

IPM – HOW IT WORKS IN THE SMOKIES

Kristine D. Johnson
Supervisory Natural Resource Specialist
National Park Service
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, TN 37738

Many of the basic components of integrated pest management have been known for centuries. Farmers have burned fields in the early spring to reduce insects and disease organisms in their overwintering state; gardeners have removed weeds mechanically by plow and hoe; timing of planting and harvest can be planned to escape the most damaging life stages of certain pests. IPM is simply the integration of a variety of control techniques with knowledge of both the host and pest ecology, and the importance of monitoring and long-term consequences. The objective is to minimize both pest damage and adverse ecological impact. The National Park Service adopted integrated pest management as an agency policy in 1980, and in the following three years, reduced pesticide use by 70%. At Great Smoky Mountains National Park, IPM strategies are used for control of exotic plants as well as for structures and forest insect and disease problems.

IPM is both a decision-making process and a strategy; a standard definition is “the selection, integration, and implementation of pest control, based on predicted economic, ecological, and sociological consequences.” IPM seeks maximum use of naturally occurring pest controls, including weather, disease agents, predators, and parasites. In addition, IPM utilizes various biological, physical, chemical control, and habitat modification techniques. Monitoring is an important aspect of IPM: it determines the need for and timing of treatments, and is a measure of success/failure for a given technique.

Before development of synthetic pesticides, people relied on simpler methods of pest control, such as cultivation, hand- picking, controlled burns, and herbal remedies. In general, there were fewer exotic pests; in the US today, we have over 4,500 species of foreign origin pests that have established free-living populations. Many of these are beneficial, but others have a significant adverse effect on health, agriculture, natural areas, and industry. After World War II, synthetic pesticides such as DDT and 2,4-D became widely available, and were used with little regard for long-term consequences. Typically, these pesticides were broad-spectrum and affected many non-target species, including such beneficial organisms as pollinators and natural predators and parasites. Calendar spraying was standard, particularly in agriculture. Pesticides were applied on a set schedule regardless of observed need. Evaluation was minimal and treatments were applied at the first sign of injury or even as a preventive measure.

As we now know, there were many problems with the post-war enthusiasm for synthetic pesticides. Pests—plant, invertebrate, and microbial—could become resistant within a surprisingly short time. Resurgence of pest populations could occur when natural enemies (“beneficials”) were killed,

resulting in pest populations even higher than before treatment. Secondary pests could prove worse than the original target, e.g., mites following after loopers were killed. Residual chemical had long lasting effects—DDT is a famous example of increasing effects ascending the food chain and persisting for years. Cancer and hormonal disruption were a common result of many synthetic pesticides, and health hazards to humans are still surfacing. In addition, spiraling costs caused even those unconcerned about environmental effects to have second thoughts. Nature bats last.

IPM has many advantages. With minimal disruption of natural controls, both cost and effort may be reduced. Damage to non-targets is reduced, as well as undesirable environmental effects. IPM is most likely to produce a permanent solution, and is cost-effective in both the long- and short-term.

The National Park Service mandate is to preserve resources unimpaired for future generations; the primary threats to resources in all parks are exotic species and air quality. The National Park Service has had a policy since 1930 of controlling exotic species, including plants, animals such as European wild boar, and some exotic forest pests, such as gypsy moth and Dutch elm disease. Exotic plants are a problem in parks because they:

1. displace native species and alter habitats. An example is Japanese grass, a shade-tolerant exotic that can invade the entire herbaceous layer. This has a particular competitive advantage in areas with high deer populations, since deer dislike it;
2. many exotics are much more labor-intensive to maintain. For example, lespedeza planted along roadsides must be mowed much more often than lower-growing species;
3. some exotics are capable of hybridizing with natives, which alters the genetic resource. Oriental bittersweet is one example;
4. cultural landscapes are important resources in many parks and may be obscured by exotics. Multiflora rose, for example, can spread from one plant to cover an entire homesite in only a few years, as can privet, daylily, and other common ornamentals;
5. disturbed areas, such as forests impacted by fire, gypsy moth, or southern pine beetle, are quickly invaded by such exotic trees as ailanthus or princess tree if a seed source is within 4–5 miles;
6. marginal habitats, such as riparian areas or cliffsides, are often habitat for rare plants that are easily out-competed by exotics like mullein or mimosa.

The National Park Service also manages many structures, developed areas, and historic/cultural resources, as well as natural areas. IPM has many applications throughout the agency. All pesticide use is approved either at the regional or Washington level, and least toxic alternatives are required.

The Great Smoky Mountains National Park is one of the largest areas in the eastern US managed as wilderness—over 800 square miles in size—and also the most heavily visited park in the NPS, with 9 million visitors each year. Over 1,600 species of vascular plants have been recorded for the Park, and of these, about 350 are not native. Only about 35 present a significant problem. The Park

has been working to eradicate a few of these—mostly kudzu—since the 1950s, but our current program has been in place since the late 1980s. In 1989, a park-wide survey was conducted, focusing primarily on disturbed areas such as roadsides and old homesites, which provided a good base for future eradication efforts. Information was gathered on each species from literature review, database searches, and exchanges with other land managers. The first principle of IPM is to know the biology of the target species: how does it reproduce and disperse? What is its typical habitat? Is it evergreen, annual, or biennial? What are its natural enemies and weakest life stage? What are the most effective, least toxic means of control? The Park, in cooperation with TNEPPC, recently compiled much of the most useful information in a manual for management of exotic plants for Tennessee, which is now available. After information is gathered, a thorough survey and prioritization process follows. Important factors in prioritization include:

1. what is the level of impact and what resources are threatened, e.g., rare plant sites;
2. how invasive is the species, e.g., those spread easily by windborne seeds or carried by birds or water, and shade tolerance;
3. threat to natural processes, and
4. feasibility of control.

Monitoring and accurate record-keeping are crucial. At GRSM, a database (dBASE) program was developed to analyze site and treatment data. The program compiles information into reports which assist with seasonal planning. For example, a priority report identifies the highest priority species for a given season and location. Other reports, such as hours worked, amount of herbicide used, and total treatment areas, are used to compile data for annual summaries.

Treatment methods frequently used include hand-pulling (large volunteer groups are helpful for such species as garlic mustard, mullein, barberry, and mush thistle), selective herbicides, timing of application (evergreen exotics, such as Japanese honeysuckle, English ivy, and privet can be treated during the winter when many non-target natives are dormant, cut/stump treatment, and basal bark herbicide applications. Post-treatment evaluations and experimental trials are incorporated.

Prevention is the first line of defense against exotics. Regular inspections of disturbed areas, particularly on the boundary are conducted, and Park neighbors who share exotic sites have been contacted. Soil brought into the Park for construction projects is inspected for such obvious problems as Johnson grass rhizomes or mush thistle growing in the source area. Education is a large component; the Park works closely with TNEPPC and other agencies to help inform the public of the threats posed by exotics and to encourage native alternatives for landscaping. Use of volunteers, particularly school groups, helps to educate as well as accomplish work.