and with repeated burning are lost from the community. Frequent burning perpetuates the dominance of cheatgrass and maintains these annual grasslands.

This process of shrub loss and conversion to annual grasslands is a key management problem that affects nearly every use of public rangelands on the Snake River Plains. Annual grasses are more susceptible to climatic fluctuations, such as drought, than perennial grasses, so forage production is less predictable on annual grasslands. Cheatgrass matures early in the season, so the grazing season is shorter than on perennial grasslands. The lack of shrub cover makes for poor-quality wildlife habitat, so annual grasslands have diminished plant and animal diversity. Finally, the increased frequency of fire on annual grasslands increases the costs of fire suppression. In the Shoshone District, about 240,000 acres have been converted from perennial to annual grasslands.

Because of the limited resource values of annual grasslands, efforts have been made to reconvert cover in some of these areas to perennial grasses. A primary strategy during the last 40 years has been to plant crested wheatgrass *(Agropyron cristatum),* an introduced perennial bunchgrass that is relatively easy to establish and exhibits competitive abilities against cheatgrass. Crested wheatgrass is often seeded as part of fire-rehabilitation projects or following removal of overabundant sagebrush stands in range-improvement projects. These seedings have typically been established as monocultures, although a new trend involves more diverse seed mixtures that include shrubs and forbs.

A crested wheatgrass monoculture usually has a large percentage of bare ground between the bunchgrasses and fewer annual grasses and weeds than other habitats. Where crested wheatgrass stands fail to become established, because of drought for instance, range-improvement projects can actually promote conversion to highly disturbed annual grassland. As of the mid-1980's, about 20 percent of the Shoshone District below 5,000-ft elevation consisted of crested wheatgrass stands.

Grasshopper Complexes and Principal Species of Southern Idaho

Only about 4 of the 40-plus common species of grasshoppers in southern Idaho attain pest status. The others seldom reach high densities and may be considered harmless or beneficial.

The spurthroated grasshoppers, subfamily Melanoplinae, include some of the most pestiferous species in southern Idaho. Most feed upon a wide range of plants, but some are more specialized. *Melanoplus cinereus,* for instance, feeds mainly on sagebrush and is found only where sagebrush is growing. *Hesperotettix viridus* feeds mainly on rabbitbrush (*Chrysothamnus* spp.) in southern Idaho.

The lesser migratory grasshopper, *M. sanguinipes,* is the number 1 grasshopper pest in southern Idaho. This species occurs in a wide variety of habitats across North America and it feeds upon many forbs and grasses. It has a high reproductive potential, and populations can reach outbreak status within a generation or two when conditions are favorable. This insect will readily migrate to irrigated crops when rangeland vegetation dries during summer droughts.

The valley grasshopper, *Oedaleonotus enigma,* also can reach outbreak densities. It feeds primarily on forbs but will feed extensively on cheatgrass in the spring and on sagebrush during summer droughts. From 50 to 95 percent of a population of this species have short wings and are flightless. Scientists do not know how commonly these grasshoppers migrate from rangeland to cropland. Depending on the proportion of flightless individuals in the population and the distance from cropland, this species is much less significant as a threat to crops than *M. sanguinipes.*

Members of the subfamily Gomphocerinae, the slantfaced grasshoppers, feed almost exclusively on grasses. Except for the bigheaded grasshopper, *Aulocara elliotti*, slantfaced grasshoppers are not major pests in southern Idaho, although *Ageneotettix deorum* and *Amphitornus coloradus* may be common pests elsewhere. *Aulocara elliotti* matures from mid-June to July, about the same time as the perennial grasses on which it feeds. Although it can attain high densities and can be very damaging to rangeland grasses, it does not seem to be a threat to cultivated crops in southern Idaho.

The lower elevations of the Intermountain region have many species in the subfamily Oedipodinae, the bandwinged grasshoppers. About half of the grasshopper species in south-central Idaho are included in this group. Most are large-bodied, generalist feeders, although *Trachyrachys kiowa* is a common, smaller grasshopper that feeds exclusively on grasses. High densities of the clearwinged grasshopper, *Camnula pellucida*, have been recorded at higher elevations in south-central Idaho.

Grasshopper Species Distributions Across Plant Communities in Southern Idaho

We established long-term grasshopper monitoring sites at 30 locations in the Shoshone District, representing annual grasslands, crested wheatgrass seedings, and sagebrush–grass areas. The sagebrush–grass sites covered a variety of vegetation types, with different species and subspecies of sagebrush represented. Dominant understory grasses included cheatgrass or native bunchgrasses, such as bluebunch wheatgrass *(Agropyron spicatum)* or Thurber's needlegrass *(Stipa thurberiana).*

During 5 years of monitoring grasshopper populations on these sites, we have observed differences in grasshopper species composition between exotic and native plant communities.

The annual grasslands had the highest grasshopper densities, along with the highest proportion of pest species, during the 5-year period. The annual grassland sites also had the lowest grasshopper species diversity and were clearly dominated by the Melanoplinae (fig. V.3–2). Other researchers have noted that these species are common in weedy, disturbed habitats.

The grasshopper species commonly found in annual grassland habitats usually are generalist feeders that live in a variety of habitats, characteristics that make them well adapted to exploit unpredictable habitats like the annual grasslands. Two species, *M. sanguinipes* and *O. enigma*, accounted for most of the grasshoppers on the annual grassland sites. The presence of *M. sanguinipes* correlated positively with areas having a high percentage of ground cover of annual vegetation and correlated negatively with areas having sagebrush cover.

The crested wheatgrass seedings had a more even representation of grasshopper species, with the grass-feeding Gomphocerinae being the most abundant group in these habitats (fig. V.3–2). Most slantfaced grasshoppers are closely associated with perennial grasses, such as crested wheatgrass, using them for food and shelter.

The sagebrush–grass sites had an even distribution of grasshopper species across the three subfamilies (fig. V.3–2). Grasshopper assemblages of the sagebrush–grass habitats included a greater proportion of species with specialized habitat requirements. These species tended to be found at fewer sites and to have a more restricted diet.

Implications for Range Managers

We conducted our studies during years of low grasshopper densities. We expect that under outbreak conditions the observed relationships may change. For example, we expect *M. sanguinipes* to be a prominent species in all southern Idaho habitats during an outbreak. We need detailed observations during high-density years. Historical data from the last outbreak (1985) are consistent with our more recent observations in that, although we found high densities in all habitats, the annual grasslands had the highest average densities.

While one may argue that during a major outbreak all habitats will require control operations, we believe that outbreaks will be less frequent and of smaller extent in habitats characterized by sagebrush cover over a perennial grass understory. Moreover, we believe that efforts to prevent further shrub loss and to reconvert annual grasslands to perennial grasses should help restrain future grasshopper outbreaks.

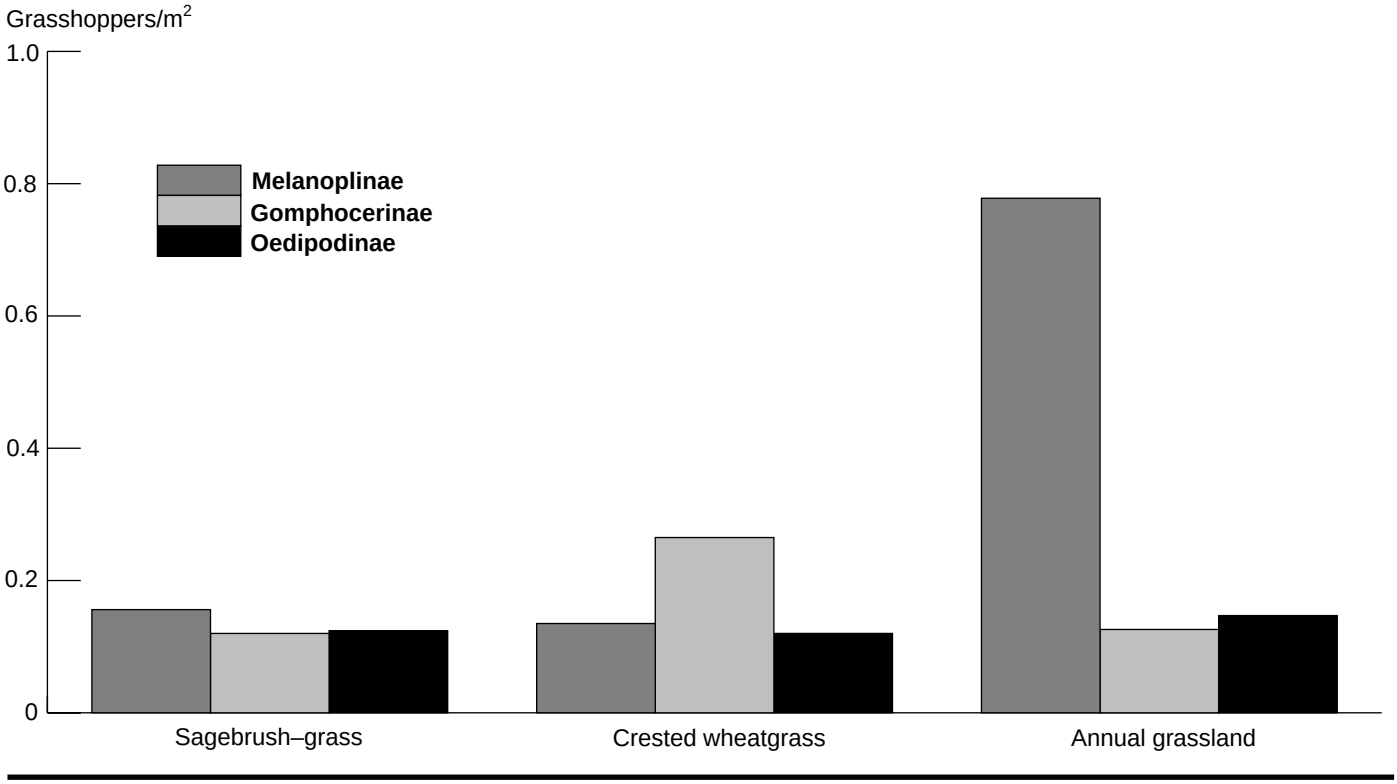

Figure V.3–2—Density distribution of grasshopper subfamilies by grassland sites on the Snake River Plains of southern Idaho.

Although the high cost of rehabilitating annual grasslands may not be justified by reduced grasshopper problems alone, the conversion of annual grasslands to a sagebrush–perennial grass vegetation type is consistent with many other goals of multiple-use management, such as the provision of wildlife habitat, livestock forage, and recreation.

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