WEED CONTROL

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A weed is any plant growing where it's not wanted. For example, Kentucky bluegrass growing in a lawn is wanted. Bluegrass growing in a shrub or flower planting is a weed. Weeds are plants that interfere with the management objectives for a given area.

Over the last decade, weed scientists have begun considering weed control from the standpoint of Integrated Pest Management. This approach requires an understanding of all the factors (cultural, biological and environmental), which brings about seasonal changes in weed populations.

The goal of Integrated Weed Management is to encourage desirable plant growth while discouraging weed growth. Methods used include:

1. Discouraging weed reproduction by seeds or roots.
2. Disposing of weed residue in ways that eliminate any chance of unintentional dispersal.
3. Altering habitat to avoid weed spread.
4. Filling in empty niches to discourage weed invasion of disturbed areas.

Ecologists have contributed to this process by helping to determine when and how weeds are most vulnerable to specific management tactics, and by providing information on weeds responses to various control practices. See Figure 9-1 for an example of an Integrated Weed Management Fact Sheet.

Weed control is very important in successful gardening and landscape maintenance. During hot, mid-summer weather, some weeds can grow much faster than most flowers, vegetables and shrubs and soon overtake and shade them. Although millions of weed seeds are already present in the soil, weeds should always be controlled before they go to seed. If allowed to produce seeds, there will be even more weeds produced the next growing season. Many weed seeds can survive for years in the soil. Some seeds require light in order to germinate and grow. Disturbing the soil can bring seeds to the surface, resulting in a new crop of weeds. Methods of controlling weeds in the landscape vary with the type of weeds, time of year, and the landscape or garden situation.

Missoula County

INTEGRATED PLANT MANAGEMENT

FACTSHEET NO. 9

WEED MANAGEMENT

for Naturalized, Interface and Open Space Areas

Integrated Weed Management Steps

- Characterize the weedy area
  -- is it dry, wet, sunny, shady?
- Decide what the desired vegetation is for the area, based on management goals.
  (i.e., Pasture? Grassland? Native?)
- Identify the weed(s).

LEARN THE WEED'S BIOLOGY:
- what is its growth habit (annual, biennial, perennial)
- what is its life cycle
- how does it reproduce (seed, vegetatively)
- what growing conditions does it need
- when is it most vulnerable to management

- Limit the optimal conditions for the weed's growth:
  - minimize soil disturbances
  - avoid bare soil (cover soil with non-weedy, vigorous vegetation)
  - avoid letting seed-producing weeds flower and set seed
  - stop weeds that reproduce from underground stems, or root pieces, from spreading during cultivation or tillage
- Choose and combine several management tools that target vulnerable stages in the weed's life cycle.

Management Tools

For best results, COMBINE and REPEAT tools.

1. HAND PULLING is more effective for taprooted (i.e., knapweed) than rhizomatous (i.e., leafy spurge) weeds.
2. CULTIVATION is best for annuals and taprooted perennials (repetition necessary).
3. GRAZING can suppress certain weeds, based on timing and on type of livestock.
4. MOWING reduces seed production and may increase herbicide efficacy by providing uniform growth.
5. MULCHING inhibits seed germination of *some* weeds if applied at least 4" deep. It is not effective for many established perennials, especially rhizomatous grasses such as quack grass, unless >12" deep plus 15 feet beyond the weed patch.
6. BIOLOGICAL CONTROLS Insects and pathogens have been used alone and in combination with other tools.
7. HERBICIDES are most useful in the early stages of weed invasion before populations are heavy, and rhizomatous weeds spread.
8. REVEGETATION Reseeding prevents weed re-invasion after the above tools are used. Revegetation is necessary when desirable plants constitute <30% of the plant community. Vegetation choice should match site conditions and goals.

For detailed information, contact the Missoula County Extension Office @ 721-4095, or the Missoula County Weed District @ 829-0496

Figure 9-1 Weed Management

Types of Weeds

Weed identification, while important, can be tricky. Experience, coupled with a good identification guide, makes the job easier. An excellent weed identification guide is Weeds of the West, which is listed in the reference section. This guide provides an identification key and detailed color photos of hundreds of weeds found in Idaho and Montana.

Annual weeds, which sprout, grow and die in one growing season, represent the majority of weeds. Annuals reproduce only by seed and don't have underground reproductive roots, rhizomes or bulbs. Annuals are normally considered easy to control when small, but are very persistent because of their fast growth and abundant seed production. They should be destroyed when young to avoid their competition and seed production. Common annual weeds include crabgrass, pigweed, smartweed, prostrate spurge and ragweed.

Biennial weeds also reproduce primarily by seeds, but have underground storage roots, crowns, or other organs that allow them to survive one winter. Biennials typically form a short leafy rosette of leaves the first season, store food in a root or crown, and then go dormant for the winter. The next spring the stem elongates, produces flowers and seeds, and then the plant dies. Biennials, like annuals, are most easily controlled as seedlings. Burdock, bull thistle, wild carrot, wild parsnip, and mullein are common biennial weeds. Dandelion is a tap-rooted weed that can be biennial or perennial.

Perennial weeds are the most difficult to control. They reproduce by seeds and usually also by vegetative parts, such as underground crowns, storage roots, rhizomes, stolons, tubers, or bulbs. Cultivation is not very effective in controlling perennial weeds unless the entire weed, including underground storage organ, is removed, or unless new growth is removed frequently and repeatedly until all food reserves are used up. Cultivation often increases the problem by spreading underground parts that sprout and spread the weed colony. Canada thistle, bindweed (morning glory) and quackgrass are some of the most prevalent perennial weeds.

Noxious weeds are those weeds that federal, state, or local governments have deemed injurious to public health, agriculture, recreation, wildlife or property. Because of significant negative impacts, land owners have a legal responsibility to control noxious weeds on their land. Authorities can implement quarantines or take other actions to control noxious weeds. Noxious weeds have been spreading rapidly over the past 100 years. Most are introduced from other countries and have invasive and aggressive characteristics. They displace native plants, reduce biodiversity, lower crop and forage production, and reduce wildlife habitat. Noxious weeds can also lower the value of land and cost millions every year in expenses and production losses. Spotted knapweed and leafy spurge are two examples of noxious weeds.

Weed Control Methods

There are four basic methods used for weed control:

Mechanical - Physical removal by hand pulling, hoeing or tilling.

Exclusion - Maintaining dense stands of desirable plants (lawns, ground covers, shrubs) that successfully compete with and shade out weeds. Natural and artificial mulches are also used to exclude weeds.

Natural - Non-toxic products that kill weeds safely for home garden use.

Chemical - Application of chemical herbicides (weed killers) that can prevent or stop weed growth through their toxic activity in the weeds or soil.

Mechanical Control

Physical removal or incorporation of weeds has the advantage of an immediate improvement in appearance. The main disadvantage is the amount of time and effort it can take if weeds are well established. If a little time each day or week is set aside for weeding, it shouldn't become a chore. Reduce your heat stress by doing your weeding in the early morning or late afternoon, especially in mid-summer. Weed on the shaded west side of the house in the morning and save the east side of the house for afternoon shade.

Weeds are much easier to control while they are small seedlings rather than when their roots become fully established. One chop with a hoe can remove a dozen or more seedling weeds, but it may require three or four chops to remove one well-established older weed.

The best time to pull weeds is when the soil is loose and moist. When it is hard and dry, postpone weed pulling until the day after irrigation or rain. Grasp weeds as close to the ground as possible and use a weeding tool or knife to pry and loosen the soil in order to avoid breaking stems off. New weed shoots can develop from crown and root sections that are left in the soil.

Hoeing is not a digging process. A hoe is a cutting tool and the blade should be sharpened periodically with a flat file. The blade should be held parallel to the soil and weeds cut right at the soil line, disturbing the soil as little as possible. That way weed seeds which are too deep to germinate won't be brought to the soil surface. Some people prefer double-action hoes designed with sharp edges on both the back and front of the blade, because they can cut weeds with both forward and reverse motions. Double-action hoes are not very effective on hard, dry soils.

Most annual weeds dry up in a few days if left where they are hoed. Certain prostrate succulent weeds, such as purslane and prostrate spurge, store water in their tissues and can survive several days until they can re-grow new roots from stems. Remove these weeds after hoeing. Perennial weeds will usually sprout from underground root segments and are best controlled by other means.

Rototillers are designed primarily for soil preparation before planting. They are excellent for preparing vegetable gardens, flowerbeds, and shrub borders for planting. Rototilling, however, can actually make weed problems worse by spreading underground roots and rhizomes of perennial weeds and bringing weed seeds to the surface where they can germinate. Excessive cultivation destroys soil structure and can damage the roots of desirable plants.

Burning is occasionally used as a cleanup tool. Burning does not control most weeds and in fact many weeds sprout in response to a burn. Burning also releases soil nutrients. Frequent yearly burning destroys soil structure, reduces soil organic matter and limits fertility.

Exclusion

Weeds can be designed out of landscapes, gardens, and fields by proper plant choice. Choose trees, shrubs and ground covers that will shade the ground and fill above and below ground niches rapidly. This leaves less space for potential weed invasion. Bare soil is an invitation to weeds. The longer the soil is bare the greater the chance of weed invasion.

A vigorous turf, ground cover, or dense shrub planting minimizes weed growth by competing with weeds for water, nutrients, and light. Supplementary chemical or mechanical weed controls are usually needed while new landscape plants are becoming established. Proper irrigation, fertilization, and mowing increases the competitiveness of desirable plants.

Mulches reduce weed problems by preventing light from reaching weed seeds or seedlings. Natural organic materials, such as chipped bark, shredded cedar, grass clippings, and pine needles are often used as mulching materials. As mulches decay, they add organic matter to the soil, improving its physical structure and nutrient content.

Organic mulches are very effective at keeping soils cool and holding in moisture. On sites with naturally cold, wet soils, mulches can retard plant growth by preventing the soil from drying out and warming up in the spring. This can increase the potential for root diseases. Organic mulches can be used with or without weed fabrics. If no barrier is used the mulch should be deeper and top-dressed more often to remain effective.

Gravel and rock are also frequently used as mulches. While they don't improve the soil structure or provide nutrients, they last longer than organic mulches. Rock mulches are almost always used in conjunction with weed barrier fabric. Debris and leaves should be vacuumed or blown off rock mulches yearly to maintain appearance and effectiveness.

Direct fertilizer and water applications, using drip irrigation rather than broadcast fertilizer and sprinkle irrigation to reduce the amount of weed growth in the mulch and on top of the barrier fabrics. Direct lawn clippings away from mulched or rocked beds when mowing. Clippings and leaves left on mulch increase weed growth and reduce the effectiveness of weed barriers.

Organic and gravel mulches should be 2 to 3 inches deep to prevent weed growth. Shallow depths are recommended around smaller plants such as flowers. Greater depths can be used around trees and shrubs, but keep the mulch pulled back about 2 inches from trunks to ensure good air circulation and reduce the potential for crown diseases.

Black and colored polyethylene plastics effectively prevent light from reaching weed seeds and are sometimes used to control weeds in vegetables gardens. Plastic mulches, however, can cause problems in tree and shrub plantings by reducing air exchange and water infiltration. As a result, tree and shrub root growth can become shallow and weak. Clear plastic encourages rather than controls weed seed germination and growth.

Woven and non-woven polypropylene and polyester landscape fabrics or weed barrier fabrics have largely replaced plastic film for mulching trees and shrubs. The fabrics allow more water and air movement into the soil. They are usually covered with organic mulches or gravel to improve the appearance and increase the life of the fabrics, which are subject to decay when exposed to light. Even with the heaviest weed barrier fabrics, however, some perennial weeds can penetrate from beneath. When organic or rock mulches cover the fabrics, weed seeds can germinate on top of and penetrate many weed barrier fabrics.

Edgings are used as barriers to prevent lawn grass rhizomes and stolons from growing into shrub and flowerbeds. Redwood and cedar boards provide a natural appearance, but eventually rot. Vinyl, metal, and cement strips last longer if they are set at the right level. Edging can settle or frost heave up or be caught by lawn mowers and damaged. Edging must extend deep enough to prevent grass rhizomes from growing underneath and high enough to prevent stolons from growing over the top. Generally 4 to 5 inches is sufficient. A small trench 10” wide by 6” deep filled with sand or gravel can also work as a natural looking edge.

Natural control

Several least toxic weed management tools can be referred to as natural controls including mechanical type controls such as solarization with plastic. Natural or organic weed control products include herbicidal soaps, vinegar soaps, and corn gluten. The herbicidal soaps with or without vinegar work best on young succulent broadleaf weeds. These products only affect the leaves of plants (including grass) they come in contact with so they are safe for use around food crops, flowers and shrubs. Repeat applications are usually necessary on perennial weeds. Corn gluten products are being used as a pre-emergent weed control in the spring, but results have been inconclusive as to the effectiveness.

Flame weeders are effective on young broadleaf weeds and less effective on grasses. A flame is used to burst the cells of weeds in gardens, lawn, or sidewalks. Obviously care should be taken in dry conditions. Hot water can also kill weeds when they are small.

Biological control methods using insects and diseases to attack weeds are better suited to range and forestlands. Weed scientists are researching these methods for controlling weeds. While the potential is great, there are presently no methods that are practical in residential landscapes.

Insects that feed on specific weeds seem to hold the best promise. To date, 88 weed-feeding insect species have been introduced into the United States to control 43 species of weeds. Recent work with plant pathogens has also demonstrated their potential in weed control.

Chemical Control

Hundreds of herbicides have been developed to control unwanted plant growth, but only a few are registered for use in home gardens. Some herbicides selectively kill weeds without damaging desirable plants. Some are applied before planting to kill existing weeds, while still others are used to prevent weeds from sprouting and growing around established plants.

The effectiveness and selectivity of herbicides are affected by several environmental factors. Air and soil temperatures, humidity, rainfall or irrigation, and wind all influence the effectiveness of herbicides. Some herbicides aren't absorbed or translocated (moved from one part of the plant to another) below certain temperatures. High temperatures cause some herbicides to volatilize, reducing the chemicals' effectiveness and increasing the potential for herbicide vapors drifting onto and damaging desirable plants. Wind greatly increases the risk of herbicide drift onto desirable plants. Dusty plants may also reduce the absorption of the chemical.

The type of soil can affect soil-applied herbicides by decreasing their effectiveness or increasing it to damaging levels on otherwise tolerant plants. Some herbicides are absorbed and inactivated when applied over organic mulches. The age or growth cycle of a plant can change herbicide absorption and translocation within the plant. The depth and degree of establishment of a plant's root system can affect its response to soil-applied herbicides.

It's very important to read all directions and precautionary statements on herbicide labels before applying or recommending application. Be sure to note weather and other factors that affect the use of a particular product. Never use or recommend an herbicide for an application that is not included on the label.

Types of Herbicides

Herbicides are classified into several different types based on their use and mode of action.

Pre-emergence herbicides are often referred to as "weed preventers". They kill germinating weed seeds or young weeds just after germination, but usually have little effect on established plants. A pre-emergence weed killer is applied prior to the appearance of weeds or after established weeds are killed or removed. Pre-emergence herbicides usually have little effect on established perennial weeds that emerge from underground roots or other storage organs, but reduce the establishment of new perennial weeds from seed.

Most pre-emergence herbicides are applied to the soil surface and then either watered in or mixed into the top inch of soil with a rake or other tool. Failure to water in or incorporate the herbicide often results in poor weed control. When the soil is disturbed by cultivation, the chemical barrier formed by a pre-emergence herbicide is disturbed and weed seeds can germinate and grow. The effective control of different pre-emergence herbicide varies from a few weeks to several months. Pre-emergence weed killers are most widely used to kill weeds around perennial woody plants with well-established root systems.

"Garden weed preventers" are recommended for use around established vegetables and flowers. These are applied after seeds have germinated and the first crop of weeds has been removed. With some flowers and vegetables, weed preventers can be applied immediately after transplanting. Some species, however, can be stunted or otherwise damaged unless you allow their root systems to become established for at least two weeks.

Pre-emergence "crabgrass preventers" are available for use on lawns. These products are applied in late winter or early spring to prevent the germination of crabgrass and other warm weather summer weeds. These products are often combined with fertilizers.

Post-emergence herbicides kill established weeds but may or may not prevent new weeds from developing from seeds or underground organs. These herbicides are divided into two types: Contact and Translocated. Contact herbicides kill only those plant parts with which they make contact. Translocated herbicides are absorbed by roots, stems or leaves and are moved throughout the plant. Contact weed killers are effective in controlling small weeds and annual weeds if good spray coverage is obtained. Translocated herbicides usually also provide good control of perennial weeds because the chemical is moved to underground storage organs.

Selective herbicides are designed to kill only certain plants, leaving others undamaged, but can damage desirable plants if applied incorrectly. Common mistakes include applying more than the recommended rate, applying when temperatures are too high, applying to the wrong soil type, or applying before plant root systems have become established.

Non-selective herbicides are toxic to all plants. They are used where it's desirable to kill all vegetation or where application can be directed away from desirable plants. Non-selective herbicides are often used to kill weeds before planting or replanting. When applying in an established landscape, special application methods (such as wipers) can be used or desirable plants can be covered to prevent the herbicide from contacting them. Glyphosphate is an example of a non-selective herbicide.

Soil Sterilants are herbicides that are applied to the soil to prevent any plants from growing in an area for a prolonged period of time (several months to several years). Although sterilants are useful for driveways and along fence rows, you must take great care to avoid contacting the roots of desirable plants. Large trees and shrubs have root systems that can extend far beyond their drip lines. Soil sterilants can move downhill through the soil and damage plants that are below the area treated. Soil sterilants should never be applied to areas where you plan to plant in the future.

A particular herbicide may fit one or more of the categories listed above. Broadleaf lawn weed killers, for example, are popular selective, post-emergence, translocated herbicides. They kill broadleaf weeds growing in lawns but have little effect on most grasses. Toxicity to grass is most likely to occur during hot, mid-summer weather. Because they will also kill broadleaf ornamental plants, however, it's important to prevent spray drift onto adjoining trees, shrubs, flowers and vegetables. Like most post-emergence herbicides, lawn weed killers are most effective when weeds are growing actively. If rain or irrigation occurs within 24 hours after application, herbicides can be washed off before they are completely absorbed by the weeds. 2,4-D is an example of a selective broadleaf weed killer.

Sprayer Precautions

Because it's very difficult to remove all herbicide residues from sprayers, even with repeated rinsing, you should use one sprayer for herbicides and a separate sprayer for all other pesticides.

A commercial applicator is anyone applying a pesticide or herbicide at a private residence or other property. The applicator must be certified through the State Department of Agriculture and have insurance. Check with local agencies for current requirements.

Making Weed Control Recommendations

1. Accurately identify the weeds present.

2. Identify all plantings in the treatment area.

3. Select the method or herbicide that will do the most satisfactory job of killing the weeds without damaging desirable plants.

4. Instruct the customer to follow all label directions and precautions.

5. Follow safety procedures, such as wearing goggles and rubber gloves when handling pesticides.

6. Spray only on calm days to avoid drift.

7. Determine if the customer has the necessary application equipment and knows how to use it.

7. The Environmental Protection Agency has numerous regulations regarding pesticide use and storage. Anyone in the business of selling or using pesticides must keep accurate records and have Material Safety Data Sheets for each pesticide used to be in compliance. Learn the applicable regulations prior to using or recommending any pesticides.

Herbicide availability and brand names change frequently. Consult manufacturer literature and product labels for the latest information on registered uses and precautions. Consult State University Extension Services for help with weed control problems and current recommendations.

References

Herbicide injury to trees and shrubs - a pictorial guide to symptom diagnosis. J. Derr and B. Appleton. 1988. 72 pages. Written for professionals and describes the symptoms and diagnosis of herbicide injuries in nursery and landscape trees. Blue Crab Press, Virginia Beach, VA.

IPM Certified Plant Professional Manual. H. Atthowe. 2002. Missoula County Extension Service. Missoula, MT.

Nursery and landscape weed control practices. R. Rice. 1986. 264 pages. Written for professionals and discusses physical, cultural, and chemical weed control practices. Thomson Publications, Fresno, CA.

Weeds of the west. T. Whitson, et al. 1991. 630 pages. Provides complete descriptions and color photos of hundreds of weeds. Includes an identification key. Can be purchased from the Weed Diagnostic Lab, PSES Department, University of Idaho, Moscow, ID 83843.

Chapter Review

A. Describe and give examples of each of the following:

Annual Weed _____

_____

Biennial Weed _____

_____

Perennial Weed _____

_____

NoxiousWeed_____

B. Describe how the following weed control methods are used, explaining the advantages and disadvantages of each.

Mechanical Control _____

_____

Exclusion _____

_____

Natural Control _____

_____

Chemical Control _____

_____

C. What is an Herbicide? _____

D. What are the two most important steps in using an herbicide (or any pesticide, for that matter)?

1. _____ 2. _____

E. Describe the following types of herbicides:

Pre-emergence Herbicide _____

Post-emergence Herbicide _____

Nonselective Herbicide _____

Soil Sterilant _____

Broadleaf Lawn Weed Killer _____

F. Classify the following common weeds as being broadleaved or grass, and annual, biennial, or perennial.

Canada thistle _____	crabgrass _____	quackgrass _____
mullein _____	burdock _____	pigweed _____
mustard _____	dandelion _____	Prostrate spurge _____

G. Name four ways that noxious weeds adversely affect the environment.

1. _____
2. _____
3. _____
4. _____