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THE SPECIES AND DISTRIBUTION OF GRASSHOPPERS IN THE 1935 OUTBREAK

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In the adult-grasshopper survey conducted late in the summer and early in the fall of 1935, specimens were collected in typical environments. These specimens were counted to determine the percentages of each species in the total number taken in each habitat. Similar collections were made in the summer of 1934 in four States -- North Dakota, South Dakota, Montana, and Wyoming -- and the results were published as supplement 9, volume 14, of the Insect Pest Survey Bulletin. In 1935, this work was expanded to include seven additional States -- Colorado, Iowa, Michigan, Minnesota, Nebraska, Utah, and Wisconsin.

Natural Vegetation Areas in Which Collections Were Made

The general types of vegetation areas in which collections were made are outlined and the important plants listed below. 1/

1. Northeastern pine forest (jack, red, and white pines)--Wisconsin and Michigan.
2. Northeastern hardwoods (birch, beech, maple, hemlock)--Wisconsin and Michigan.
3. Southern hardwood (oak and hickory)--Wisconsin and Michigan.

Other plants found in Wisconsin and Michigan areas include:

Grasses: Quackgrass (Agropyron repens), cheat (Bromus secalinus), downy brome (B. tectorum), green and yellow foxtail (Chaetochloa viridis and C. glauca), squirreltail (Hordeum jubatum), ticklegrass (Panicum capillare), switchgrass (P. virgatum), and Poa spp.

1/ The natural vegetation areas were described largely from the work of H. L. Shantz and Raphael Zon in the Atlas of American Agriculture, part 1, The Physical Basis of Agriculture, sect. E, Natural Vegetation (October 1924), issued by the United States Department of Agriculture, Bureau of Agricultural Economics, under the supervision of O. E. Baker. The collections were made by field agents of the Bureau of Entomology and Plant Quarantine, in cooperation with the various State entomological agencies.

Clovers: (Trifolium spp.).

Mustards: Ball (Neslia paniculata), tumbling (Norta altissima), hedge (Erysimum officinali), and tansy (Sophia incisa).

Other hosts are peppergrass (Lepidium spp.), chickweed (Stellaria media), pigweed or goosefoot (Chenopodium spp.), dock (Rumex spp.), mare's-tail (Leptilon canadense), goldenrod (Solidago), sticktight (Bidens spp.), cocklebur (Xanthium), ragweed (Ambrosia spp.), sowthistle (Sonchus spp.), wild lettuce (Lactuca spp.), dandelion (Leontodon spp.), plantain (Plantago spp.), Solanum spp., Verbena spp., dodder (Cuscuta spp.), and Mallow spp.

4. Tall-grass prairies--

(a) Bluestem sod: All of Iowa, southern and western Minnesota, the extreme eastern part of the Dakotas, and Nebraska. Principal grasses are big bluestem (Andropogon furcatus), little bluestem (A. scoparius), Indian grass (Sorghastrum nutans), some buffalo grass (Buchloe dactyloides), and side-oats grama (Bouteloua curtipendula) in the western portion of the area, also quack-grass.

(b) Needlegrass; slender wheatgrass: Just west of bluestem sod area in the eastern part of the Dakotas and Nebraska. Principal grasses are needlegrass (Stipa spartea), slender wheatgrass (Agropyron pauciflorum), Indian grass, buffalo grass, side-oats grama, and others.

Other plants in the tall-grass prairie areas are lambsquarters (Chenopodium); marsh-elder (Iva xanthifolia), frenchweed (Thlaspi arvense), peppergrass (Lepidium), small and giant ragweed (Ambrosia artemisifolia and A. trifida), wild lettuce (Lactuca), wild licorice (Glycyrrhiza lepidota), smartweed (Polygonum), goldenrod (Solidago), gumweed (Grindelia squarrosa), sweetclover (Melilotus), Canada thistle (Cirsium arvense), dandelion (Leontodon), and mare's-tail (Leptilon canadense).

Along water courses and in gullies are the following important trees and shrubs: Elm (Ulmus), ash (Fraxinus), boxelder (Acer negundo), and oak (Quercus macrocarpa), Populus, chokecherry (Prunus virginiana), buckbrush (Symphoricarpus racemosus), Juneberry (Amelanchier canadensis), roses (Rosa), currants and gooseberries (Ribes), and hawthorn (Crataegus).

(c) Sandsage; sandgrass: Central Nebraska, Artemisia filifolia and Calamovilfa longifolia.

5. Short-grass, or plains grassland.

(a) Grama grass and western needlegrass: Western North Dakota, part of eastern and extreme northeastern Montana, just east of the Missouri River and north of Moreau River in South Dakota. Principal grasses are grama (Bouteloua gracilis), western needlegrass (Stipa comata), junegrass (Koeleria cristata), and buffalo grass (Buchloe dactyloides). Other important plants are purple coneflower (Echinacea angustifolia), silvery psorale (Psoralea argophylla), sage (Artemisia spp.), and many of the plants from the tall-grass area.

(b) Western wheatgrass and sagebrush: Badlands of North Dakota, a large area extending diagonally from northwest to southeast in the eastern half of Montana and east of Big Horn Mountains, Wyoming, and extreme northwestern part of Dakota, all more or less broken country. Principal grasses are western wheatgrass (Agropyron smithii), niggerwool (Carex filifolia), Poa spp., Koleria, and Calamagrostis. Principal plants are sage (Artemisia cana and A. frigida), gumweed, buckbrush, and many other plants and shrubs common to the short-grass area.

(c) Grama grass: General eastern two-thirds of Montana east of Big Horn Mountains in Wyoming, extending to the Black Hills and down along the boundary between South Dakota and Wyoming, into Colorado close to the mountains. The principal grass is grama (Bouteloua gracilis). Other grasses are niggerwool (Carex filifolia), junegrass (Koleria cristata), and Poa spp. Prominent spring flowers are white mountain-lily (Lecicocrinum montanum), pasque flower (Pulsatilla hirsutissima), phlox (Phlox hoodii), wild onion (Allium textile), and ground daisy (Townsendia exscapa). Mountain sage (Artemisia frigida) is abundant with grass. In overgrazed or rocky or barren areas matchweed (Gutierrezia sarothrae), Selaginella densa (club-foot moss), plantain (Plantago purshii), and Poa secunda are prominent. Along coulee bottoms is western wheatgrass (Agropyron smithii). The trees and shrubs are those common to the entire short-grass area.

(d) Grama grass and mountain sage: Along the eastern front of the mountains. Principal grasses and plants are grama grass (Bouteloua gracilis), niggerwool (Carex filifolia), mountain sage (Artemisia frigida), yarrow (Achillea millefolium), Friogonum spp., penstemons, wild roses, and lupines.

(e) Grama and buffalo grass: Most of eastern Colorado, western Nebraska and a strip east and west, south of the White River in South Dakota. Occurring in equal quantities are grama grass (Bouteloua gracilis) and buffalo grass (Buchloe dactyloides). Other grasses under more moist conditions are western needlegrass (Stipa comata), wiregrass (Aristida longiseta), and sand sporobolus (Sporobolus cryptandrus). Most of the plants are low-growing and include plantain (Plantago purshii), annual fescue (Festuca octoflora), pennyroyal (Hedeoma hispida), beggartick (Lappula occidentalis), soapweed or Spanish bayonet (Yucca glauca), pricklypear (Opuntia), and, where the soil is wetter, mare's-tail (Leptilon canadense), and gumweed (Grindelia squarrosa). Along the streams and rivers are species of Populus and Salix.

(f) Wiregrass: Southwestern Nebraska. An open cover of grama and buffalo grass with a scattered growth of wiregrass (Aristida longiseta). There are many deep-rooted plants such as Psoralea tenuiflora and bush morning-glory (Ipomoea lystophylla).

6. Foothill, or western yellow pine and Douglas fir forest --

Black Hills and eastern front of main range in Colorado. The chief trees are rock or western yellow pine (Pinus ponderosa) and Douglas-fir (Pseudotsuga mucronata) on the north slopes. In the southeastern part of Colorado is the pinyon pine (Pinus edulis). The grasses are grama (Bouteloua gracilis), junegrass (Koleria cristata); numerous shrubs of the genera Symphoricarpos (buckbrush), Rhus (sumac), Ribes (gooseberry and currant),

Cercocarpus (mountain mahogany), Crataegus (hawthorn), Rosa (rosebushes), and Prunus (chokecherry).

7. Montane (collections made only in Colorado)--

Represented by lodgepole pine (Pinus murrayana), Engelmann spruce (Picea engelmanni), Colorado blue spruce (P. pungens), and quaking aspen (Populus tremuloides). Along streams are found willow (Salix), birch (Betula), and honeysuckle (Lonicera). In the openings are sedges (Carex), sages (Artemisia), sandwort (Arenaria), lupines (Lupinus), shrubby cingunfoil (Dasiphora fruticosa), locoweed (Astragalus), larkspur (Delphinium), paintbrush (Castilleja), and many others.

8. Alpine meadows, above timber line --

Characterized by timber-line effects on Engelmann spruce, causing them to grow along the ground, dwarf willows, and other plants, monkshood (Aconitum), bluebell (Mertensia), sedges (Carex), phlox, goldenrod (Solidago), cowslip (Primula), gentian (Dasystephana), and many more.

9. Sagebrush, or northern desert shrub --

All of Wyoming west of Laramie and Big Horn Mountains, except the mountain areas and all of the Great Basin region in Utah. The plants are sages (Artemisia tridentata, A. nova, and A. rigida), salt sages (Atriplex corrugata, A. nuttallii, and allied species), matchweed (Gutierrezia sarothrae), big and little rabbitbrush (Chrysothamnus nauseosus and C. stenophyllis), winter fat (Eurotia lanata), and certain annuals, military grass (Bromus tectorum), alfilaria (Erodium cicutarium), and other desert species.

These natural vegetation areas overlap and the plants that dominate one area may be important throughout another. Most of the collections were made either in or close to cultivated crops. In some instances special efforts were made to collect in the native environments away from the influence of cultivation.

The cropped area and pasture and hay grassland environments are varied because of differences of natural vegetation and climate. In the eastern and more humid portions of the survey territory, the fields are smaller and more cut up by fencerows and roadsides, and the bordering vegetation is much more rank and lush than in the drier, more arid western part. Therefore, a wheat field in eastern Montana furnishes a different environment than does a wheat field in Iowa, Wisconsin, or other States having greater rainfall. The grain fields in the more arid short-grass region are surrounded by large tracts of open range, and the populations there are influenced by the surrounding short-grass species of grasshoppers. The percentage of the total land area of the State in harvested crops is about 60 percent in Iowa and 4 percent in Montana. With the breaking up of the native vegetation into farms, many new plants have been introduced in the form of crops and weeds.

A study of the collections made in the different natural vegetation areas indicates that the greatest number of species occurred in the short-grass or plains-grassland region. Michigan and Wisconsin lie in the hardwood and pine-timber region, with rank vegetation. The collections from these States represented only 12 species. In the collections from Iowa, Minnesota, and other tall-grass prairie areas the number of species was 22. The collections from the western parts of the Dakotas, Nebraska, eastern Montana, Wyoming, and Colorado averaged about 44 species. At elevations of from 4,000 to 5,000 feet in Colorado or foothill region the number was 40; in the lower montane zone, from 6,000 to 7,500 feet, there were 32 species; from 8,000 to 8,500 feet there were 14; and above 10,500 feet there were only 5 species. These figures have only a relative significance and do not represent the actual number of species occurring in the natural vegetation areas. Utah in the northern desert-shrub region yielded 24 species.

When collections were made in a crop, special effort was made to sweep only in that crop. Field-margin collections were divided between soddy and weedy types. Pastures were fenced, and consisted of native or introduced grasses of relative small acreages surrounded by cultivated crops. The native grasslands were large tracts not affected by cultivation. For each State the total number of each species is shown as a percentage of the total number of specimens collected in the State during the survey. The relative distribution of species is listed for the States and the five most important species in each environment are also given.

It must be understood that the collecting was very general in character and not all the species are represented. In future work more attention will be paid to careful collecting in specific natural vegetation areas, as contrasted with introduced conditions. This should give some information relative to the effect of cultivation on grasshopper populations. When thousands of acres of lush grain appeared in the prairies of South Dakota, there came an enormous increase in population of Melanoplus differentialis Thos. and M. bivittatus Say, until in 1931 the hordes of these pests stripped bare an area of 30,000 square miles. Then, as increasingly dry years followed, climaxed by the great drought of 1934 and the subsequent destruction of crops and depletion of native vegetation, these two species all but vanished. In 1935 along river courses, they are again staging a comeback in certain places.

COLORADO

The collections in Colorado were made in 11 different environments, as shown in the table of the distribution of species. These represent the general habitats found on the plains, in the foothills, on the mountains, and in high mountain and alpine meadows. The elevations for these ranged from 3,500 to 12,200 feet. The annual precipitation ranges from 10 to 25 inches, with the rainfall increasing in amount and frequency with the increase in elevation. These natural vegetation zones are as follows:

1. Plains--grama, buffalo grass association --

Dry and somewhat xerophytic, with an annual precipitation of about 10 inches.

2. Foothill region -- rock pine and Douglas-fir --

Elevation from 5,000 to 6,000 feet, approximately, with annual precipitation of 15 to 20 inches.

3. Low mountain -- 6,000 to 7,500 feet

4. High mountain -- 8,000 to 8,500 feet

5. Alpine -- 10,500 to 12,200 feet

Altogether, 3,257 specimens, including 58 species, were collected. The plains-grassland collection had the greatest number of species -- 37; the foothill region had 40; the lower montane zone had 32; the higher montane zone, 14; and the alpine, only 5. The 5 most important species for each habitat are listed.

The worst infestations in 1935 were in the north-central counties fringing the mountains, where succulent food was more abundant. In the more arid regions of the eastern counties severe drought, coupled with effective control campaigns, has greatly reduced the heavy populations that occurred in the severe outbreaks of 1930 and 1931. Melanoplus mexicanus Sauss. was first in numbers over the whole area. M. bivittatus and M. differentialis have fallen off, owing to drought and lack of succulent food.

Distribution by species of 3,257 specimens collected in Colorado, expressed in percentage of total number collected in each habitat

Species	Small grains	Road-side	Leg-umes	Foot-hill below 6,000 ft.	Low mt. 6,000-7,500 ft.	High mt. 8,000-8,500 ft.	Alpine 10,500-12,200 ft.	Weed patches	Plains grass-land	River bot-tom	Pas-ture grass land	Total specimens	% of grand total
Acrolophitus hirtipes Say-----	--	--	--	--	--	--	--	0.37	--	0.61	--	2	0.06
Acoloplus turnbullii Thos.-----	6.64	10.36	3.73	1.97	.88	--	--	4.80	5.52	8.48	9.45	220	6.75
Ageneotettix deorum Scudd.-----	4.98	3.58	3.92	6.21	6.58	--	--	5.54	3.91	5.45	--	130	3.99
Amphitornus bicolor Thos.-----	--	--	--	.45	1.32	--	--	--	.23	1.21	--	7	.21
Arphia pseudonietana Thos.-----	.24	.13	--	.15	.44	--	--	--	.23	1.21	--	5	.15
Aulocara elliotti Thos.-----	1.42	1.53	--	6.67	1.32	--	2.13	.74	10.34	.61	14.17	90	2.76
Boopedon nubilum Say-----	--	--	--	.15	--	--	--	--	--	--	--	1	.03
Brachystola magna Gir.-----	--	.64	.59	.15	--	--	--	--	.46	.61	--	13	.40
Camula pellucida Scudd.-----	--	1.66	.59	.45	25.44	18.52	--	--	9.23	5.45	--	80	2.46
Chorthippus curtipennis Harr.---	--	--	.59	--	.88	57.78	--	--	--	3.03	.79	87	2.67
Circotettix rabula R. & H.-----	--	--	--	.30	--	--	--	.74	--	--	--	2	.06
Cordillacris occipitalis Thos.---	--	--	.20	.15	--	--	--	--	--	--	--	1	.03
Cratypedes neglectus Thos.-----	--	--	--	--	2.19	3.70	--	--	--	--	--	5	.15
Dactylotum pictum Thos.-----	--	.13	--	.61	--	--	--	--	.46	--	2.36	6	.18
Derotoma haydenii Thos.-----	5.21	8.18	1.96	2.73	3.51	--	--	13.65	7.36	12.12	2.36	197	6.05
Dissosteira carolina L.-----	2.13	3.71	.59	1.67	.88	--	--	1.11	1.61	.61	--	58	1.78
Dissosteira longipennis Thos.---	.47	1.92	--	--	--	--	--	7.75	4.37	--	1.82	60	1.84
Drepanopterna femoratum Scudd.---	--	.38	.59	.76	--	--	--	.37	.92	--	1.57	16	.49
Encoptolophus costalis Scudd.---	.71	--	.20	.15	--	--	--	--	.23	--	--	5	.15
Gomphocerus clavatus Thos.-----	--	.13	--	.15	--	.74	38.03	--	--	--	--	11	.34
Hadrotettix trifasciatus Say-----	1.18	3.71	.39	2.27	.44	--	--	--	2.07	1.21	.79	53	1.63
Hesperotettix brevipennis Thos.---	--	.13	--	--	--	--	--	--	--	--	--	1	.03
Hesperotettix speciosus Scudd.---	--	.13	.20	1.21	.44	--	--	--	.23	--	--	4	.12
Hesperotettix viridis Thos.-----	.24	1.02	--	3.18	.88	--	--	--	.92	1.21	.79	19	.58
Hippiscus rugosus Scudd.-----	--	--	--	--	--	--	--	--	.23	--	--	1	.03
Hypochlora alba Dodge-----	--	--	--	--	.44	--	--	--	--	--	.61	1	.03
Melanoplus angustipennis Dodge---	.71	2.81	.59	6.52	.88	--	--	7.01	1.15	--	--	58	1.78
Melanoplus bivittatus Say-----	10.19	3.96	19.22	7.73	10.96	2.22	--	8.49	2.07	6.67	.79	239	7.34
Melanoplus bowditchi Scudd.-----	--	.26	--	.30	--	--	--	--	--	--	--	2	.06

Colorado (Cont'd)

Species	Small grains	Road- side	Leg- umes	Foot- hill below 6,000 ft.	Low mt. 6,000 7,500 ft.	High mt. 8,000 8,500 ft.	Alpine 10,500 12,200 ft.	Weed pat- ches	Plains grass land	River bot- tom	Pas- ture grass land	Total spec- imens	% of grand total
Melanoplus dawsoni Scudd.-----	--	--	--	--	.88	--	--	--	--	1.21	--	2	.06
Melanoplus differentialis Thos.---	3.22	1.92	5.88	.61	1.32	--	--	1.11	.23	.61	--	102	3.13
Melanoplus dodgei Thos.-----	--	--	--	--	--	.74	53.19	--	--	--	--	27	.83
Melanoplus femur-rubrum DeG.---	17.54	9.46	26.67	3.95	5.22	--	--	4.43	1.15	--	5.51	325	9.98
Melanoplus flavidus Scudd.-----	--	--	--	1.36	--	--	--	--	--	.61	--	4	.12
Melanoplus fluviatilis Brun.---	--	.26	.20	2.88	--	--	--	--	--	4.24	7.09	40	1.23
Melanoplus gladstoni Scudd.-----	2.37	4.48	.39	3.18	3.07	--	--	.74	2.76	5.45	1.57	82	2.52
Melanoplus infantilis Scudd.---	--	--	.39	--	3.07	1.48	2.13	--	1.15	.61	--	18	.55
Melanoplus keeleri Thos.-----	--	.38	--	.45	--	--	--	--	--	--	--	3	.09
Melanoplus lakinus Scudd.-----	9.95	6.27	6.08	.76	.88	--	--	6.27	.92	2.42	1.57	154	4.23
Melanoplus mexicanus Sauss.-----	13.03	9.34	12.94	18.48	12.28	5.19	4.26	16.24	9.43	7.27	28.35	390	11.97
Melanoplus occidentalis Thos.---	--	.38	--	1.36	1.75	1.48	--	--	1.38	.61	3.94	23	.71
Melanoplus packardii Scudd.-----	7.58	9.21	3.33	13.64	.88	2.22	--	6.27	13.79	6.06	13.39	266	8.17
Mermiria maculipennis Rehn-----	.24	--	--	.91	--	--	--	1.85	.23	--	--	7	.21
Mestobregma kiowa Thos.-----	.47	1.41	.59	2.12	3.95	--	--	3.22	2.00	--	--	48	1.47
Metator pardalinus Sauss.-----	.24	.51	--	1.21	--	--	--	--	1.38	--	--	11	.34
Opeia obscura Thos.-----	--	.51	.78	--	--	.74	--	--	1.15	1.82	--	17	.52
Phlibostroma quadrimaculatum Thos.-----	.71	2.17	.39	2.58	1.75	--	--	1.85	11.26	2.42	1.57	89	2.73
Phoetaliotes nebrascensis Thos.---	--	--	--	.15	--	--	--	.37	--	--	--	2	.06
Schistocerca lineata Scudd.-----	.24	--	--	--	--	--	--	--	--	--	--	1	.03
Spharagemon bolli Scudd.-----	.24	--	--	--	--	--	--	--	--	--	--	3	.09
Spharagemon collare Scudd.-----	3.79	.90	3.53	.91	.44	--	--	.74	--	1.21	--	48	1.47
Spharagemon equale Say-----	1.42	1.92	.59	1.21	.88	.74	--	1.85	2.30	1.82	3.14	51	1.57
Trimerotropis campestris McNeill	1.18	1.92	.39	.30	.44	.74	--	2.58	1.84	1.82	--	42	1.29
Trimerotropis formosus Day-----	.47	--	.20	--	--	--	--	.37	--	.61	.79	7	.21
Trimerotropis laticincta Sauss.---	--	1.53	--	--	--	--	--	--	4.60	6.06	--	43	1.32
Trimerotropis pallidipennis Burm.	3.08	3.06	4.31	--	.44	--	--	3.32	.46	.61	--	75	2.30
Trimerotropis sparsa Thos.-----	--	--	--	--	--	3.07	--	--	--	--	--	5	.15
Trimerotropis suffusus Scudd.---	--	--	--	--	.88	--	--	--	.46	--	--	2	.06
Total specimens per environment-----	422	782	510	660	228	135	47	271	435	165	127	--	--

Colorado

Plains grassland

Percent

1. *Melanoplus packardii*-----14
2. *Phlibostroma quadrimaculatum* 11
3. *Aulocara ellioti*-----10
4. *Melanoplus mexicanus*----- 9
5. *Cammula pellucida*----- 9
6. Thirty-two other species----47

Mountain, 7,000-7,500 feet

1. *Cammula pellucida*-----25
2. *Melanoplus mexicanus*-----12
3. *Melanoplus bivittatus*-----11
4. *Ageneotettix deorum*----- 7
5. *Melanoplus femur-rubrum*----- 5
6. Twenty-seven other species--40

Alpine, above 10,500 feet

1. *Melanoplus dodgei*-----53
2. *Gomphocerus clavatus*-----39
3. *Melanoplus mexicanus*----- 4
4. *Melanoplus infantilis*----- 2
5. *Aulocara ellioti*----- 2
6. No others

Small grain

1. *Melanoplus femur-rubrum*-----18
2. *Melanoplus mexicanus*-----13
3. *Melanoplus bivittatus*-----10
4. *Melanoplus lakimus*-----10
5. *Melanoplus packardii*----- 8
6. Twenty-four other species---41

Legumes

1. *Melanoplus femur-rubrum*-----27
2. *Melanoplus bivittatus*-----19
3. *Melanoplus mexicanus*-----13
4. *Melanoplus lakimus*----- 6
5. *Melanoplus differentialis*--- 6
6. Twenty-five other species---29

River bottom

1. *Derotmema haydeni*-----12
2. *Aeoloplus turnbulli*----- 8
3. *Melanoplus mexicanus*----- 7
4. *Melanoplus bivittatus*----- 7
5. *Melanoplus packardii*----- 6
6. Twenty-seven other species--60

Foothill

Percent

1. *Melanoplus mexicanus*-----18
2. *Melanoplus packardii*-----14
3. *Melanoplus bivittatus*----- 8
4. *Aulocara ellioti*----- 7
5. *Melanoplus angustipennis*---- 6
6. Thirty-five other species---47

Mountain, 8,000-8,500 feet

1. *Chorthippus curtipennis*-----58
2. *Cammula pellucida*-----18
3. *Melanoplus mexicanus*----- 5
4. *Cratypedes neglectus*----- 4
5. *Trimerotropis sparsa*----- 4
6. Nine other species-----11

Pasture

1. *Melanoplus mexicanus*-----28
2. *Aulocara ellioti*-----14
3. *Melanoplus packardii*-----13
4. *Aeoloplus turnbulli*----- 9
5. *Melanoplus fluviatilis*----- 7
6. Sixteen other species-----29

Roadside

1. *Aeoloplus turnbulli*-----10
2. *Melanoplus femur-rubrum*----- 9
3. *Melanoplus mexicanus*----- 9
4. *Melanoplus packardii*----- 9
5. *Melanoplus lakimus*----- 6
6. Thirty-two other species---57

Weed patch

1. *Melanoplus mexicanus*-----16
2. *Derotmema haydeni*-----14
3. *Melanoplus bivittatus*----- 8
4. *Dissosteira longipennis*----- 8
5. *Melanoplus angustipennis*---- 7
6. Twenty-one other species---47

Percentage of grand total

1. *Melanoplus mexicanus*-----12
2. *Melanoplus femur-rubrum*-----10
3. *Melanoplus packardii*----- 8
4. *Melanoplus bivittatus*----- 7
5. *Aeoloplus turnbulli*----- 7
6. Fifty-four other species---56

IOWA

All of the collections were made in the western third of the State. The whole of Iowa lies in the bluestem sod area of the tall-grass prairie region. Most of this original vegetation has been entirely replaced by cultivated crops and the country is cut up into small fields having a great length of fencerows, roadsides, and other types of field margin. About 60 to 70 percent of the total land area is under cultivation.

A total of 2,991 specimens were collected, representing 21 species taken in 5 habitats. This is only about half the number of species taken in the short-grass region. The distribution of the 5 most important species is given for each habitat. Melanoplus femur-rubrum was, perhaps, the most numerous species. M. mexicanus was second. There was a rather even distribution of grasshoppers over some 27 counties in the western third of the State. This is an increase over last year.

Iowa

Small grains

Percent

1. Melanoplus mexicanus-----59
2. Melanoplus femur-rubrum----24
3. Melanoplus differentialis-- 5
4. Ageneotettix deorum----- 4
5. Melanoplus packardii----- 2
6. Six other species----- 6

Legumes

1. Melanoplus femur-rubrum----60
2. Melanoplus mexicanus-----36
3. Ageneotettix deorum----- 2
4. Melanoplus differentialis-- 1
5. Melanoplus bivittatus----- 1/2
6. Six other species----- 1/2

Pasture

1. Melanoplus mexicanus-----65
2. Melanoplus femur-rubrum----24
3. Ageneotettix deorum----- 6
4. Melanoplus differentialis-- 2
5. Dissosteira carolina----- 1
6. Nine other species----- 2

Roadside

Percent

1. Melanoplus femur-rubrum-----84
2. Melanoplus mexicanus-----12
3. Melanoplus differentialis--- 2
4. Melanoplus bivittatus----- 1/2
5. Brachystola magna----- 1/2
6. Five other species----- 1

Weed patch

1. Melanoplus mexicanus-----65
2. Melanoplus femur-rubrum----28
3. Ageneotettix deorum----- 5
4. Melanoplus differentialis--- 2

Percentage of grand total

1. Melanoplus femur-rubrum-----52
2. Melanoplus mexicanus-----41
3. Ageneotettix deorum----- 3
4. Melanoplus differentialis--- 2
5. Dissosteira carolina----- 1
6. Sixteen other species----- 1

Distribution by species of 2,991 specimens collected in Iowa, expressed in percentage of total number collected in each habitat.

Species	Small grains	Road- side	Legumes	Weed patches	Pasture grass- land	Total specimens	Percentage of grand total
Ageneotettix deorum Scudd.-----	4.39	0.15	1.74	4.99	5.63	81	2.71
Brachystola magna Gir.-----	--	.31	--	--	--	2	.07
Chortophaga australior R. & H.	--	--	.08	--	--	1	.03
Dissosteira carolina L.-----	1.75	.15	.25	--	.51	12	.40
Drepanopterna femoratum Scudd.	--	--	--	--	.13	1	.03
Encoptolophus costalis Scudd.--	--	.15	--	--	.26	3	.10
Encoptolophus sordidus Burm.--	--	--	--	--	.13	1	.03
Hesperotettix speciosus Scudd.	.44	--	--	--	--	1	.03
Hesperotettix viridis Thos.---	.44	--	--	--	--	1	.03
Hippiscus rugosus Scudd.-----	.88	--	.08	--	.13	4	.13
Melanoplus bivittatus Say-----	.88	.46	.25	--	.13	10	.30
Melanoplus differentialis Thos.	5.26	2.30	1.08	2.25	2.43	67	2.24
Melanoplus femur-rubrum DeG.--	24.12	84.53	59.78	28.09	23.56	1556	52.02
Melanoplus infantilis Scudd.--	--	--	--	--	.13	1	.03
Melanoplu mexicanus Sauss.-----	59.21	11.64	36.07	65.17	64.92	1218	40.72
Melanoplus packardii Scudd.---	2.19	--	--	--	--	5	.17
Mermiria neomexicana Thos.-----	--	--	--	--	.13	1	.03
Mestobregma kiowa Thos.-----	.44	--	.17	--	.26	5	.17
Schistocerca americana Drury--	--	.15	--	--	--	1	.03
Schistocerca lineata Scudd.---	--	.15	.17	--	--	3	.10
Syrbula admirabilis Uhler-----	--	--	.17	--	.13	3	.10
Total specimens per environment:	228	653	1206	89	781	--	--

MICHIGAN

A portion of the State lies in the northeastern pine forest region, part in the northeastern hardwoods, and part in the southern hardwoods. The densest white pine forests in the country were once found on the sandy loam soils of Michigan. Most of these have been denuded, leaving large areas of cut-over stump grasslands which form ideal breeding grounds for Cannula pellucida and M. mexicanus under combined conditions of drought and overpasturing. Some 250 species of weeds and grasses are listed for this State and they abound in these stump lands. They are listed mostly as to genera under the natural vegetation of this State.

Most of the collections were made in some type of grassland, small grains and legumes being the only crops included. Some 6,673 specimens, representing 12 species, were collected. The number of species here is about one-fourth that of the short-grass region, one-half that of the tall-grass prairie, and about equal to the number of species found at elevations of 8,500 feet and higher in Colorado. The amount of plant cover has something to do with the population and variety of species, the denser the cover the less the population and the number of species.

In all of the collections M. mexicanus made up 72 percent of the total. This species was dominant by far in both the Upper and Lower Peninsulas. C. pellucida was second, being more numerous in the Upper Peninsula. M. femur-rubrum was probably third in numbers, at least in the Upper Peninsula, with Ageneotettix deorum in about equal numbers in the Lower Peninsula.

In 1934 C. pellucida outnumbered M. mexicanus two to one in the Upper Peninsula, but in 1935 M. mexicanus outnumbered C. pellucida more than three to one. Cold rains and foggy weather during the hatching season reduced all grasshopper populations here and more especially C. pellucida. In the Lower Peninsula, M. mexicanus outnumbered C. pellucida ten to one. The average infestation in the Upper Peninsula in 1934 was about 2.5 times as great as in 1935. In the Lower Peninsula, that is in 30 counties in the upper half, the 1935 infestation is about 25 times as great as in 1934.

Distribution by species of 6,673 specimens collected in Michigan, expressed in percentage of total number collected in each habitat.

Species	Pasture	Mixed	Small grains	Hay	Quack grass	Cut over	Legumes	Waste, wild, and abandoned land	Total Specimens	Percentage of grand total
<i>Ageneotettix deorum</i> Scudd-----	4.00	1.26	1.59	--	--	16.67	2.75	10.30	295	4.42
<i>Arphia pseudonietana</i> Thos.-----	3.93	1.38	3.17	1.45	1.16	6.32	1.18	3.94	226	3.39
<i>Camnula pellucida</i> Scudd.-----	11.75	3.27	9.52	10.00	13.18	.77	1.96	4.22	602	9.02
<i>Chorthippus curtipennis</i> Harr.--	.31	.25	--	1.27	3.10	--	.78	--	31	.46
<i>Dissosteira carolina</i> L.-----	.51	.63	1.59	1.09	--	--	1.18	--	35	.52
<i>Encoptolophus sordidus</i> Burm.--	.82	1.51	7.94	.18	1.16	.77	1.57	3.03	71	1.06
<i>Melanoplus bivittatus</i> Say-----	.26	.63	1.59	4.00	.39	.19	7.45	--	59	.88
<i>M. dawsoni</i> Scudd.-----	2.18	--	--	.36	--	1.15	.78	.91	98	1.47
<i>M. femur-rubrum</i> DeG.-----	4.75	8.93	4.76	10.18	5.81	--	27.06	--	399	5.98
<i>M. mexicanus</i> Sauss.-----	70.40	81.76	69.84	70.91	74.03	73.95	52.94	77.27	4797	71.89
<i>Schistocerca alutacea</i> Harr.---	.69	--	--	.18	1.16	--	.39	.30	33	.49
<i>Spharagemon collare</i> Scudd.-----	.41	.38	--	.36	--	.19	1.96	--	28	.42
Total specimens										
per environment-----	3,898	795	63	550	258	522	255	330	--	--

Michigan

<u>Pasture</u>		<u>Quackgrass</u>	
	<u>Percent</u>		<u>Percent</u>
1. Melanoplus mexicanus-----	70	1. Melanoplus mexicanus-----	74
2. Cammula pellucida-----	12	2. Cammula pellucida-----	13
3. Melanoplus femur-rubrum-----	5	3. Melanoplus femur-rubrum-----	6
4. Ageneotettix deorum-----	4	4. Chorthippus curtipennis-----	3
5. Arphia pseudonietana-----	4	5. Encoptolophus costalis-----	1
6. Seven other species-----	5	6. Three other species-----	3
<u>Mixed</u>		<u>Cut-over</u>	
1. Melanoplus mexicanus-----	82	1. Melanoplus mexicanus-----	74
2. Melanoplus femur-rubrum-----	9	2. Ageneotettix deorum-----	17
3. Cammula pellucida-----	3	3. Arphia pseudonietana-----	6
4. Encoptolophus costalis-----	2	4. Melanoplus dawsoni-----	1
5. Arphia pseudonietana-----	1	5. Encoptolophus sordidus-----	1
6. Five other species-----	3	6. Three other species-----	1
<u>Small grain</u>		<u>Legumes</u>	
1. Melanoplus mexicanus-----	70	1. Melanoplus mexicanus-----	53
2. Cammula pellucida-----	10	2. Melanoplus femur-rubrum-----	27
3. Encoptolophus sordidus-----	8	3. Melanoplus bivittatus-----	7
4. Melanoplus femur-rubrum-----	5	4. Ageneotettix deorum-----	3
5. Arphis pseudonietana-----	3	5. Cammula pellucida-----	2
6. Three other species-----	4	6. Six other species-----	8
<u>Hay</u>		<u>Waste, Wild and Abandoned Land</u>	
1. Melanoplus mexicanus-----	71	1. Melanoplus mexicanus-----	77
2. Melanoplus femur-rubrum-----	10	2. Ageneotettix deorum-----	10
3. Cammula pellucida-----	10	3. Cammula pellucida-----	4
4. Melanoplus bivittatus-----	4	4. Arphia pseudonietana-----	4
5. Arphia pseudonietana-----	1	5. Encoptolophus sordidus-----	3
6. Six other species-----	4	6. Two other species-----	2
<u>Percentage of grand total</u>			
	<u>Percent</u>		
1. Melanoplus mexicanus-----	72		
2. Cammula pellucida-----	9		
3. Melanoplus femur-rubrum-----	6		
4. Ageneotettix deorum-----	4		
5. Arphia pseudonietana-----	3		
6. Seven other species-----	6		

MINNESOTA

All of the collections from Minnesota were made in the western part of the State. This lies in the bluestem sod area of the tall-grass prairie region. The important grasses and other plants are those common to this natural vegetation area.

There were 3,896 specimens altogether in the collections taken from 9 common habitats. These comprise 32 species all of which are listed, together with their distribution. The 5 most important species in each environment are given with their relative abundance in percentages of the total number collected in each habitat.

Melanoplus mexicanus ranked seventh in numbers for 1935, whereas in 1934 it ranked third. Encoptolophus costalis has supplanted M. bivittatus in second place. M. femur-rubrum at fourth place and Ageneotettix deorum at fifth place have displaced M. packardii and Dissosteira carolina, respectively. The whole grasshopper population has been greatly reduced by vigorous, well-organized control campaigns during the past several years. In 1934 there were 30 counties needing some control measures. The survey in 1935 showed only 2 counties needing poisoned bait.

Distribution by species of 3,896 specimens collected in Minnesota, expressed in percentage of total number collected in each habitat.

Species	Small grains	Legumes	Road-side	Pasture grass land	Rail-road	River bottom	Pasture coulee	Weed patches	Irrigation ditch	Total specimens	Percentage of grand total
Ageneotettix deorum Scudd.-----	0.59	10.06	5.81	9.94	29.89	11.56	10.03	1.68	0.78	287	7.37
Aeoloplus turnbullii Thos.-----	--	--	--	.18	--	--	--	--	--	2	.05
Arphia pseudonietana Thos.-----	--	.30	.64	2.95	--	2.04	2.84	--	--	49	1.26
Aulocara ellioti Thos.-----	--	--	--	--	--	1.36	--	--	--	2	.05
Camula pellucida Scudd.-----	27.25	20.73	24.14	18.46	7.75	9.52	25.57	42.86	13.62	835	21.43
Chloealtis conspersa Harr.-----	--	--	.09	.18	--	--	--	--	--	2	.05
Chorthippus curtipennis Harr.--	4.31	2.74	7.26	2.95	5.75	1.36	.57	.84	1.17	163	4.18
Dissosteira carolina L.-----	.59	2.13	11.80	.18	8.05	.68	1.14	5.04	.39	160	4.11
Encoptolophus costalis Scudd.--	7.45	7.32	18.60	14.15	--	8.16	23.86	15.97	6.23	514	13.19
Gomphocerus clavatus Thom.-----	.20	--	.09	.81	--	1.36	--	--	--	14	.36
Hadrotettix trifasciatus Say---	--	--	--	--	--	.68	--	--	--	1	.03
Hesperotettix brevipennis Thos.	--	--	.09	--	--	.68	--	--	.78	4	.10
Hesperotettix viridis Thos.-----	.20	--	.09	.54	--	--	--	--	--	8	.21
Melanoplus angustipennis Dodge-	1.76	.61	.27	.18	--	--	--	--	--	16	.40
Melanoplus bivittatus Say-----	29.43	3.66	9.89	3.67	5.75	2.72	2.84	2.52	66.15	495	12.71
Melanoplus bowditchi Scudd.-----	--	.30	--	--	--	--	--	--	--	1	.03
Melanoplus confusus Scudd.-----	--	--	--	.18	--	--	--	--	--	2	.05
Melanoplus dawsoni Scudd.-----	9.22	7.62	4.97	8.77	1.15	1.36	1.14	13.45	3.11	265	6.80
Melanoplus femur-rubrum DeG.---	5.88	28.35	8.80	3.94	5.75	8.16	18.18	5.04	4.67	333	8.55
Melanoplus gladstoni Scudd.-----	1.76	3.05	.27	6.18	--	11.56	3.41	.84	--	119	3.05
Melanoplus infantilis Scudd.---	.20	--	--	.54	--	2.04	3.41	--	--	16	.42
Melanoplus keeleri luridus Dodge	1.18	2.44	1.45	.54	--	--	--	5.04	--	42	1.08
Melanoplus mexicanus Sauss.-----	5.29	7.32	2.36	7.52	35.63	3.40	1.70	3.36	3.11	214	5.49
Melanoplus packardii Scudd.-----	1.57	--	.54	.45	--	.68	--	.84	--	21	.54
Mestobregma kiowa Thos.-----	1.96	1.52	.45	6.98	1.14	30.61	2.84	.84	--	155	3.98
Opeia obscura Thos.-----	--	--	.09	--	--	--	--	--	--	1	.03
Orphulella pelidna Burm.-----	.59	--	--	.36	--	--	--	--	--	7	.18
Orphulella speciosa Scudd.-----	.78	.61	1.18	8.77	1.15	1.36	1.79	1.68	--	126	3.23
Phoetaliotes nebrascensis Thos.	--	.30	.18	.72	--	--	--	--	--	11	.29
Spharagemon collare Scudd.-----	.78	.91	.73	.98	--	.68	.57	--	--	27	.69
Stethophyma gracile Thos.-----	--	--	.09	.18	--	--	--	--	--	3	.08
Trimerotropis campestris McNeill	--	--	.09	--	--	--	--	--	--	1	.03
Total specimens per environment	510	328	1,102	1,117	87	147	176	119	257	--	--

Minnesota

Small grains

	<u>Percent</u>
1. Melanoplus bivittatus-----	28
2. Cammula pellucida-----	27
3. Melanoplus dawsoni-----	9
4. Encoptolophus costalis-----	7
5. Melanoplus femur-rubrum-----	6
6. Fifteen other species-----	23

Roadside

1. Cammula pellucida-----	24
2. Encoptolophus costalis-----	19
3. Dissostiera carolina-----	12
4. Melanoplus bivittatus-----	10
5. Melanoplus femur-rubrum-----	9
6. Twenty other species-----	26

Railroad

1. Melanoplus mexicanus-----	36
2. Ageneotettix deorum-----	30
3. Dissostiera carolina-----	8
4. Cammula pellucida-----	8
5. M. femur-rubrum-----	6
6. Five other species-----	12

Coulee

1. Cammula pellucida-----	26
2. Encoptolophus costalis-----	24
3. Melanoplus femur-rubrum-----	18
4. Ageneotettix deorum-----	10
5. M. gladstoni-----	3
6. Ten other species-----	19

Ditch bank

1. Melanoplus bivittatus-----	66
2. Cammula pellucida-----	14
3. Encoptolophus costalis-----	6
4. M. femur-rubrum-----	5
5. M. mexicanus-----	3
6. Five other species-----	6

Legumes

	<u>Percent</u>
1. Melanoplus femur-rubrum-----	28
2. Cammula pellucida-----	21
3. Ageneotettix deorum-----	10
4. Melanoplus dawsoni-----	8
5. Encoptolophus costalis-----	7
6. Thirteen other species-----	26

Pasture

1. Cammula pellucida-----	18
2. Encoptolophus costalis-----	14
3. A. deorum-----	10
4. Melanoplus dawsoni-----	9
5. Orphulella speciosa-----	9
6. Twenty-one other species-----	40

River bottom

1. Mestobregma kiowa-----	31
2. Ageneotettix deorum-----	11
3. Melanoplus gladstoni-----	12
4. C. pellucida-----	9
5. Encoptolophus costalis-----	8
6. Fifteen other species-----	29

Weed patch

1. Cammula pellucida-----	43
2. Encoptolophus costalis-----	16
3. Melanoplus dawsoni-----	13
4. Dissostiera carolina-----	5
5. Melanoplus femur-rubrum-----	5
6. Nine other species-----	18

Percentage of grand total

1. Cammula pellucida-----	21
2. Encoptolophus costalis-----	13
3. Melanoplus bivittatus-----	13
4. Melanoplus femur-rubrum-----	9
5. Ageneotettix deorum-----	7
6. Twenty-seven other species---	37

MONTANA

All of the collections in this State were made in that portion east of the Continental Divide. It is in the short-grass area which is subdivided for the State as follows:

1. Grama and western needlegrass:

Part of extreme east-central and extreme northeastern portions.

2. Western wheatgrass and sagebrush:

Large area extending diagonally from northwest to southeast through eastern half.

3. Grama grass:

General eastern two-thirds of State.

4. Grama grass and mountain sage:

Along eastern front of the mountains. The chief crops are small grains and alfalfa and there are large tracts of grazing lands that have been severely damaged during the last outbreak.

There were 10,401 specimens in the Montana collections, representing 42 species in 10 habitats. The distribution is given for all environments and the 5 most important species are listed for each habitat. Melanoplus mexicanus is still the dominant species in most places. In 1934 it was also the dominant species on the rangeland forming from 7 to 45 percent of the population. In 1935 M. mexicanus was fifth in abundance at 9 percent of the population. Cordillacris crenulata Brnn., Mestobregma kiowa, and Ageneotettix deorum were the dominant species this past season.

Infestations have shifted from the northern counties to the Yellowstone Valley, where the worst outbreaks occurred last summer. For 10 years--1923 to 1934--this valley had been practically free from grasshopper trouble.

Distribution by species, of 10,401 specimens collected in Montana, expressed in percentage of total number collected in each habitat.

Species	Mixed road- side and small grain	Small grains	Soddy road- side	Weedy road- side	Plains grass- land	Legumes	Low Mo- untain grass- land	Re- ver- sion	River bottom	Coulee	Total speci- mens	Percent- age of grand total
<i>Aeoloplus turnbullii</i> Thos.-----	0.10	--	--	0.61	0.08	--	--	0.21	0.15	--	13	0.12
<i>Aerochoreutes carlinianus</i> Thos.--	.52	0.86	--	.10	--	--	--	--	--	--	22	.21
<i>Ageneotettix deorum</i> Scudd.-----	7.78	1.15	12.68	2.93	11.84	0.21	3.57	11.94	7.50	17.86	760	7.31
<i>Amphitornus bicolor</i> Thos.-----	.45	.43	9.77	1.72	8.43	--	3.57	7.68	5.36	--	386	3.71
<i>Arphia pseudonietana</i> Thos.-----	.07	--	--	--	.71	--	--	--	.31	--	22	.21
<i>Aulocara ellioti</i> Thos.-----	2.71	2.15	14.58	6.96	10.10	.14	15.48	15.75	7.04	7.14	653	6.28
<i>Boopedon nubilum</i> Say-----	.03	--	--	--	--	--	--	--	.46	--	4	.04
<i>Bruneria brunnea</i> Thos.-----	.35	--	--	--	1.27	--	--	--	--	--	42	.40
<i>Camula pellucida</i> Scudd.-----	.97	2.01	2.77	4.54	1.47	5.00	--	.21	11.49	--	289	2.78
<i>Chorthippus curtippennis</i> Harr.---	--	--	--	.10	--	1.79	--	--	--	--	26	.25
<i>Cordillacris crenulata</i> Brun.-----	.03	--	7.00	.30	14.59	--	--	--	.31	--	421	4.05
<i>Derotmema haydenii</i> Thos.-----	.10	--	.29	.10	--	--	--	.21	--	--	7	.07
<i>Dissosteira carolina</i> L.-----	2.57	1.00	--	.10	.08	.29	--	--	.62	--	92	.88
<i>Drepanopterna femoratum</i> Scudd.---	1.91	.57	2.62	1.72	3.26	--	--	2.56	29.25	17.86	382	3.67
<i>Encoptolophus costalis</i> Scudd.---	1.39	--	--	--	1.39	--	--	--	.62	--	79	.76
<i>Gomphocerus clavatus</i> Thom.-----	.07	--	--	.30	.24	--	--	--	.46	--	14	.13
<i>Hadrotettix trifasciatus</i> Say----	.29	.14	.44	--	.08	--	--	--	.31	--	16	.15
<i>Hesperotettix viridis</i> Thos.-----	.03	--	.44	--	.12	--	--	1.07	1.07	--	19	.18
<i>Hypochlora alba</i> Dodge-----	.03	--	--	--	--	--	--	--	--	--	1	.01
<i>Melanoplus angustipennis</i> Dodge--	.24	--	--	--	--	--	--	10.23	--	--	55	.53
<i>Melanoplus bivittatus</i> Say-----	1.81	1.72	--	1.72	.04	6.15	--	.21	.62	--	173	1.66
<i>Melanoplus bowditchi</i> Scudd.-----	--	--	--	--	--	--	--	--	.46	17.86	8	.08
<i>Melanoplus confusus</i> Scudd.-----	--	--	--	.10	.32	--	--	--	2.14	--	23	.22
<i>Melanoplus dawsoni</i> Scudd.-----	--	.14	--	--	.08	2.07	1.19	--	.15	--	34	.33
<i>Melanoplus femur-rubrum</i> DeG.-----	4.79	6.31	--	27.55	.79	36.10	10.71	.85	.77	--	998	9.60
<i>Melanoplus gladstoni</i> Scudd.-----	1.25	--	--	--	.32	--	2.38	1.14	--	--	48	.46
<i>Melanoplus infantilis</i> Scudd.-----	2.08	1.72	5.25	.91	6.92	.29	44.05	4.90	--	--	355	3.41
<i>Melanoplus mexicanus</i> Sauss.-----	57.12	73.17	19.68	38.85	8.59	44.46	13.10	24.52	10.57	39.29	3718	35.75
<i>Melanoplus occidentalis</i> Thos.---	--	--	.87	--	1.03	--	--	.21	--	7.14	35	.34
<i>Melanoplus packardii</i> Scudd.-----	17.45	7.03	1.90	4.54	.87	3.29	1.19	10.45	2.30	3.57	455	4.37

Montana (Cont'd).

Species	Mixed road- side and small grain	Small grains	Soddy road- side	Weedy road- side	Plains grass- land	Legumes	Low Mo- untain grass- land	Re- ver- sion	River bottom	Coulee	Total speci- mens	Percent- age of total
Mestobregma kiowa Thos.-----	1.08	0.43	12.54	2.32	13.67	0.07	4.76	--	1.68	--	503	4.84
Metator pardalinus Sauss.-----	.94	--	2.62	1.31	2.11	--	--	2.77	.62	3.57	129	1.24
Opeia obscura Thos.-----	.76	.14	4.66	1.72	4.09	--	--	1.07	6.58	--	223	2.14
Orphulella speciosa Scudd.-----	.03	--	--	--	.60	--	--	--	2.14	--	30	.29
Philibostroma quadrimaculatum Thos.	1.53	--	1.60	.61	5.76	--	--	--	--	--	206	1.98
Phoetaliotes nebrascensis Thos.--	.52	--	--	--	.36	.07	--	--	6.13	--	65	.62
Schistocerca lineata Scudd.-----	.07	--	--	--	--	--	--	--	--	--	2	.02
Spharagemon collare Scudd.-----	.35	--	--	--	.44	.07	--	.85	.15	--	27	.26
Spharagemon equale Say-----	.49	.29	.29	.91	.36	--	--	3.84	.77	--	59	.57
Trimerotropis campestris McNeill-	.39	.43	--	--	--	--	--	--	--	--	4	.04
Trimerotropis pallidipennis Burm-	--	.29	--	--	--	--	--	--	--	--	2	.02
Trimerotropis sparsa Thos.-----	.03	--	--	--	--	--	--	--	--	--	1	.01
Total specimens per environment--	2878	697	686	991	2516	1399	84	469	653	28	--	--

MontanaSmall grains and roadsidePercent

1. Melanoplus mexicanus-----	57
2. Melanoplus packardii-----	17
3. Ageneotettix deorum-----	8
4. Melanoplus femur-rubrum-----	5
5. Aulocara ellioti-----	3
6. Thirty-one other species-----	10

Soddy roadside

1. Melanoplus mexicanus-----	20
2. Aulocara ellioti-----	15
3. Ageneotettix deorum-----	13
4. Mestobregma kiowa-----	12
5. Amphitornus coloradus-----	10
6. Thirteen other species-----	30

Plains grassland

1. Cordillacris crenulata-----	15
2. Mestobregma kiowa-----	14
3. Ageneotettix deorum-----	12
4. Aulocara ellioti-----	10
5. Melanoplus mexicanus-----	9
6. Twenty-six other species-----	40

Low mountain grassland

1. Melanoplus infantilis-----	44
2. Aulocara ellioti-----	15
3. Melanoplus mexicanus-----	13
4. Melanoplus femur-rubrum-----	11
5. Mestobregma kiowa-----	5
6. Five other species-----	12

River bottom

1. Drepanopterna femoratum-----	29
2. Melanoplus mexicanus-----	11
3. Cammula pellucida-----	11
4. Ageneotettix deorum-----	8
5. Aulocara ellioti-----	7
6. Twenty-three other species-----	34

Small grainsPercent

1. Melanoplus mexicanus-----	73
2. Melanoplus packardii-----	7
3. Melanoplus femur-rubrum-----	6
4. Aulocara ellioti-----	2
5. Cammula pellucida-----	2
6. Fourteen other species-----	10

Weedy roadside

1. Melanoplus mexicanus-----	39
2. Melanoplus femur-rubrum-----	28
3. Aulocara ellioti-----	7
4. Cammula pellucida-----	4
5. Melanoplus packardii-----	4
6. Eighteen other species-----	18

Legumes

1. Melanoplus mexicanus-----	44
2. Melanoplus femur-rubrum-----	36
3. Melanoplus bivittatus-----	6
4. Cammula pellucida-----	5
5. Melanoplus packardii-----	3
6. Nine other species-----	6

Reversion

1. Melanoplus mexicanus-----	25
2. Aulocara ellioti-----	16
3. Ageneotettix deorum-----	12
4. Melanoplus packardii-----	10
5. Melanoplus angustipennis-----	10
6. Fifteen other species-----	27

Coulee

1. Melanoplus mexicanus-----	39
2. Melanoplus bowditchi-----	18
3. Drepanopterna femoratum-----	18
4. Ageneotettix deorum-----	18
5. Aulocara ellioti-----	7
6. None	

Percentage of grand total

1. Melanoplus mexicanus-----	36
2. Melanoplus femur-rubrum-----	10
3. Ageneotettix deorum-----	7
4. Aulocara ellioti-----	6
5. Mestobregma kiowa-----	5
6. Other species-----	36

NEBRASKA

The collections made in Nebraska were divided into two lots:
(1) Those taken in the extreme eastern part and (2) those in the middle and western parts. Nebraska is comprised of the following natural vegetation areas:

1. Tall-grass prairie in eastern portion:
 - (a) Bluestem sod association in the extreme east.
 - (b) Needlegrass and slender wheatgrass association just west of (a).
2. Sand sage-sand grass area in the middle of the State. Here the soil is far too light for safe cultivation and very few collections were made.
3. Wiregrass association containing an open cover of grama grass, Buffalo grass and wiregrass.
4. Grama-buffalo grass association in the extreme west.

In all parts of the State there are the common weeds Ambrosia, Chenopodium, Amaranthus, Lactuca, Polygonum, Salsola, Leptilon, Grindelia.

Twelve species were collected in the tall-grass area and 33 in the short-grass area. Most of the collections in the eastern part were made along roadsides, in legumes, and in rape. There were 844 specimens collected in three habitats with Melanoplus mexicanus by far the most important species. In the western part most of the collections were made along roadsides and in legumes, and 958 specimens were taken from six habitats. M. femor-rubrum was the dominant species in a total of all collections. This was due, perhaps, to the fact that most of the specimens came from roadsides and alfalfa fields. The six most important species and their relative abundance are listed for each habitat.

The worst infestations in 1935 were limited to the eastern counties bordering the Missouri River. Here the general population has increased over 1934. In the western part, where farming is somewhat spotted, infestations were light and spotted in 1935.

Distribution by species of 958 specimens collected in western Nebraska, expressed in percentage of total number collected in each habitat.

Species	Small grains	Road-side	Legumes	Plains grassland	Railroad	Corn	Total specimens	Percentage of grand total
Aeoloplus turnbullii Thos.-----	--	6.16	--	--	--	--	21	2.19
Ageneotettix deorum Scudd.-----	--	2.35	5.13	27.47	10.28	11.34	69	7.20
Aulocara elliotti Thos.-----	12.50	--	1.83	--	7.48	--	19	1.98
Boopedon nubilum Say-----	--	--	--	1.10	--	--	1	.10
Brachystola magna Gir.-----	2.08	--	--	1.10	--	--	2	.21
Camnula pellucida Scudd.-----	--	.29	--	--	--	--	1	.10
Derotmema haydenii Thos.-----	2.08	--	.37	--	--	--	2	.21
Dissosteira carolina L.-----	8.33	.29	1.10	--	1.87	8.25	19	1.98
Drepanopterna femoratum Scudd.-	12.50	.88	1.10	1.10	--	--	13	1.36
Hadrotettix trifasciatus Say---	10.42	1.47	.73	--	.93	--	13	1.36
Hesperotettix speciosus Scudd.-	--	.59	--	--	--	--	2	.21
Hesperotettix viridis Thos.-----	--	--	--	--	--	1.03	1	.10
Hippiscus rugosus Scudd.-----	--	.59	--	--	--	--	2	.21
Melanoplus angustipennis Dodge-	--	--	8.42	--	3.74	29.90	56	5.85
Melanoplus bivittatus Say-----	--	7.92	9.16	2.20	8.41	5.15	68	7.10
Melanoplus dawsoni Scudd.-----	--	--	.37	--	--	--	1	.10
Melanoplus differentialis Thos.	6.25	5.87	4.76	--	2.80	1.03	40	5.18
Melanoplus femur-rubrum DeG.---	2.08	49.56	30.40	--	48.60	3.09	308	32.15
Melanoplus gladstoni Scudd.-----	--	--	1.10	3.30	--	--	6	.63
Melanoplus infantilis Scudd.---	--	--	.73	--	--	1.03	3	.31
Melanoplus lakinus Scudd.-----	--	3.81	.37	--	--	--	14	1.46
Melanoplus mexicanus Sauss.-----	16.67	10.26	26.37	15.38	13.08	30.93	173	18.06
Melanoplus occidentalis Thos.---	2.08	--	--	--	--	0	1	.10
Melanoplus packardii Scudd.-----	4.17	3.23	2.56	7.69	--	7.22	34	3.55
Mermiria maculipennis Rehn-----	2.08	1.76	--	1.10	.93	--	9	.94
Mestobregma kiowa Thos.-----	--	1.17	2.56	1.10	--	1.03	13	1.36
Metator pardalinus Sauss.-----	14.58	.29	.37	--	--	--	9	.94
Opeia obscura Thos.-----	--	.29	--	2.20	--	--	3	.31
Phlibostroma quadrimaculatum Thos.	--	.29	.73	21.98	--	--	23	2.40
Phoetaliotes nebrascensis Thos.	--	2.05	--	--	.93	--	8	.84
Spharagemon collare Scudd.-----	--	.29	.37	--	--	--	2	.21
Spharagemon equale Say-----	4.17	.29	1.47	14.29	.93	--	21	2.19
Trimerotropis agrestis McNeill-	--	.29	--	--	--	--	1	.10
Total specimens per environment	48	341	273	91	107	97	--	--

Distribution by species of 844 specimens collected in Eastern Nebraska, expressed in percentage of total number collected in each habitat (Cont'd.)

Species	Small grains	Road-side	Legumes	Rape	Rail-road	Corn	Total specimens	Percentage of grand total
Ageneotettix deorum Scudd.-----	--	4.10	0.00	--	--	--	18	2.13
Derotmema haydeni Thos.-----	--	.24	--	--	--	--	1	.12
Dissosteira Carolina L.-----	--	.24	--	0.70	--	--	3	.36
Encoptolophus costalis Scudd.-----	--	.48	.37	--	--	--	3	.36
Melanoplus bivittatus Say-----	--	2.65	1.49	.70	--	--	16	1.90
Melanoplus differentialis Thos.--	--	3.86	2.61	.70	--	--	24	2.84
Melanoplus femur-rubrum DeG.-----	--	29.16	4.10	3.50	--	--	138	16.35
Melanoplus mexicanus Sauss.-----	--	56.87	91.42	94.41	--	--	620	73.46
Mestobregma kiowa Thos.-----	0.72	--	--	--	--	--	3	.36
Metator pardalinus Sauss.-----	--	.72	--	--	--	--	3	.36
Opeia obscura Thos.-----	--	.24	--	--	--	--	1	.12
Philibostroma quadrimaculatum Thos.	--	.72	--	--	--	--	3	.36
Total specimens per environment--	415.0	268.0	143.0	--	--	--	--	--

Nebraska

Eastern part

Roadside

	<u>Percent</u>
1. <i>Melanoplus mexicanus</i> -----	57
2. <i>Melanoplus femur-rubrum</i> ----	29
3. <i>Ageneotettix deorum</i> -----	4
4. <i>Melanoplus differentialis</i> --	4
5. <i>Melanoplus bivittatus</i> -----	3
6. Seven other species-----	3

Legumes

1. <i>Melanoplus mexicanus</i> -----	91
2. <i>Melanoplus femur-rubrum</i> ----	4
3. <i>Melanoplus differentialis</i> --	2
4. <i>Melanoplus bivittatus</i> -----	2
5. <i>Encyrtolophus costalis</i> -----	1
6. No others	

Rape

	<u>Percent</u>
1. <i>Melanoplus mexicanus</i> -----	94
2. <i>Melanoplus femur-rubrum</i> ----	3
3. <i>Melanoplus bivittatus</i> -----	1
4. <i>Melanoplus differentialis</i> ----	1
5. <i>Dissosteira carolina</i> -----	1
6. No others	

Percentage of grand total

1. <i>Melanoplus mexicanus</i> -----	73
2. <i>Melanoplus femur-rubrum</i> -----	16
3. <i>Melanoplus bivittatus</i> -----	3
4. <i>Ageneotettix deorum</i> -----	2
5. <i>Melanoplus bivittatus</i> -----	2
6. Seven other species-----	4

Western part

Roadside

1. <i>Melanoplus femur-rubrum</i> ----	50
2. <i>Melanoplus mexicanus</i> -----	10
3. <i>Melanoplus bivittatus</i> -----	8
4. <i>Aeoloplus turnbullii</i> -----	6
5. <i>Melanoplus differentialis</i> --	6
6. Eighteen other species-----	20

Legumes

1. <i>Melanoplus femur-rubrum</i> ----	30
2. <i>Melanoplus mexicanus</i> -----	26
3. <i>Melanoplus bivittatus</i> -----	9
4. <i>Melanoplus angustipennis</i> --	8
5. <i>Ageneotettix deorum</i> -----	5
6. Sixteen other species-----	22

Small grains

1. <i>Melanoplus mexicanus</i> -----	17
2. <i>Metator pardalinus</i> -----	15
3. <i>Aulocara elliotti</i> -----	12
4. <i>Drepanopterna femoratum</i> ----	12
5. <i>Hadrotettix trifasciatus</i> ----	10
6. Nine other species-----	34

Plains grassland

1. <i>Ageneotettix deorum</i> -----	27
2. <i>Phlibostroma quadrimaculatum</i> -----	22
3. <i>Melanoplus mexicanus</i> -----	15
4. <i>Spharagemon equale</i> -----	14
5. <i>Melanoplus packardii</i> -----	8
6. Eight other species-----	14

Railroad

1. <i>Melanoplus femur-rubrum</i> -----	49
2. <i>Melanoplus mexicanus</i> -----	13
3. <i>Ageneotettix deorum</i> -----	10
4. <i>Melanoplus bivittatus</i> -----	8
5. <i>Aulocara elliotti</i> -----	7
6. Six other species-----	13

Corn

1. <i>Melanoplus mexicanus</i> -----	31
2. <i>Melanoplus angustipennis</i> ----	30
3. <i>Ageneotettix deorum</i> -----	11
4. <i>Dissosteira carolina</i> -----	8
5. <i>Melanoplus packardii</i> -----	7
6. Six other species-----	13

Percentage of grand total

1. <i>Melanoplus femur-rubrum</i> -----	32
2. <i>Melanoplus mexicanus</i> -----	18
3. <i>Ageneotettix deorum</i> -----	7
4. <i>Melanoplus bivittatus</i> -----	7
5. <i>Melanoplus angustipennis</i> ----	6
6. Thirty-three other species---	30

NORTH DAKOTA

The collections made in North Dakota were divided into those taken from the eastern half, or tall-grass prairie, or those from the western half, or short-grass region. The natural vegetation is as follows:

1. Tall-grass area (eastern half):

- (a) Bluestem sod association--extreme eastern portion or along the Red River Valley.
- (b) Needlegrass-slender wheatgrass--west of (a) to just beyond Jamestown and swinging northwest to Canada.

2. Short-grass region (western half):

- (a) Grama and western needlegrass--most of the western half.
- (b) Western wheatgrass and sagebrush--badlands of southwestern quarter.
- (c) Grama grass--extreme west and southwest.

This is mostly the hard-spring-wheat area, with intensive farming in the east and large-scale crop production in the west. The east is more mesophytic and west xerophytic.

In the eastern half 673 specimens were collected, representing 22 species. In the west 5,447 specimens were taken, representing 41 species. Melanoplus mexicanus was the dominant species in both portions. In 1934 Camnula pellucida was right up to the top in abundance in the eastern part of the State, but in 1935 it fell to fourth place. It ran from 50 to 75 percent of the total grasshopper population in the eastern part in 1934, but in 1935 it was under 10 percent anywhere. June rains reduced the numbers of the particular species considerably.

The populations were low in the eastern quarter and in the southern tier of counties east of the Missouri River. In parts of the north-central, northwestern, and southwestern counties, severe infestations still occurred, but the general population since 1934 has been reduced about 50 percent over most of the State.

Distribution by species of 673 specimens collected in eastern North Dakota, expressed in percentage of total number collected in each habitat

Species	Small grains	Flax	Road-side	Pasture	Railroad	Total specimens	Percentage of grand total
<i>Ageneotettix deorum</i> Scudd.-----	2.59	1.11	4.94	5.08	8.70	28	4.15
<i>Arphia pseudonietana</i> Thos.-----	.52	1.11	--	1.03	--	4	.59
<i>Camnula pellucida</i> Scudd.-----	1.04	1.11	11.11	9.14	6.52	42	6.23
<i>Chorthippus curtipennis</i> Harr.-----	1.55	--	1.23	3.55	--	14	2.08
<i>Dissosteira carolina</i> L.-----	.52	--	2.47	--	2.17	4	.59
<i>Encoptolophus costalis</i> Scudd.-----	4.15	3.33	23.46	17.26	17.39	72	10.68
<i>Hesperotettix viridis</i> Thos.-----	.52	--	--	.51	2.17	7	1.04
<i>Melanoplus angustipennis</i> Dodge-----	2.59	--	--	--	--	5	.74
<i>Melanoplus bivittatus</i> Say-----	1.04	2.22	2.47	.51	--	7	1.04
<i>Melanoplus dawsoni</i> Scudd.-----	1.55	--	1.23	7.11	6.52	23	3.41
<i>Melanoplus differentialis</i> Thos.-----	--	--	--	.51	--	1	.15
<i>Melanoplus femur-rubrum</i> DeG.-----	10.88	14.44	2.47	11.17	8.70	74	10.98
<i>Melanoplus gladstoni</i> Scudd.-----	1.04	1.11	1.23	.51	--	4	.59
<i>Melanoplus infantilis</i> Scudd.-----	--	--	--	5.08	--	10	1.48
<i>Melanoplus mexicanus</i> Sauss.-----	67.36	70.00	39.51	28.43	45.65	323	47.92
<i>Melanoplus packardii</i> Scudd.-----	2.07	2.22	4.94	1.52	--	13	1.93
<i>Mermiria maculipennis mcclungi</i> Rehn	--	1.11	--	--	--	1	.15
<i>Mestobregma kiowa</i> Thos.-----	1.04	--	--	6.09	2.17	14	2.08
<i>Opeia obscura</i> Thos.-----	--	1.11	--	--	--	1	.15
<i>Orphulella speciosa</i> Scudd.-----	--	--	--	.51	--	1	.15
<i>Phoetaliotes nebrascensis</i> Thos.-----	2.59	--	--	--	--	8	1.19
<i>Spharagemon collare</i> Scudd.-----	--	1.11	4.94	--	--	17	2.52
Total specimens per environment-----	193	90	81	197	46	--	--

Eastern North Dakota

Small grains

	<u>Percent</u>
1. Melanoplus mexicanus-----	67
2. Melanoplus femur-rubrum-----	11
3. Encoptolophus costalis-----	4
4. Ageneotettix deorum-----	3
5. Phoetaliotes nebrascensis---	3
6. Eleven others-----	12

Roadside

1. Melanoplus mexicanus-----	40
2. Encoptolophus costalis-----	23
3. Camnula pellucida-----	11
4. Ageneotettix deorum-----	5
5. Melanoplus packardii-----	5
6. Seven others-----	16

Railroad

1. Melanoplus mexicanus-----	46
2. Encoptolophus costalis-----	17
3. Melanoplus femur-rubrum-----	9
4. Ageneotettix deorum-----	9
5. Camnula pellucida-----	7
6. Four others-----	12

Flax

	<u>Percent</u>
1. Melanoplus mexicanus-----	70
2. Melanoplus femur-rubrum-----	14
3. Encoptolophus costalis-----	3
4. Melanoplus bivittatus-----	2
5. Melanoplus packardii-----	2
6. Seven others-----	9

Pasture

1. Melanoplus mexicanus-----	28
2. Encoptolophus costalis-----	17
3. Melanoplus femur-rubrum-----	11
4. Camnula pellucida-----	9
5. Melanoplus dawsoni-----	7
6. Eleven others-----	28

Percentage of grand total

1. M. mexicanus-----	48
2. M. femur-rubrum-----	11
3. Encoptolophus costalis-----	11
4. Camnula pellucida-----	6
5. Ageneotettix deorum-----	4
6. Seventeen others-----	20

Distribution by species, of 5,447 specimens collected in western North Dakota, expressed in percentage of total number collected in each habitat

Species	Small grains	Crested wheat-grass	Upland prairie	Legumes	Flax	Road-side	Rail-road right of way	Bottom-land	Pas-ture	Total speci-mens	Percentage of grand total
<i>Aeoloplus turnbullii</i> Thos.-----	--	--	--	--	--	1.15	--	--	0.88	22	0.40
<i>Ageneotettix deorum</i> Scudd.-----	15.49	8.40	33.18	0.73	6.85	11.75	31.91	8.91	28.75	912	16.74
<i>Amphitornus bicolor</i> Thos.-----	.19	--	3.56	--	1.47	.25	1.06	.50	1.26	42	.77
<i>Arphia pseudonietana</i> Thos.-----	.10	--	.22	--	--	--	.27	--	.38	6	.11
<i>Aulocara ellioti</i> Thos.-----	2.87	1.05	3.34	--	5.13	.32	.27	.99	1.13	95	1.74
<i>Camnula pellucida</i> Scudd.-----	2.77	38.87	--	.36	.49	.82	.53	15.35	.63	267	4.90
<i>Chorthippus curtipennis</i> Harr.-----	.10	--	--	--	--	--	--	5.94	--	13	.24
<i>Cordillacris crenulata</i> Brun.-----	--	--	--	--	--	--	--	--	.76	6	.11
<i>Dactylotum pictum</i> Thos.-----	--	--	--	--	--	--	--	--	.13	1	.02
<i>Derotmema haydenii</i> Thos.-----	.57	4.41	--	--	--	.08	.27	--	--	29	.53
<i>Dissosteira carolina</i> L.-----	5.93	2.31	.22	2.55	1.71	18.82	5.59	2.48	.25	364	6.68
<i>Drepanopterna femoratum</i> Scudd.-----	.19	--	4.45	--	4.16	.66	1.06	1.98	4.41	90	1.65
<i>Encoptolophus costalis</i> Scudd.-----	1.24	.63	.45	--	.98	.49	.27	14.36	1.89	74	1.36
<i>Gomphocerus clavatus</i> Thom.-----	--	--	--	--	--	--	--	--	1.13	1	.02
<i>Hadrotettix trifasciatus</i> Say-----	.10	--	.45	--	--	.41	.53	--	--	10	.18
<i>Hesperotettix speciosus</i> Scudd.-----	--	--	--	--	--	--	--	--	1.13	1	.02
<i>Hesperotettix viridis</i> Thos.-----	.29	--	.67	--	.24	.49	--	--	.13	15	.28
<i>Hypochlora alba</i> Dodge-----	--	--	--	--	--	--	--	--	.13	1	.02
<i>Melanoplus angustipennis</i> Dodge-----	1.72	.21	--	2.55	4.16	3.29	2.13	--	1.13	112	2.06
<i>Melanoplus bivittatus</i> Say-----	.57	--	--	.36	1.71	1.07	--	--	--	37	.68
<i>Melanoplus bowditchi</i> Scudd.-----	--	--	--	--	--	--	.27	--	--	1	.02
<i>Melanoplus dawsoni</i> Scudd.-----	.19	--	--	.36	--	--	--	--	--	3	.06
<i>Melanoplus differentialis</i> Thos.-----	1.05	--	--	.36	1.71	.41	--	--	--	38	.70
<i>Melanoplus femur-rubrum</i> DeG.-----	4.11	.84	.67	10.91	12.47	2.96	1.86	1.98	.13	183	3.36
<i>Melanoplus gladstoni</i> Scudd.-----	.86	1.05	4.68	3.27	1.47	1.89	1.60	.99	2.65	104	1.91
<i>Melanoplus infantilis</i> Scudd.-----	1.24	3.78	3.12	1.09	.73	.82	1.33	--	4.79	104	1.91
<i>Melanoplus mexicanus</i> Sauss.-----	45.89	26.68	9.35	59.27	34.47	31.06	19.41	12.38	8.58	1586	29.12
<i>Melanoplus packardii</i> Scudd.-----	6.69	1.89	2.23	14.91	4.88	6.41	4.26	.50	.50	265	4.87

Western North Dakota (Cont'd).

Species	Small grains	Crested wheat- grass	Upland prairie	Legumes	Flax	Road- side	Rail- road right of way	Bottom- land	Pas- ture	Total speci- mens	Percentage of grand total
Mermiria maculipennis mcclungi Rehn	--	--	--	--	--	--	8.24	--	--	31	0.57
Mestobregma kiowa Thos.-----	1.63	1.47	2.45	--	2.69	3.20	7.18	2.97	12.74	220	4.04
Metator pardalinus Sauss.-----	.86	6.73	1.56	0.36	7.58	4.03	1.86	14.85	7.19	223	4.09
Opeia obscura Thos.-----	1.63	--	2.45	.73	3.19	.53	3.19	6.44	1.89	95	1.71
Orphulella speciosa Scudd.-----	.10	--	--	--	--	--	.27	1.98	--	6	.11
Philibostroma quadrimaculatum Thos.+	.57	--	26.28	1.09	--	6.16	3.72	3.96	16.77	358	6.57
Phoetaliotes nebrascensis Thos.---	1.53	--	--	.36	2.20	1.40	1.33	1.49	1.51	63	1.25
Spharagemon bolli Scudd.-----	.19	--	--	--	.24	--	--	--	--	3	.06
Spharagemon collare Scudd.-----	.96	.84	--	.73	.24	.49	1.06	1.98	.13	34	.62
Spharagemon equale Say-----	.29	.63	.67	--	.24	.49	.53	--	.13	20	.37
Trimerotropis campestris McNeill--	--	.21	--	--	--	--	--	--	--	1	.02
Trimerotropis laticincta Scuss.---	.10	--	--	--	--	--	--	--	--	1	.02
Trimerotropis pallidipennis Burm.--	--	--	--	--	--	--	--	--	.13	1	.02
Total specimens per environment	1046	476	449	275	409	1217	376	202	793		

Western North Dakota

Small grains

	<u>Percent</u>
1. Melanoplus mexicanus-----	46
2. Ageneotettix deorum-----	15
3. Melanoplus packardii-----	7
4. Dissosteira carolina-----	6
5. Melanoplus femur-rubrum-----	4
6. Twenty-six others-----	22

Upland prairie

1. Ageneotettix deorum-----	33
2. Phlibostroma quadrimaculatum--	26
3. Melanoplus mexicanus-----	9
4. Melanoplus gladstoni-----	5
5. Drepanopterna femoratum-----	4
6. Fourteen others-----	23

Flax

1. Melanoplus mexicanus-----	34
2. Melanoplus femur-rubrum-----	12
3. Metator pardalinus-----	8
4. Ageneotettix deorum-----	7
5. Aulocara elliotti-----	5
6. Eighteen others-----	34

Railroad

1. Ageneotettix deorum-----	32
2. Melanoplus mexicanus-----	19
3. Mermiria maculipennis-----	8
4. Mestobregma kiowa-----	7
5. Dissosteira carolina-----	6
6. Twenty-one others-----	28

Pasture

1. Ageneotettix deorum-----	29
2. Phlibostroma quadrimaculatum--	17
3. Mestobregma kiowa-----	13
4. Melanoplus mexicanus-----	9
5. Metator pardalinus-----	7
6. Twenty-four others-----	25

Crosted wheat grass

	<u>Percent</u>
1. Cammula pellucida-----	39
2. Melanoplus mexicanus-----	27
3. Ageneotettix deorum-----	8
4. Metator pardalinus-----	7
5. Derotoma haydenii-----	4
6. Twelve others-----	15

Legumes

1. Melanoplus mexicanus-----	59
2. Melanoplus packardii-----	15
3. Melanoplus femur-rubrum-----	11
4. Melanoplus gladstoni-----	3
5. Dissosteira carolina-----	3
6. Twelve others-----	9

Roadside

1. Melanoplus mexicanus-----	31
2. Dissosteira carolina-----	19
3. Ageneotettix deorum-----	12
4. Melanoplus packardii-----	6
5. Phlibostroma quadrimaculatum--	6
6. Twenty-one others-----	26

Bottomland

1. Cammula pellucida-----	15
2. Metator pardalinus-----	15
3. Encoptolophus costalis-----	14
4. Melanoplus mexicanus-----	12
5. Ageneotettix deorum-----	9
6. Fourteen others-----	35

Percentage of grand total

1. Melanoplus mexicanus-----	29
2. Ageneotettix deorum-----	17
3. Dissosteira carolina-----	7
4. Phlibostroma quadrimaculatum--	5
5. Cammula pellucida-----	5
6. Thirty-seven others-----	35

SOUTH DAKOTA

All of the collections in South Dakota were made in the short-grass region. There are five types of association occurring in this area:

1. Grama and western needlegrass:
East of the Missouri and north of the Moreau Rivers.
2. Western wheatgrass:
Most of the area south of the Moreau River and west of the Missouri River.
3. Grama-buffalo grass:
A strip east and west south of the White River and west of the Missouri River.
4. Western wheatgrass and sagebrush:
Extreme northwestern portion in foothills.
5. Grama grass:
Also extreme northwestern portion on plains.

Most of the collecting was restricted to places other than cultivated crops. There were no collections in corn and only a small percentage (3 percent) in small grains. The bulk of the specimens came from the native grasslands; therefore, any statements regarding relative abundance of the different species must be modified by this fact.

A total of 2,741 specimens were taken, representing 47 species. The dominant species in the whole lot were Ageneotettix deorum and Mestobregma kiowa, each equaling about 19 percent of the total number collected. Melanoplus mexicanus ranks third, at approximately 13 percent.

M. bivittatus and M. differentialis were still not very abundant after the drought, which decimated their numbers; however, observation showed that these two species are building up again in the cultivated crops along river courses.

In 1934 M. mexicanus was the dominant species in this part of South Dakota, but this year it has fallen to third place. Strange to say, Mestobregma kiowa was the most numerous of all species in alfalfa, constituting 42 percent. These collections were made in September when the alfalfa was short and dry. In 1934 M. mexicanus constituted from 40 to 80 percent of the populations in alfalfa in this area, but in 1935, only 7 percent.

Threatening infestations were found all along the river courses in the central and western parts of the State. The worst infestations were along the Missouri River bottom in Hughes County.

Distribution by species of 2,741 specimens collected in western South Dakota, expressed in percentage of total number collected in each habitat

Species	Small grains	Road- side	Plains grass- land	Legumes	Pasture grass- land	Low moun- tain grassland	Weedy patches	River bot- tom	Railroad right of way	Total specimens	Percentage of grand total
Aeoloplus turnbullii Thos.----	--	5.63	--	0.56	0.79	--	3.98	7.93	--	59	2.15
Ageneotettix deorum Scudd.----	4.82	8.23	24.89	19.44	25.59	21.90	6.25	14.10	25.87	534	19.48
Amphitornus bicolor Thos.-----	--	.87	7.27	2.78	.39	4.44	1.14	2.64	.60	101	3.68
Arphis pseudonietana Thos.-----	--	.43	.11	--	--	--	--	--	--	2	.07
Aulocara elliotti Thos.-----	--	.43	2.27	.56	1.57	14.92	11.93	5.95	--	121	4.41
Boopedon nubilum Say-----	--	.43	.11	--	--	--	3.98	--	--	9	.33
Brachystola magna Gir.-----	--	.43	--	--	--	--	--	--	--	1	.04
Camnula pellucida Scudd.-----	4.82	5.63	--	1.67	2.76	1.90	--	--	--	33	1.20
Chorthippus curtipennis Harr.--	2.41	1.30	--	--	--	--	--	--	--	5	.18
Cordillacris crenulata Brun.--	--	--	1.14	1.11	--	--	--	--	--	12	.44
Cordillacris occipitalis-----	--	--	.11	1.11	.39	7.62	.57	2.64	--	41	1.50
Derotmema haydenii Thos.-----	--	7.36	.23	--	.39	--	5.11	.44	.60	32	1.17
Dissosteira carolina L.-----	26.51	5.63	.45	2.78	--	--	9.09	1.32	--	66	2.41
Dissosteira longipennis Thos.--	--	--	--	--	--	--	1.14	--	--	1	.04
Drepanopterna femoratum Scudd.	1.20	--	1.82	5.00	--	2.76	12.50	11.01	--	105	3.83
Encoptolophus costalis Scudd.--	--	--	--	.56	3.94	--	--	1.54	--	18	.66
Gomphocerus clavatus Thom.-----	--	--	--	.56	--	2.54	--	.22	--	10	.36
Hadrotettix trifasciatus Say--	--	2.60	.57	.56	1.57	--	6.82	5.51	--	53	1.93
Hesperotettix viridis Thos.----	--	1.30	.11	.56	--	2.22	--	.44	1.79	17	.62
Hippiscus rugosus Scudd.-----	--	--	--	--	--	--	--	.44	--	2	.07
Melanoplus angustipennis Dodge	--	.43	--	--	--	9.21	--	--	1.19	32	1.17
Melanoplus bivittatus Say-----	--	.43	--	.56	--	1.59	3.41	.22	--	14	.51
Melanoplus confusus Scudd.-----	--	2.16	--	--	--	1.27	--	--	--	9	.33
Melanoplus dawsoni Scudd.-----	--	.43	--	--	--	--	--	--	--	1	.04
Melanoplus differentialis Thos.	--	.43	--	--	.39	--	2.27	--	--	6	.22
Melanoplus femur-rubrum DeG.--	4.82	6.49	1.02	5.56	.79	--	--	.22	3.57	47	1.71
Melanoplus gladstoni Scudd.----	--	--	2.50	--	.79	--	--	--	1.79	27	.99
Melanoplus infantilis Scudd.----	--	--	.45	--	--	--	--	--	--	4	.15

Western South Dakota (Cont'd.)

Species.	Small grains	Road- side	Plains grass- land	Legumes	Pasture grass land	Low Mountain grassland	Weedy patches	River bot- tom	Railroad right of way	Total specimens	Percentage of grand total
Melanoplus lakinus Scudd.	--	--	--	1.11	--	--	0.57	7.93	--	39	1.42
Melanoplus mexicanus Sauss.	51.81	25.97	7.84	6.67	14.57	3.81	16.48	3.30	42.86	349	12.73
Melanoplus occidentalis Thos.	--	--	.68	--	--	--	1.14	--	--	8	.29
Melanoplus packardii Scudd.	--	4.33	2.05	--	.79	.63	--	2.86	5.95	55	2.01
Mermiria maculipennis Rehn.	--	6.93	.11	--	--	--	--	6.17	--	45	1.64
Mestobregma kiowa Thos.	--	9.09	25.57	42.22	22.44	18.10	3.98	15.42	7.74	526	19.19
Metator pardalinus Sauss.	--	--	3.98	2.22	5.91	9.52	1.14	5.73	--	111	4.05
Opeia obscura Thos.	--	.43	1.14	1.11	--	--	4.55	.22	--	28	.81
Orphulella pelidna Burm.	--	--	--	.56	--	--	--	--	--	1	.04
Orphulella speciosa Scudd.	1.20	--	--	1.11	1.57	--	--	--	--	7	.26
Phlibostroma quadrimaculatum Thos.	--	.87	10.68	1.11	5.51	.32	4.55	1.98	--	130	4.74
Phoetaliotes nebrascensis Thos.	--	--	3.86	--	.79	--	--	.66	.60	40	1.46
Schistocerca lineata Scudd.	--	--	.11	--	--	--	--	--	--	1	.04
Spharagemon bolli Scudd.	1.20	--	--	--	--	--	--	--	--	1	.04
Spharagemon collare Scudd.	--	.43	--	--	6.30	--	1.14	.22	4.76	27	.99
Spharagemon equale Say.	1.20	1.30	.80	.56	--	--	--	.44	--	1	.04
Trimerotropis agrestis McNeill.	--	--	--	--	--	--	--	.22	--	1	.04
Trimerotropis laticincta Sauss.	--	--	--	--	--	--	--	.22	--	1	.04
Trimerotropis pallidipennis Burm.	--	--	.11	--	--	--	--	--	--	1	.04
Total specimens per environment	83	231	880	180	254	315	176	454	168	--	--

South Dakota

Small grains

Percent

1. *Melanoplus mexicanus*-----52
2. *Dissosteira carolina*-----27
3. *Ageneotettix deorum*----- 5
4. *Camula pellucida*----- 5
5. *Melanoplus femur-rubrum*---- 5
6. Five others----- 6

Roadside

1. *Melanoplus mexicanus*-----26
2. *Mestobregma kiowa*----- 9
3. *Ageneotettix deorum*----- 8
4. *Derotmena haydenii*----- 7
5. *Melanoplus femur-rubrum*---- 6
6. Twenty-two others-----44

Plains grassland

1. *Mestobregma kiowa*-----26
2. *Ageneotettix deorum*-----25
3. *Philibostroma quadrimaculatum*-11
4. *Melanoplus mexicanus*----- 8
5. *Anphitornus coloradus*----- 7
6. Twenty-two others-----23

Legumes

1. *Mestobregma kiowa*-----42
2. *Ageneotettix deorum*-----19
3. *Melanoplus mexicanus*----- 7
4. *Melanoplus femur-rubrum*---- 6
5. *Drepanopterna femoratum*---- 5
6. Nineteen others-----21

Railroad right-of-way

1. *Melanoplus mexicanus*-----43
2. *Ageneotettix deorum*-----26
3. *Mestobregma kiowa*----- 8
4. *Melanoplus packardii*----- 6
5. *Spharagemon collare*----- 5
6. Seven others-----12

Pasture grassland

Percent

1. *Ageneotettix deorum*-----26
2. *Mestobregma kiowa*-----22
3. *Melanoplus mexicanus*-----15
4. *Spharagemon collare*----- 6
5. *Metator pardalinus*----- 6
6. Fifteen others-----25

Low mountain grassland

1. *Ageneotettix deorum*-----22
2. *Mestobregma kiowa*-----18
3. *Aulocara elliotti*-----15
4. *Metator pardalinus*-----10
5. *Melanoplus angustipennis*---- 9
6. Eleven others-----26

Weedy patches

1. *Melanoplus mexicanus*-----16
2. *Drepanopterna femoratum*-----12
3. *Aulocara elliotti*-----12
4. *Dissosteira carolina*----- 9
5. *Hadrotettix trifasciatus*---- 7
6. Sixteen others-----44

River Bottom

1. *Mestobregma kiowa*-----15
2. *Ageneotettix deorum*-----14
3. *Drepanopterna femoratum*-----11
4. *Aecoloplus turnbullii*----- 8
5. *Melanoplus lakinus*----- 8
6. Twenty-three others-----44

Percentage of grand total

1. *Ageneotettix deorum*-----19
2. *Mestobregma kiowa*-----19
3. *Melanoplus mexicanus*-----13
4. *Philibostroma quadrimaculatum*- 5
5. *Aulocara elliotti*----- 4
6. Forty-two others-----40

UTAH

Most of the natural vegetation of the State is desert shrub composed of sagebrush, or northern-desert shrub, and greasewood, or salt-desert shrub.

The collections contained 2,040 specimens, representing 23 species taken in about 8 environments. The dominant species was Melanoplus mexicanus with M. femur-rubrum a close second in numbers, and Trimerotropis vinculata third. The worst infestations were in the north-central part, and there were light infestations throughout the farming district.

Distribution by species of 2,040 specimens collected in Utah, expressed in percentage of total number collected in each habitat.

Species	Alfalfa for seed	Alfalfa	Stubble and alfalfa	Orchard	Pasture	Meadow	Small grain	Mix- ture	Corn	Stubble	Total speci- mens	Percentage of grand total
<i>Aeoloplus turnbullii</i> Thos.---	--	--	1.86	--	--	--	--	--	--	--	7	0.34
<i>Ageneotettix deorum</i> Scudd.---	--	0.11	--	--	--	--	--	0.38	--	--	1	.10
<i>Arphia pseudonietana</i> Thos.---	--	.44	.27	--	--	2.48	--	.38	--	0.56	10	.49
<i>Aulocara ellioti</i> Thos.-----	1.00	.44	2.13	--	--	--	--	--	--	--	13	.64
<i>Camnula pellucida</i> Scudd.-----	1.00	8.87	2.66	--	--	28.10	26.67	1.15	4.55	7.87	147	7.21
<i>Chorthippus curtipennis</i> Harr.	--	1.33	--	--	--	24.80	--	--	--	--	42	2.06
<i>Dissosteira carolina</i> L.-----	4.00	3.77	6.38	4.17	9.76	2.48	20.00	3.45	22.73	7.87	101	4.95
<i>Dissosteira spurcata</i> Sauss.--	--	--	.53	--	--	--	--	--	--	--	2	.10
<i>Drepanopterna femoratum</i> Scudd.	3.00	.11	.27	4.17	--	--	--	--	--	--	6	.29
<i>Hesperotettix viridis</i> Thos.--	--	--	.80	4.17	--	--	--	--	--	--	4	.20
<i>Melanopli</i> -----	--	.33	--	--	--	20.66	--	.77	--	--	30	1.47
<i>Melanoplus angustipennis</i> Dodge	--	.22	--	--	--	--	--	--	--	--	2	.10
<i>Melanoplus bivittatus</i> Say---	--	1.33	1.33	--	2.44	.83	--	2.30	4.55	3.37	32	1.57
<i>Melanoplus differentialis</i> Thos.	--	.55	--	--	--	--	--	.77	--	--	7	.34
<i>Melanoplus femur-rubrum</i> DeG.	18.00	22.06	26.06	20.83	14.63	9.09	--	26.82	31.82	29.78	467	22.89
<i>Melanoplus mexicanus</i> Sauss.--	28.00	29.16	30.32	4.17	14.63	9.09	33.33	25.67	9.09	27.53	546	26.76
<i>Melanoplus packardii</i> Scudd.--	32.00	8.65	16.22	12.50	7.32	--	--	9.96	9.09	6.18	216	10.59
<i>Mermiria maculipennis</i> Rehn--	--	8.78	--	8.33	--	--	--	1.15	--	--	12	.59
<i>Mestobregma kiowa</i> Thos.-----	1.00	.55	.53	--	21.95	.83	--	.77	--	.56	21	1.03
<i>Schistocerca shoshone</i> Thos.--	--	--	--	--	--	--	--	.38	--	--	1	.10
<i>Schistocerca lineata</i> Scudd.--	--	.11	.27	--	--	--	--	1.15	--	.56	6	.29
<i>Spharagemon collare</i> Scudd.---	--	.55	1.06	--	--	--	--	1.15	--	.56	6	.29
<i>Spharagemon equale</i> Say-----	--	1.11	--	--	2.44	--	--	--	4.55	1.69	15	.74
<i>Trimerotropis vinculata</i> Scudd.	12.00	19.51	9.31	41.70	26.83	1.65	20.00	24.90	13.64	11.80	338	16.57
Total specimens per environment-----	100	902	376	24	41	121	15	261	22	178		

Utah

Alfalfa for seed

	<u>Percent</u>
1. Melanoplus packardii-----	32
2. Melanoplus mexicanus-----	28
3. Melanoplus femur-rubrum-----	18
4. Trimerotropis vinculata-----	12
5. Dissosteira carolina-----	4
6. Five other species-----	6

Alfalfa

1. Melanoplus mexicanus-----	29
2. Melanoplus femur-rubrum-----	22
3. Trimerotropis vinculata-----	20
4. Cammula pellucida-----	9
5. Melanoplus packardii-----	9
6. Fifteen other species-----	11

Stubble and alfalfa

1. Melanoplus mexicanus-----	30
2. Melanoplus femur-rubrum-----	26
3. Melanoplus packardii-----	16
4. Trimerotropis vinculata-----	9
5. Dissosteira carolina-----	6
6. Eleven other species-----	13

Orchard

1. Trimerotropis vinculata-----	42
2. Melanoplus femur-rubrum-----	21
3. Melanoplus packardii-----	12
4. Mermeria maculipennis-----	8
5. Dissosteira carolina-----	4
6. Three other species-----	13

Corn

1. Melanoplus femur-rubrum-----	32
2. Dissosteira carolina-----	23
3. Trimerotropis vinculata-----	14
4. Melanoplus mexicanus-----	9
5. Melanoplus packardii-----	9
6. Three others-----	13

Pasture

	<u>Percent</u>
1. Trimerotropis vinculata-----	27
2. Mestobregma kiowa-----	22
3. Melanoplus femur-rubrum-----	15
4. Melanoplus mexicanus-----	15
5. Dissosteira carolina-----	10
6. Three other species-----	11

Meadow

1. Cammula pellucida-----	28
2. Chorthippus curtipennis-----	25
3. Melanopli-----	21
4. Melanoplus femur-rubrum-----	9
5. Melanoplus mexicanus-----	9
6. Five other species-----	8

Small grain

1. Melanoplus mexicanus-----	33
2. Cammula pellucida-----	27
3. Dissosteira carolina-----	20
4. Trimerotropis vinculata-----	20
5. No other species	

Mixture

1. Melanoplus femur-rubrum-----	27
2. Melanoplus mexicanus-----	26
3. Trimerotropis vinculata-----	25
4. Melanoplus packardii-----	10
5. Dissosteira carolina-----	3
6. Ten other species-----	9

Stubble

1. Melanoplus femur-rubrum-----	30
2. Melanoplus mexicanus-----	28
3. Trimerotropis vinculata-----	12
4. Cammula pellucida-----	8
5. Dissosteira carolina-----	8
6. Seven other species-----	14

Percentage of grand total

1. Melanoplus mexicanus-----	27
2. Melanoplus femur-rubrum-----	23
3. Trimerotropis vinculata-----	17
4. Melanoplus packardii-----	11
5. Cammula pellucida-----	7
6. Nineteen other species-----	15

WISCONSIN

The whole of Wisconsin is in the eastern forest region and the natural vegetation areas are as follows:

1. Jack, red, and white pines--northern part.
2. Birch, beech, maple, and hemlock association--northern part.
3. Oak, hickory association--southern part.

Like Michigan, there is a lot of cut-over stump land, small pasture, and hay meadow which, under extreme drought and overpasturing, furnishes ideal breeding grounds for Melanoplus mexicanus and Camnula pellucida. The vegetation is very lush, affording an abundance of plant cover.

Most of the specimens are from pasture grassland. Altogether, 789 specimens were taken, representing only 9 species. Only 3 habitats were included. According to the collections, M. femur-rubrum formed over 80 percent of the population. C. pellucida has been the dominant species for several years. The rains or foggy weather in June just about wiped out this species, as well as the general infestations. The severe infestations have shifted to the southern part of the State.

Distribution by species of 789 specimens collected in Wisconsin, expressed in percentage of total number collected in each habitat

Species	Pasture grass land	Small grains	Alfalfa	Total specimens	Percentage of grand total
<i>Camnula pellucida</i> Scudd.-----	2.82	.56	--	15	1.81
<i>Chorthippus curtipennis</i> Harr.----	--	1.12	--	2	.25
<i>Dissosteira carolina</i> L.-----	--	1.12	--	2	.25
<i>Encoptolophus costalis</i> Scudd.----	1.21	--	--	6	.76
<i>Melanoplus dawsoni</i> Scudd.-----	.40	--	--	2	.75
<i>Melanoplus femur-rubrum</i> DeG.----	76.01	93.85	100.00	659	83.52
<i>Melanoplus mexicanus</i> Sauss.-----	17.94	3.35	--	95	12.04
<i>Mestobregma kiowa</i> Thos.-----	1.41	--	--	7	.89
<i>Spharagemon collare</i> Scudd.-----	.20	--	--	1	.13
Total specimens					
per environment-----	496	179	114	--	--

Wisconsin

Pasture grassland

	<u>Percent</u>
1. Melanoplus femur-rubrum-----	76
2. Melanoplus mexicanus-----	18
3. Cammula pellucida-----	3
4. Mestobregna kiowa-----	1
5. Encoptolophus costalis-----	1
6. Two other species-----	1

Alfalfa

1. Melanoplus femur-rubrum-----	100
---------------------------------	-----

Small grains

	<u>Percent</u>
1. Melanoplus femur-rubrum-----	94
2. Melanoplus mexicanus-----	3
3. Chorthippus curtipennis-----	1
4. Dissosteira carolina-----	1
5. Cammula pellucida-----	1

Percentage of grand total

1. Melanoplus femur-rubrum-----	83
2. Melanoplus mexicanus-----	12
3. Cammula pellucida-----	2
4. Mestobregna kiowa-----	1
5. Encoptolophus costalis-----	1
6. Four other species-----	1

WYOMING

All of the collections were made in either the short grass or northern desert shrub areas. The natural vegetation areas in this State are subdivided as follows (the mountain regions are not included):

1. Northern desert shrub or sagebrush area:

All of the State west of the Laramie and Big Horn Mountains except the mountain areas.

2. Short-grass region:

(a) Grama grass--most of the extreme eastern part of Wyoming to the Black Hills and down the eastern border.

(b) Western wheatgrass and sagebrush--a strip just east of the Big Horn Mountains.

(c) Grama and mountain sage--a narrow strip fronting the eastern slope of the Big Horn and Laramie Mountains.

There were 4,385 specimens in the collections mostly from alfalfa. Six habitats are represented and 42 species were taken. Melanoplus mexicanus was dominant, with Camnula pellucida a close second. It was only in this State that M. bivittatus was at all numerous. It ranked third. Practically all the collections were confined to the northern counties.

The infestations were mostly limited to the six northern counties. Outside of these there were few and light infestations. The distribution of the species was about the same in the crops. In the plains grassland C. pellucida was dominant in 1935 at 23 percent and a minor species at 60 percent in 1934. This was the greatest change.

Distribution by species of 4,385 specimens collected in Wyoming, expressed in percentage of total number collected in each habitat

Species	Small grains	Legumes	Road-side	Plains grass-land	Corn	Creek bottom	Total specimens	Percentage of grand total
<i>Aeoloplus turnbullii</i> Thos.-----	2.73	0.47	0.51	2.26	--	3.70	55	1.25
<i>Ageneotettix deorum</i> Scudd.-----	.68	2.20	.26	12.72	9.41	8.23	168	3.83
<i>Amphitornus bicolor</i> Thos.-----	1.14	.26	--	4.70	--	--	44	1.00
<i>Arphis pseudonietana</i> Thos.-----	.23	.35	--	.17	--	2.88	18	.41
<i>Aulocara ellioti</i> Thos.-----	1.14	1.21	1.54	6.45	1.18	6.17	101	2.30
<i>Brachystola magna</i> Gir.-----	--	--	--	2.89	--	.82	18	.41
<i>Bruneria brunnea</i> Thos.-----	--	.04	--	--	--	--	1	.02
<i>Camnula pellucida</i> Scudd.-----	8.66	24.60	5.90	23.34	5.88	1.65	902	20.57
<i>Chorthippus curtipennis</i> Harr.---	--	.79	--	.35	--	.82	9	.21
<i>Cordillacris crenulata</i> Brun.---	--	--	--	.17	--	--	1	.02
<i>Cratypedes neglectus</i> Thos.-----	1.14	.04	--	--	--	--	6	.14
<i>Derotmema haydenii</i> Thos.-----	--	.04	--	1.05	1.18	--	9	.21
<i>Dissosteira carolina</i> L.-----	1.14	.82	.77	.17	.59	2.47	36	.82
<i>Drepanopterna femoratum</i> Scudd.---	--	.08	--	4.18	.59	--	27	.62
<i>Encoptolophus costalis</i> Scudd.---	--	--	.26	.17	--	--	3	.07
<i>Gomphocerus clavatus</i> Thom.-----	--	.04	--	--	--	--	1	.02
<i>Hadrotettix trifasciatus</i> Say-----	--	--	--	.87	--	.41	6	.14
<i>Hesperotettix viridis</i> Thos.-----	.46	.30	--	.35	.59	--	13	.30
<i>Hypochlora alba</i> Dodge-----	--	.04	--	1.05	--	--	7	.16
<i>Melanoplus angustipennis</i> Dodge---	.91	.39	--	2.09	14.71	6.58	67	1.53
<i>Melanoplus bivittatus</i> Say-----	25.06	22.96	11.28	6.45	4.71	8.64	784	17.88
<i>Melanoplus bowditchi</i> Scudd.-----	--	.26	.70	.59	2.06	--	12	.27
<i>Melanoplus confusus</i> Scudd.-----	--	.04	--	--	--	--	1	.02
<i>Melanoplus dawsoni</i> Scudd.-----	.23	.13	--	--	--	--	4	.09
<i>Melanoplus differentialis</i> Thos.---	--	--	--	.35	--	3.70	11	.25
<i>Melanoplus femur-rubrum</i> DeG.-----	20.27	14.59	42.31	1.74	5.29	25.51	688	15.69
<i>Melanoplus gladstoni</i> Scudd.-----	--	.04	--	.35	--	--	3	.07
<i>Melanoplus infantilis</i> Scudd.-----	.46	.43	--	.70	1.18	--	18	.41
<i>Melanoplus keeleri luridus</i> Dodge---	--	.12	--	--	--	--	3	.07
<i>Melanoplus mexicanus</i> Sauss.-----	25.97	24.69	31.79	18.82	25.88	10.29	1006	22.94
<i>Melanoplus occidentalis</i> Thos.---	--	.04	--	.87	--	--	7	.16
<i>Melanoplus packardii</i> Scudd.-----	7.29	2.93	3.08	1.39	5.29	1.23	144	3.28
<i>Mermiria maculipennis</i> Rehn-----	--	--	--	--	--	.41	1	.02
<i>Mestobregma kiowa</i> Thos.-----	--	.86	.51	1.57	14.71	.41	58	1.32
<i>Metator pardalinus</i> Sauss.-----	.46	1.55	1.03	.87	--	8.23	76	1.73
<i>Opeia obscura</i> Thos.-----	--	.04	--	.70	3.53	--	11	.25

Wyoming (Cont'd.)

Species	Small grains	Legumes	Road- side	Plains grass- land	Corn	Creek bottom	Total specimens	Percentage of grand total
Philibostroma quadrimaculatum Thos.	--	--	--	2.09	--	--	14	.32
Phoetaliotes nebrascensis Thos.	--	.04	--	--	--	2.47	7	.16
Spharagemon collare Scudd.	1.59	.08	.51	.35	2.94	2.88	26	.59
Spharagemon equale Say	--	.17	--	--	.59	.41	7	.16
Trimerotropis pistrinaria Sauss.	--	--	--	--	1.18	--	3	.07
Trimerotropis pallidipennis Burm.	.46	.17	--	.17	--	--	7	.16
Total								
Specimens per environment	439	2317	390	574	170	243	--	--

Wyoming

Small grains

	<u>Percent</u>
1. <i>Melanoplus mexicanus</i> -----	26
2. <i>Melanoplus bivittatus</i> -----	25
3. <i>Melanoplus femur-rubrum</i> -----	20
4. <i>Camnula pellucida</i> -----	9
5. <i>Melanoplus packardii</i> -----	7
6. Fourteen others-----	13

Legumes

1. <i>Melanoplus mexicanus</i> -----	25
2. <i>Camnula pellucida</i> -----	25
3. <i>Melanoplus bivittatus</i> -----	23
4. <i>Melanoplus femur-rubrum</i> -----	15
5. <i>Melanoplus packardii</i> -----	3
6. Twenty-nine others-----	30

Roadside

1. <i>Melanoplus femur-rubrum</i> -----	42
2. <i>Melanoplus mexicanus</i> -----	32
3. <i>Melanoplus bivittatus</i> -----	11
4. <i>Camnula pellucida</i> -----	6
5. <i>Melanoplus packardii</i> -----	3
6. Nine others-----	6

Corn

	<u>Percent</u>
1. <i>Melanoplus mexicanus</i> -----	26
2. <i>Melanoplus angustipennis</i> ----	15
3. <i>Mestobregma kiowa</i> -----	15
4. <i>Ageneotettix deorum</i> -----	9
5. <i>Camnula pellucida</i> -----	6
6. Fourteen others-----	29

Creek Bottoms

1. <i>Melanoplus femur-rubrum</i> -----	26
2. <i>Melanoplus mexicanus</i> -----	10
3. <i>Melanoplus bivittatus</i> -----	9
4. <i>Ageneotettix deorum</i> -----	8
5. <i>Metator pardalinus</i> -----	8
6. Sixteen others-----	39

Plains grassland

1. <i>Camnula pellucida</i> -----	23
2. <i>Melanoplus mexicanus</i> -----	19
3. <i>Ageneotettix deorum</i> -----	13
4. <i>Aulocara elliotti</i> -----	6
5. <i>Melanoplus bivittatus</i> -----	6
6. Twenty-seven others-----	33

Percentage of grand total

1. <i>Melanoplus mexicanus</i> -----	23
2. <i>Camnula pellucida</i> -----	21
3. <i>Melanoplus bivittatus</i> -----	18
4. <i>Melanoplus femur-rubrum</i> -----	16
5. <i>Ageneotettix deorum</i> -----	4
6. Thirty-seven others-----	18

DOMINANT SPECIES IN STATES WHERE NO COLLECTIONS ARE RECORDED

There are five States for which we have no collections and these are listed with their dominant species. No attempt is made to show any distribution other than the order of their importance for the first three. All of the infestations were light in these States.

ARIZONA

Melanoplus mexicanus, M. femur-rubrum, Trimerotropis pallidipennis, M. gladstoni, M. lakinus Scudd., M. differentialis, M. pictus Scudd., Dissosteira carolina.

CALIFORNIA

Camnula pellucida, Melanoplus mexicanus, M. marginatus Scudd., M. femur-rubrum, M. differentialis, Oedaleonotus enigma Scudd., Hippiscus californicus Scudd., Schistocerca venusta Scudd., S. vaga Scudd., Dissosteira spurcata, M. packardii, Autocara femoratum Scudd., Oedaleonotus borckii var. pacificus Scudd., Trimerotropis vinculata.

IDAHO

Melanoplus mexicanus, Camnula pellucida, M. bivittatus, Dissosteira carolina, Cratypedes neglectus.

KANSAS

Melanoplus mexicanus, M. differentialis, M. bivittatus, M. femur-rubrum.

NEVADA

The only species recorded in the report for Nevada was Camnula pellucida.

NEW MEXICO

Melanoplus bivittatus, M. differentialis, M. femur-rubrum.

OREGON

Camnula pellucida, Melanoplus femur-rubrum, M. bivittatus.

SUMMARY

Probably the greatest change that took place in the relative abundance of species was that which happened to the Camnula pellucida and Melanoplus mexicanus populations in North Dakota, Minnesota, Wisconsin, and Michigan. C. pellucida either equaled or exceeded M. mexicanus in 1934. In many places heavy infestations of C. pellucida hatched in June but cold, foggy weather practically wiped out these outbreaks, reducing the numbers of this species almost to a minimum. M. mexicanus was also affected but not to the extent that C. pellucida was. M. mexicanus was dominant in about 10 States and C. pellucida in 4 out of the 18.

Ageneotettix deorum was an important species in all the States east of the Continental Divide. It is widely distributed and abundant in small grains, field margins, legumes, and grasslands. Another important species was Encoptolophus costalis, which was numerous in Michigan, Wisconsin, Minnesota, and eastern North Dakota. Phlibostroma quadrimaculatum was prominent in the short-grass areas in pasture and on the range. Other important species of the rangeland in the short-grass areas were Cordillacris crenulata, which was dominant in Montana; Aulocara ellioti, Drepanopterna femoratum, Mestobregma kiowa, and M. infantilis. Considerable damage was done to the rangeland and it was observed that under ordinary conditions of correct grazing native grasses will support populations of 7 or 8 per square yard without visible damage. When these increase to 15 per square yard the damage becomes severe, and at 20 or 30 the foliage is kept chewed to the crown, making the range unfit for pasturing.

M. femur-rubrum was important and dominant in many places, reaching its greatest abundance in the legumes. It was the dominant species in 3 States. M. bivittatus was of importance in 5 or 6 States, but the numbers of this species are still down. Both this and M. differentialis are building up again along the water courses of South Dakota and Nebraska.

With increased moisture in the drought areas, M. bivittatus and M. differentialis will have more succulent food and a chance to build up again. Increased moisture in Wisconsin and Michigan last summer caused tall weeds and grass to grow up in favorite egg-laying places of C. pellucida, which are unfavorable conditions for this species. Therefore changes in weather also bring about changes in the optimum conditions for the development of certain species.

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