III.9 Environmental Monitoring of Grasshopper Control Programs

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Environmental monitoring is the measurement of the effect on the environment of pesticides used for pest control. Monitoring is required by law, is the policy of the Animal and Plant Health Inspection Service (APHIS), and provides useful information for pest-control programs. Monitoring has been, and will continue to be, an important part of grasshopper control operations.

Why Monitor?

Monitoring is required by the National Environmental Policy Act (NEPA) to document the implementation of mitigative (moderating) measures, such as buffers around sensitive sites. In APHIS, we monitor to compare residue levels and nontarget effects resulting from treatments with predictions made in the risk analyses in environmental impact statements written for programs such as grasshopper control.

Sometimes monitoring is conducted under the Endangered Species Act (ESA) to demonstrate protection of threatened and endangered (T and E) species or habitats that are critical for those species. Whether or not to monitor is specified in protection measures agreed to during consultations between APHIS and the U.S. Department of the Interior's U.S. Fish and Wildlife Service (FWS).

Not only is environmental monitoring APHIS policy, it also provides valuable information for APHIS. Information gained from monitoring leads to a greater understanding of the effects of the program on the environment, information that has proven itself useful numerous times. Information gained also is valuable as a tool for assessing the effects of future programs, for educating the public regarding the effects of programs on public health and the environment, and for defense of the program in case of claims or of litigation over purported adverse effects.

In grasshopper programs, monitoring is done mostly out of concern for effects on nontarget plants and animals. Monitoring often is required around sensitive sites (habitats of T and E species, wildlife refuges, aquatic habitats, areas of human occupancy, and other sites of concern to the public) and to demonstrate that standard operating procedures or protective or mitigation measures are adhered to. In addition, monitoring is used to fill gaps in knowledge regarding the fate and transport of program chemicals or biological control treatments.

The Monitoring Plan

Environmental monitoring should be thought of as integral to every grasshopper treatment. APHIS' Environmental Monitoring Team (EMT), within Plant Protection and Quarantine (PPQ), designs the monitoring plans for APHIS programs. EMT should be contacted in the early planning stages for each new control program, such as during the preparation of the site-specific environmental assessment (EA). EMT also should be contacted if treatments are planned for new areas already covered by a previously existing EA and no new EA is being prepared.

The APHIS State Plant Health Director (SPHD) or officer organizing the program should also involve the PPQ environmental monitoring coordinator when contacting EMT. If a site-specific EA is prepared, it should state whether or not monitoring will be conducted and then describe the type of sensitive sites to be monitored. EMT—in coordination with the SPHD, the environmental monitoring coordinator, and the FWS if T and E species are involved—will determine whether any sites should or should not be monitored. If monitoring is required, then EMT personnel will write the monitoring plan.

The monitoring plan will describe where and when sampling will take place, what will be sampled, and how many samples should be collected. The types of samples collected might include flowing or stationary water, soil, sediment, fish, insects, vegetation, and dye cards that measure airborne drift. Trained personnel (environmental monitors) will carry out the monitoring plan and send samples for residue analysis to APHIS' National Monitoring and Residue Analysis Laboratory (NMRAL) in Gulfport, MS. The results from the laboratory are analyzed by EMT and interpreted with the aid of field notes and data collected at the time of treatment and sample collection. These data are reported in monitoring reports by EMT at the end of the treatment season. Addresses and phone numbers are listed on the next page.

Addresses and Phone Numbers

USDA–APHIS–PPQ
National Monitoring and Residue Analysis
Laboratory (NMRAL)
3505 25th Avenue, Building 4
Gulfport, MS 39501
(228) 863–8124
(228) 867–6130 FAX

USDA–APHIS–PPQ
Environmental Monitoring Team
4700 River Road, Unit 150
Riverdale, MD 20737–1237
(301) 734–7175
(301) 734–5992 FAX

Monitoring Tools

There are many tools environmental monitors use to collect samples from the environment. It is important to make a list of the equipment necessary before starting environmental monitoring. NMRAL will send supplies overnight if necessary. The basic tools are dye cards, which are used to measure airborne drift of chemicals and pans or gypsy moth sticky traps to collect drifting bait.

Water is collected by dipping a container into the water body or continuously sampled with a peristaltic pump, depending on the sampling question of interest, the type of water body being monitored, and the chemical being sampled. Soil corers sometimes are used to collect soil; vegetation is collected by (gloved) hand. Water samples must be stabilized by lowering the pH with a special kit, and all samples must be frozen as soon as possible after collecting. This process requires having a large freezer nearby, even at relatively remote sites, and preferably dry ice or an ice bath in which to place bagged, labeled samples in the field. EMT and NMRAL are available to help with questions about collecting sites and methods.

Monitoring plans and techniques require considerable forethought and planning. It is critical, therefore, to get EMT involved early on in any operation, so that an environmental monitoring plan can be written, distributed, and worked into the overall cooperative control operation.

Chemicals in the Water?

The chemical labels for ultralow-volume (ULV) malathion, carbaryl, and carbaryl bait plainly state the risks to aquatic animals. The 2000 Cheminova label for Fyfanon® ULV malathion states, "This product is toxic to fish, aquatic invertebrates, and aquatic life stages of amphibians. For terrestrial uses, do not apply directly to water, or to areas where surface water is present. . . . Drift and runoff may be hazardous to aquatic organisms near the application site." The labels for carbaryl spray and carbaryl bait are similar. For this reason, a 500-ft no-treatment buffer for aerially applied ULV pesticides and a 200-ft buffer for bait applications have been adopted as operational procedures in grasshopper programs.

The technology for detecting chemical residues is such that malathion residues can now be detected in water down to about 1/100th (0.01) of a microgram per liter (µg/L). In a pond 1 acre in size and 1 foot deep, the amount of malathion necessary to create residues near 0.05 µg/L is only about 0.03 fluid oz, or 0.38 percent of the original application (8 fluid oz/acre). Thus, if 99.5 percent of the spray lands on its target or in the buffer, and just 0.5 percent of it reaches a 1-ft-deep 1-acre pond, then the resulting residues would be detectable. The calculations for carbaryl are similar. At 1.0 µg/L, small aquatic crustaceans and aquatic stages of insects become susceptible. These organisms are more tolerant of carbaryl residues, showing sensitivity near 1 to 5 µg/L. Fish are from 10 to 1,000 times more tolerant of malathion and carbaryl than are aquatic invertebrates.

The chemical label states the risks of the pesticides to aquatic organisms and that drift and runoff could be harmful to them. The self-imposed buffers in the grasshopper program are probably sufficient in most cases to prevent harmful residues. Regardless, monitoring is recommended to be sure aquatic ecosystems are unaffected by program activities. Dye cards at the water's edge and water samples will help program managers detect and quantify any residues reaching the water and suggest when buffers might need to be enlarged to minimize residues further.

Although carbaryl and malathion are the most commonly used pesticides in the grasshopper program, other pesticides (such as Dimilin®) might be adopted in the future. Most pesticides that would be effective at grasshopper control probably also will require a no-treatment buffer and residue monitoring around water bodies.

Conclusions

Environmental monitoring is a method of assessing effects of the grasshopper control program on nontarget animals and plants. Monitoring sometimes is required to bring the program in compliance with Federal statutes such as the ESA and the NEPA. APHIS also has the policy of monitoring the environment around pest eradication and control programs such as the cooperative rangeland grasshopper control program.

Whether or not monitoring is required depends on the site, the presence of T and E species, protected areas, wetlands, and other factors. EMT will help determine if monitoring is advisable for specific grasshopper control operations and should be contacted as early as possible during the planning of such operations.

Information gained through monitoring has been of considerable value to the program in the past, and monitoring will continue to be an important part of grasshopper programs in the future.