Chapter 18
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.

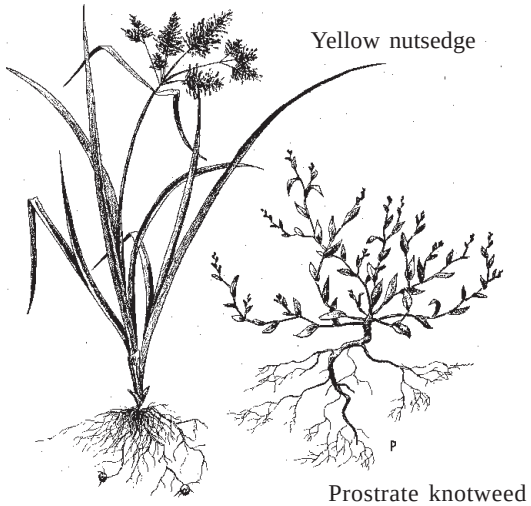
On school grounds, there is usually consensus on the weedy nature of certain plant species such as thistles, docks, crabgrass, and poison oak or ivy that spring up where they are not wanted. These species have common characteristics that enable them to "take over" when conditions are right. By understanding conditions suited to weed growth, landscapes can be designed and maintained in ways that minimize such conditions, and the need for herbicides can be reduced or eliminated. The goal is to encourage desirable plants to out-compete 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. (Note that the management of weeds in turf is discussed in Chapter 10.)

Identification and Biology

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

Annuals. These are the most common weeds; they live one 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 two years, and reproduce both vegetatively and by seed.



Perennials. These weeds live more than two years. Although perennials produce seeds, their 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, etc.)
- 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, unshaded habitats—often with low nutrient levels and soil moisture. Certain plants such as thistles, knotweeds, plantains, barnyard and crab grasses, etc. have evolved to 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 will 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.

Mapping Weed Habitats

The first step in monitoring is to map areas where weeds are growing. This need not 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 Cooperative Extension Service literature and personnel, or pictorial weed guides. A quick and effective method for preserving weed samples using plastic-covered index cards is described in Appendix F. This simple method results in a portable, easy-to-use weed reference.

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) indicates excessive water perhaps due to a broken irrigation pipe or valve. Conversely, prostrate knotweed (Polygonum aviculare) indicates dry, compacted soil requiring aeration and addition of organic matter. By changing the conditions indicated by the weed, these unwanted plants can be discouraged 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 (this often happens as a result of weed control efforts)

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

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 oak or 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 to weeds growing in shrub beds or along fence lines and lower priority for management.

Since most weed tolerance levels are subjective, one way to establish them is to invite a representative group (e.g., the school principal, coach, landscape maintenance supervisor, PTA officer, teacher, student, and parent) to tour the school grounds and decide where weed levels are acceptable and where they are not. 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 re-evaluated 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. By developing plans, budget needs can be spread 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. By gathering monitoring data, the underlying causes of weed presence can be pinpointed. 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 should also 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, 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 a "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 groundcovers with rapid, spreading growth habits that can out-compete weeds.

Competitive Interplanting

When shrubs or groundcovers are installed, the spaces between individual plants are often colonized by weeds 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 maritima), farewell-to-spring (Clarkia amoena), and scarlet flax (Linum grandiflorum var. rubrum).

Mulching

Mulches are primarily used to exclude light from the soil, thus limiting weed seed germination. Mulches can be composed of organic materials (compost, wood chips, etc.), stones or gravel, or synthetic landscape fabric. Landscape fabric is preferred over black plastic, because 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 use of string trimmers and mowers are very effective weed control 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 school yard to maintain and beautify. If students are involved in grounds maintenance, they will be more careful of the plants and take pride in a clean, well-maintained school yard.

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 addition of 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.

Existing cyclone fence lines can be modified by pouring a 16-inch wide concrete or asphalt strip to cover the soil under and beside the fence. 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 control.

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, etc. This technique utilizes 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 their growing tips are covered by a protective sheath.

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. Even tough bermudagrass can be killed with this method. 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.
- In the Southwest, wait 3 to 4 weeks before removing the plastic, and 6 to 9 weeks anywhere else.

Chemical Controls

When non-chemical 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 Appendix G for a list of resources. When selecting herbicides, keep in mind the criteria described for treatments in Chapter 4. An example of using these criteria is provided in Box 18-A.

Box 18-A
Selective Use of Low Toxicity Herbicides.

Tim Rhay, IPM specialist with the Eugene, Oregon Public Works Department, manages the city's parks and sports fields within an IPM framework. His approach has been adopted by a number of local schools as well. When herbicides are needed, he selects materials that have relatively low toxicity and are compatible with spot-treatment. In discussing his infield/bare-soil weed management program (see also Physical Controls), he writes,

"The integrated methodology developed in Eugene...will both provide quality infield surfaces and reduce the resource requirement for doing so. In particular, the need for herbicide application will be dramatically reduced. Some spot treatment may be necessary to deal with noxious perennial plants that do not respond to cultivation. In some cases, a comprehensive treatment may be needed to gain initial control of an area. In some climate zones, treatment may be needed only at the infield/outfield interface, to prevent opportunistic vegetation from creeping into the bare soil area. When such treatment is required, consider low-toxicity granular preemergence materials which can be soil-incorporated during the dormant season, after the field is taken out of play....For postemergence work, newly available fatty acid-based herbicides [i.e., herbicidal soaps] may be useful for some types of vegetation. Others may require the use of foliar-applied, translocated materials such as glyphosate. Consult local regulatory and reference sources before choosing herbicide materials." (Rhay 1994)

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 non-target 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 insure even coverage, but 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. Applicators must be certified to apply herbicides and should always wear protective gear during applications. 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.

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