IPM for Weeds on School Grounds

INTRODUCTION

A "weed" is commonly defined as a plant growing in a place where it is not wanted. Plants can be unwanted because they compete with desired species, because they cause harm to people or structures, or because their appearance or odor is offensive. The designation "weed" can be quite subjective. For instance, the dandelion can be considered a weed in one setting and a wildflower or culinary herb in another.

On school grounds, there is usually consensus on the weedy nature of certain plant species, such as thistles, docks, crabgrass, and poison ivy, that spring up where they are not wanted. These species have common characteristics that enable them to "take over" when conditions are right. Landscapes can be designed and maintained in ways that minimize conditions suited to weed growth, reducing or eliminating the need for herbicides. The goal is to encourage desirable plants to outcompete weeds in habitats where plant growth is acceptable (shrub beds, turf areas, tree wells, student gardens), and to remove conditions conducive to weeds in areas where vegetation is not wanted (in pavement cracks, on running tracks, under fences). A review of basic principles of weed biology and ecology will help identify conditions that promote weed growth and suggest methods for encouraging competitive desirable vegetation and discouraging weeds. Extensive information concerning weeds in turf, identification and control can be found at: **www.agronomy.psu.edu/Extension/Turf/WeedMgmt.html**. (*The management of weeds in turf is discussed in the section on school lawns on page 76.*)

IDENTIFICATION AND BIOLOGY

Weeds can be found among both broadleaf plants and grasses. Like all plants, weeds are classified within 3 general categories according to the duration of their life cycle and their methods of reproduction.

Annuals

These are the most common weeds; they live 1 year and reproduce by seed. These plants have a rapid life cycle that enables them to germinate, shoot up, blossom, set seed, and die within the space of a few weeks or months. Their rapid life cycle allows them to thrive on a minimum of nutrients and water.

Biennials

These weeds live 2 years, and reproduce both vegetatively and by seed.

Perennials

These weeds live more than 2 years. Although perennials produce seeds, the main means of reproduction is usually vegetative; for example, by forming new plants from bulbs or corms, or by producing new top growth from buds located on underground stems (rhizomes).

Weed Habitats

Weeds tend to grow in places where the soil is bare or disturbed:

- areas that have been cultivated (shrub and flower beds)
- trampled or close-mowed lawns
- unpaved play areas and paths
- sports fields
- fence lines
- graded roadsides
- cracks in sidewalks or other pavement
- areas where the same herbicide has been used repeatedly and plants tolerant to that material have moved in

Weedy areas found on school grounds tend to be hot, dry, sunny habitats—often with low nutrient levels and soil moisture. Certain plants, such as thistles, knotweeds, plantains, and barnyard and crab grasses, take advantage of these conditions. As they grow, die, and decompose, the soil is stabilized, erosion is reduced, and the soil environment becomes more moist and fertile. Under these improved conditions, plant species with less weedy characteristics may eventually displace the weeds. Thus, a meadow left undisturbed may eventually become a forest.

DETECTION AND MONITORING

The purpose of monitoring is to determine if, when, where, and why weeds are growing or posing a problem, and to assign priorities for habitat change and least-toxic weed suppression. The components of effective weed monitoring are described here.

Most of the information in this chapter is from *IPM for Schools: A How-to Manual.* United States Environmental Protection Agency. EPA 909-B-97-001. March 1997.

Mapping Weed Habitats

The first step in monitoring is to map areas where weeds are growing. This does not need to be a detailed, time-consuming process—a rough map will do. For areas to monitor, see the list under Weed Habitats above.

Identifying Weed Species

It is important to accurately identify the most common weed species on your school grounds in order to determine appropriate management methods. Knowing the scientific name of the weed makes it much easier to obtain information from research professionals and the scientific literature. Assistance is available from county Penn State Cooperative Extension personnel or pictorial weed guides. A method for preserving weed samples is described in the box to the right.

Learn about the growing conditions required by the weed as well as its growth characteristics and methods of reproduction. Weeds can be indicators of soil conditions that need to be changed to discourage weed growth. For example, yellow nutsedge (*Cyperus esculentus*) often grows in waterlogged soils, indicating excessive water perhaps due to a broken irrigation pipe or valve. Conversely, prostrate knotweed (*Polygonum aviculare*) indicates dry, compacted soil that requires aeration and addition of organic matter. Changing the conditions indicated by the weed can discourage these unwanted plants from growing.

Record Keeping

It is important to record the time of year a particular weed species appears, its abundance, and its impact on the landscape. This information will help determine:

- which weeds and how many of each can be tolerated in a specific area without the weeds impairing the function of the landscape or its aesthetic appeal
- whether or not management strategies are effective
- whether weed populations are rising, falling, or staying about the same from year to year
- whether new species of weeds are becoming a problem (as often happens as a result of weed management efforts)

Without this information, it is impossible to determine the long-term effectiveness of management methods.

Collecting and Preserving Plant Specimens for Identification

If you want to have a damaged plant inspected or a weed identified, collect an adequate sample since a small part of a plant may not include all the signs and symptoms needed to make an accurate diagnosis. Plant material that has been dead for an extended time is generally useless in determining the identity of the causal agent of a disease. For plant identification purposes include leaves, stems, roots, and flowers or seed-bearing portions. A single leaf or leaflet is not an adequate sample for plant identification purposes.

Place green leaves between dry paper towels and enclose them in a plastic bag *without adding moisture*. Carefully shake excess soil from roots. Place roots in a plastic bag with *moist* (not water-logged) wood shavings or similar material to prevent drying. Wrap fruits separately in paper and mail without adding moisture. If you are unable to deliver the specimen in person, place the bag in cardboard mailing tubes, boxes or padded mailing envelopes reinforced with cardboard sheets and send it to your Penn State Cooperative Extension county office.

Establishing Weed Tolerance Levels

School landscape maintenance budgets rarely stretch far enough to suppress all weeds, even if that were desirable. Aesthetic standards should be adjusted to take this into account. Assigning tolerance levels helps prioritize budget allocations, facilitate long-term plans, and provide justification for weed management action—or lack of action.

Identify areas where weeds pose potential health or safety hazards or threaten damage to facilities, and distinguish these locations from those where weeds are considered aesthetic problems alone. For example, poison ivy can cause severe skin rashes and itching, and weeds growing in playing fields or running tracks can pose tripping hazards. Assign low tolerance levels to weeds in such areas, and place high priority on their management. On the other hand, assign higher tolerance levels—and lower priority for management—to weeds growing in shrub beds or along fence lines.

Since most weed tolerance levels are subjective, one way to establish them is to invite a representative group to tour the school grounds and decide where weed levels are

acceptable and where they are not. Such a group might include the school principal, coach, landscape maintenance supervisor, PTA officers, students, and parents. It is important that this group reach consensus on overall weed management objectives for various school sites, and that weed tolerance and action levels derive from this agreement. Weed tolerance levels can be reevaluated on an annual basis.

Long-Term Weed Management Plans

Long-term plans should focus on making changes to the habitat to permanently exclude weeds in areas where weed tolerance levels are low. In some cases this may require augmented budget allocations. Developing plans can help spread budget needs over several years.

Evaluation of Weed Management Programs

The availability of herbicides has often helped perpetuate poor landscape designs and inappropriate maintenance practices, because herbicides could be used to compensate for them. Gathering monitoring data can pinpoint the underlying causes of weed presence. The data can be used to change design specifications for landscapes, sport fields, playgrounds, and pavement to avoid encouraging weeds.

The long-term costs, risks, and benefits of various weed management approaches also should be evaluated. A one-time cost to install concrete or asphalt mow strips under backstops and fence lines and thereby permanently remove weed habitat may be less costly in the long run than repeated herbicide use that may pose a potential health risk, possibly resulting in lawsuits and poor public relations.

MANAGEMENT OPTIONS

Horticultural Controls

This approach involves manipulating plant selection, planting techniques, and cultural practices so that desired vegetation grows so densely and vigorously that weeds are crowded out.

Planting beds can be rototilled and irrigated to force weed seeds to germinate. As soon as sprouted weeds appear as “green fuzz” on top of the soil, they can be killed by a second cultivation with the tiller set at 1 inch. Shallow cultivation prevents weed seeds from being moved to the top 2 inches of soil—the germination range. This will reduce weed growth while ornamental plants are becoming established.

Plant Selection

In shrub beds, you can include ground covers with rapid, spreading growth habits that can outcompete weeds.

Competitive Interplanting

When shrubs or ground covers are installed, weeds often colonize the spaces between individual plants before the ornamentals can spread and shade them out. These weed habitats can be eliminated by overseeding newly planted areas with fast-growing annual flowers such as sweet alyssum (*Lobularia maritime*), farewell-to-spring (*Clarkia amoena*), and scarlet flax (*Linum grandiflorum* var. *rubrum*).

Mulching

Mulches are used primarily to exclude light from the soil, thus limiting weed seed germination. Mulches can be composed of organic materials (compost, wood chips), stones or gravel, or synthetic landscape fabric. Landscape fabric is preferred over black plastic, since it allows air and water to move through the soil to benefit ornamental plant roots, but excludes light at the soil surface to thwart weeds.

To be effective, mulches should be applied immediately after plants are installed. Bark or compost mulches should be 3 to 4 inches deep to exclude light. If landscape fabric is used, it should be covered with an inch or two of bark, stones, etc. to improve the aesthetic appearance of the planting area and reduce degradation of the fabric by sunlight. Landscape fabric can last for years if properly maintained.

Physical Controls

Hand-pulling, cultivation, and using string trimmers and mowers are very effective weed suppression techniques. If labor is in short supply, make good use of parent and student volunteers, community service groups, and youth groups. Classrooms can adopt a flower bed or a section of the schoolyard to maintain and beautify. If students are involved in grounds maintenance, they will be more careful around the plants and take pride in a clean, well-maintained schoolyard.

Weeds on baseball infields, running tracks, and other bare soil areas can be suppressed by periodic shallow cultivation with a tractor-mounted rotary harrow, also called a rotary hoe or power rake (Rhay, 1994). In areas with heavy clay soils, this method can be combined with adding sawdust to reduce the crusting and puddling characteristics of these soils.

Eliminate Weed Habitat

Creating a "mow strip" under and immediately adjacent to fence lines can solve a common weed problem. When fences surround paved playing surfaces such as basketball courts, the steel fence posts can be installed directly into the paving material, 8 to 12 inches to the inside of the paving edge. The paving prevents weeds from growing under or adjacent to the fence, and provides a paved strip for the wheel of a mower which can keep adjacent grass trimmed. The strip also provides access for use of string trimmers when shrub beds abut the fence line.

Pouring a 16-inch-wide concrete or asphalt strip to cover the soil under and beside the fence can modify existing cyclone fence lines. This retrofit can be performed in stages over several years as budgets permit. The one-time paving cost will produce many years of savings in weed management.

Use asphalt or cement crack filler to fill cracks in paved areas where weeds are a problem.

Flaming

Flamers are used by a growing number of parks and school districts to treat weeds in pavement cracks, under picnic tables and benches, along fence lines, and similar places. This technique uses a small gas- or propane-fired torch to sear the tops of young weeds. The heat raises the temperature of the sap in the plant cells, the cell walls rupture, and the weed wilts and dies. Flaming is most effective on young annual and perennial weeds in the seedling (4- to 5-leaf) stage, because at that point the fragile root system is killed along with the top growth. Grasses are difficult to kill by flaming because a protective sheath covers their growing tips.

Keep the torch about 6 inches above the vegetation and pass it slowly over the plants. Hold the flamer over each plant briefly so the plant is heated but not actually burned. The leaves may lose their usual green color, but there may not be any evidence of wilting, let alone plant death, for several to many hours. Leaves that have been heated sufficiently to burst cell walls will feel very soft to the touch and may turn a purplish color.

Soil Solarization

This technique uses a covering of clear plastic to raise soil temperatures high enough to destroy weeds and their seeds. For solarization to be effective, daytime temperatures should average 85°F or more, so it should be done during the hottest and sunniest time of the year. Solarization can kill annual or perennial weeds as well as soil pathogens and nematodes. Solarization can also be used to destroy weed seeds and other soil pests in rototilled beds scheduled for new plantings.

To solarize a section of soil, do the following:

- Mow any existing vegetation to the ground.
- Cultivate to incorporate the vegetation into the soil.
- Provide a smooth surface by raking the soil so it is level.
- Encourage weed seeds to germinate by irrigating the soil 1 to 2 weeks before covering it.
- Irrigate again just before laying down the plastic.
- Use UV-stabilized plastic 2 to 4 mils thick.
- Anchor the tarp by burying its edges in a small soil trench around the area to be solarized.

Chemical Controls

When nonchemical weed management methods are not sufficient to solve weed problems, herbicides are available for integration into the program. There are many herbicides on the market. For information on the efficacy and hazards of various herbicides and on how to select an appropriate product for your situation, consult the Penn State Cooperative Extension office in your county.

Whenever possible, apply herbicides as spot-treatments to the target weeds. For example, a tool called a "rope wick applicator" can be used to wipe a small amount of herbicide on a single plant or patch of weeds. This reduces human exposure and helps to protect nontarget vegetation and beneficial soil organisms that can be damaged or killed by herbicide residues. Wick applicators are available as hand-held versions or as attachments to small tractors and riding mowers.

When applying herbicides, use a colorant to mark the treated area. This will not only ensure even coverage, but also will help passersby see and avoid the treated area. Do not allow children to play or lie on the treated area—rope it off and post a sign.

Herbicides must be used in accordance with their EPA-approved label directions. **Pennsylvania law allows pesticide applications on school grounds only by certified applicators, registered technicians, or by non-certified applicators or non-registered technicians under the direct supervision of a certified applicator. Notification must be given to all staff and parents or guardians of students who request it 72 hours prior to pesticide use. Warning signs must also be posted in the vicinity 72 hours prior to and for 48 hours after the application.** All labels and Material Safety Data Sheets (MSDS) for the pesticide products authorized for use in the IPM program should be maintained on file. Never apply these materials where they might wash into the storm drains, sanitary sewer, creeks, ponds, or other water sources.