Compendium:

Proactive Management of Grasshopper Habitat

Most agricultural families of the Northern Plains have heroic stories of family members battling grasshoppers. Almost every ranch and farm in the Northern Plains has suffered from grasshopper infestations at sometime in the past. Large scale grasshopper outbreaks extending throughout the western portion of North America occurred during the 1930's and 1980's and smaller scale regional outbreaks have occurred almost every year someplace in the Northern Plains. It is realistic to predict that grasshopper outbreaks will occur in the near future someplace in the Northern Plains.

Grasshoppers exist at low population densities and do not cause problems during growing seasons between outbreaks. All of the pestiferous rangeland grasshopper species of the Northern Plains remain year after year on the land where they hatch. During growing seasons that the population numbers greatly increase, the grasshoppers will move to new areas with green food plants after they have consumed and destroyed all the available food plants at the hatch sites. The large increase in population numbers is the problem. A few grasshoppers do not eat much, but huge quantities of grasshoppers consume and destroy large quantities of food plants. Land management practices that permit resident populations of grasshoppers to increase to outbreak numbers need to be changed. Land managers create their own grasshopper problems with poor land management practices. Biologically effective management of the residuum vegetation structure of grasshopper habitat can maintain grasshopper populations at tolerable low densities. Proactive management of grasshopper habitat must reduce the grasshoppers strengths and exploit the grasshoppers weaknesses.

Grasshoppers have a major survival strength that relegates proactive management of grasshopper habitat to a neverending annual challenge. Grasshoppers have high fecundity potential, each adult female can produce 100 to 200 viable eggs. Because of this remarkable inherent ability, grasshoppers can increase the population density multifold from one growing season to the next. A one year lapse in land management diligence can lead to a major grasshopper outbreak.

Fortunately, grasshoppers have two major weaknesses that render grasshopper population numbers vulnerable to proactive management of the residuum vegetation structure of their habitat. The first weakness is that grasshoppers are cold blooded and are unable to regulate their body temperature metabolically. Grasshoppers need to bask on open bareground areas to collect direct incident solar radiation to raise their body temperatures to the preferred optimal high levels above 95° F (35° C). When grasshoppers can not achieve the optimal body temperature during most of the day, their growth and development rates slow, the length of time nymphs are at each instar stage increases, nymph mortality increases, the number of nymphs reaching the adult stage decreases, maturation time after adults fledge increases, the quantity of viable eggs produced by each adult female greatly decreases, and the resident grasshopper population remains low.

The second vulnerable weakness is that grasshopper eggs require a total of 500 to 600 DD day-degrees of heat from direct incident solar radiation for complete development of the embryo; this includes about 400 DD of heat during the first summer and an additional 150 DD of heat during the following spring to complete embryonic development and hatching. All except one of the pestiferous rangeland grasshoppers deposit their egg pods below the soil surface in bareground patches. Bareground egg pod sites accumulate heat units rapidly and increase the rates of embryonic development. Shading of the soil surface at the egg laying sites from grass canopy cover reduces the quantity of incident solar radiation that decreases the accumulation of heat units, reduces the rate of embryo development delaying egg hatch, and reduces the number of hatchlings produced.

The pestiferous rangeland grasshoppers that coexist on your grazinglands can be diminished to tolerable densities with the typical reactive short-term chemical insecticide spray treatments or the grasshoppers can be sustained at low population numbers by proactive long-term management of their habitat.

Grass plants, soil microorganisms, and large grazing graminivores coevolved and develop extensive interactions that permit grassland ecosystems to function effectively. The defoliation resistance mechanisms that developed within grass plants provide important biological and physiological processes so grass plants can produce greater herbage biomass that replaces lost leaf material, restore disrupted vital processes, and vegetatively reproduce secondary tillers from axillary buds that increase grass tiller density and reduce bareground areas. The soil microorganisms in the rhizosphere and the biogeochemical processes cycle large quantities of plant available essential elements between the organic and inorganic forms. Activation of the defoliation resistance mechanisms and the biogeochemical processes requires partial defoliation by grazing that removes about 25% to 33% of the aboveground leaf material of grass lead tillers between the 3.5 new leaf stage and the flower stage and results in greatly increased ecosystem productivity that is favorable for livestock production. Proactive management of the residuum vegetation structure of grasshopper habitat uses the ecosystem mechanisms and processes to increase aboveground herbage biomass, increase grass plant basal cover, and decrease bareground area creating habitat conditions unfavorable for pest grasshopper production.

Pestiferous rangeland grasshopper population numbers in the Northern Plains can be held at tolerable low densities by proactive management of the grasshopper habitat by using the recently discovered grasshopper biology and population dynamics and the technologies for activation of the defoliation resistance mechanisms and the biogeochemical processes.

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