VI.1 The Importance of Making Correct Decisions

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Within the general arena of grasshopper management, it is possible to make decisions that reduce or cancel out expected potential benefits. According to my dictionary, such decisions possibly could qualify as "blunders" (arising from stupidity, ignorance, or carelessness), "mistakes" (arising from misconception or inattention), or "errors" (arising from a violation of standard guidelines). I do not know what to call strict adherence to guidelines based on misconceptions, but that seems to be another possibility for making faulty decisions. Regardless of what we as pest managers call such decisions, an examination of their origins reveals that most are preventable.

Incorrect decisions within grasshopper management can cause us either to take incorrect actions or fail to take correct actions. Examples of the former include treating rangelands too early, treating too late, treating populations of species that are not chronic pests, selecting suboptimal treatments, and treating noneconomical grasshopper infestations. Examples of the latter— failing to take correct actions—include failing to detect infestations in a timely manner, deciding not to treat injurious infestations, and failing to reduce undesirable consequences of treatments. The following chapters on decision support tools are intended to help both novices and experienced personnel gather accurate information about grasshopper populations and thereby increase the probability of making correct management decisions.

W. J. Cushing's chapter (VI.8) on seasonal occurrence of selected grasshopper species is helpful in the proper timing of surveys. Timing of nymphal (immature grasshopper) surveys is critical if managers are to assess accurately the threat of current infestations at a time when all treatment options are available and before irreparable damage occurs. Timing of adult grasshopper surveys must coincide with the adult period of major pest species if managers are to have accuracy in assessing the potential for future infestations. The chapter of J. S. Berry et al. on sampling techniques and sampling intensity (VI.10) provides guidelines that should cover most survey situations.

R. J. Dysart's chapter (VI.6) shows that some of the 400 grasshopper species in the West are serious pests, that the majority of species are fairly innocuous (harmless), and that a few species even have beneficial attributes. Cushing's "Hopper Helper" (VI.7) and R. J. Pfadt's "Field Guide to Common Western Grasshoppers" (VI.5) are useful in deciding if a grasshopper population contains important pest species. Having identification tools and knowing the makeup of a grasshopper population are vital in deciding to control the population.

An example of where timely grasshopper identification averted unnecessary treatment occurred during the first season of the Grasshopper Integrated Pest Management (GHIPM) Project in 1988 in western North Dakota. Potentially threatening grasshopper densities were reported in an area along the Little Missouri River, where nearness to water might have required a complicated integration of chemical spray, carbaryl bait, and *Nosema locustae* bait treatments. However, surveyors determined that the infestation was mostly *Melanoplus keeleri*, a species that feeds abundantly on coarse brushy forbs and that never has been implicated as a major participant in a sustained outbreak. GHIPM Project personnel correctly decided to take no action, and the "outbreak" subsided the following year.

From its inception in 1987, the GHIPM Project placed major emphasis on consolidation of massive sets of information related to biology and control of grasshoppers, on interdisciplinary analysis and interpretation of complex interactions within that body of information, and on organization and presentation of pertinent conclusions in a useful format. The process relied heavily on computer technology to provide solutions to long-standing problems.

Some of the project's products and tools are described in chapters on economic considerations, by M. D. Skold and coworkers (VI.3 and 4); geographic information systems, by W. P. Kemp (VI.9); and the Hopper decision support system, by J. S. Berry (VI.2). These chapters discuss useful but complex analyses that are well beyond the capabilities of many managers who could benefit from those analyses. Fortunately, the authors have contributed to computer software that allows any computer-literate individual to follow the reasoning powers of a panel of experts when trying to make treatment decisions.

The concepts of economic injury levels and economic thresholds are cornerstones in the foundation of IPM. The chapters by Skold and coworkers represent the state of the art in applying economic considerations to grasshopper management. Chapters show very clearly that chemical control is but one of several available management options and is not universally the most economical tactic. Analyses described in the Skold chapters are an integral part of Hopper, which managers can use to estimate public, private, or total benefits versus costs for either public, private, or cooperative rangeland grasshopper control projects.

Clearly, the decision to control or not control rangeland grasshoppers is not simple. Also, the general public rightfully expects a high level of technical competence within the decisionmaking process. This section of the GHIPM User Handbook represents a concerted effort to equip managers with a complete list of definitive questions as well as the means to obtain accurate answers to those questions. Adherence to the suggestions and guidelines in this section will help managers avoid blunders, mistakes, and errors—and will help support rational pest management on public and private rangelands.

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