



MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #351

Weed Management

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What Makes a Plant a “Landscape Weed”?

A weed is any plant that becomes undesirable in the landscape because of the following:

- It is growing in a place where it is unwanted (lawn grass in a flowerbed, tree seedlings in a lawn, purslane growing between patio pavers, spearmint invading a raised vegetable bed).
- It is visually unattractive (color, texture, growth habit, growth rate makes it aesthetically unappealing to the eye).
- It poses a health or safety hazard (poisonous plants, thorny plants, fuel for fires).

- It out-competes more desirable plants in the home landscape (competes for water, nutrients, light) or when it escapes into native landscapes (creating biodiversity problems).
- It acts as a host or shelter for other pests (alternate host for rust, attractive to injurious insects, food/shelter for damaging wildlife).

What Characteristics Make Weeds Successful?

Characteristics that make weeds successful where they become a problem include the following:

- Rapid growth rate.
- Prolific seed producer.
- Long longevity of seed.
- Deep roots, stolons, tubers, etc. making them tolerant of adverse growing conditions.
- More “ecologically fit” than other plants in the landscape.
- Adapted to readily spread (wind, animal manure, water, and human activities).
- Often adapted to disturbed soil/sites.
- May not have insects and diseases to keep them in check.
- May be better competitors for light, nutrients, or sun.

Seed Bank

A seed bank builds up as a weed drops seed into the soil over many years –seed can remain viable for years. Persistence and vigilance to keep weeds from going to seed are keys to depleting seed bank [Tables 1 & 2]

Weeds tend to be very competitive and are capable of taking advantage of disturbed areas. They often produce large amounts of seeds or are capable of quick reproduction. Weeds are generally a problem where the desired crop is doing poorly or the soil has been disturbed.

Table 1. Seeds per Plant

Weed	Number of Seeds Produced Per Plant
Dandelion	15,000
Canada thistle	680
Curly dock	29,500
Lamb's quarter	72,450
Mullein	223,200
Pigweed	117,400
Purslane	52,300

Table 2. Viability of Buried Seed

Weed	Viability of Buried Seed
Black mustard	50 years
Curly dock	80 years
Foxtail	30 years
Mallow	20 years
Plantain	40 years
Shepherd's purse	35 years

How Do Weeds Get Into Our Landscapes?

Major sources of landscape weeds include the following:

- Weeds going to seed (seed bank)
- Brought into garden in manure and soil amendments or with soils
- Disseminated from neighboring property's plants and weeds
- Deliberate introduction

Minor sources of landscape weeds include the following:

- Brought into garden with plant materials
- Brought into garden in irrigation water
- Brought into garden by humans or animals
- Using poor quality seed (weed content in seed)

Noxious Weeds

Common weeds refer to weeds commonly found in various cropping situations, such as the lawn, vegetable garden, flowerbeds, or naturalized areas.

Noxious weeds refer to weed species declared by state or local statutes as a threat to agriculture and naturalized areas. Some designations require control under the law.

Legal Designations for Noxious Weeds

List A: All populations of List A species in Colorado are designated for eradication because they are not widespread (myrtle spurge, purple loosestrife)

List B: These weeds have discrete populations and will be managed to stop their continued spread, or eradicated in certain areas (Chinese clematis, oxeye daisy)

List C: These weeds are already very widespread, and not required to be controlled; however, education and research continue on these species. (downy brome, field bindweed)

For additional information on Colorado's noxious weed laws, refer to the Colorado Department of Agriculture Noxious Weed Management Program at www.colorado.gov/ag/weeds

Weed Life Cycle

To control weeds, the gardener needs to know their life cycles.

Annuals

Summer Annual – The seed germinates in the spring, the plant develops and produces seed during the summer, and the plant dies with killing frost in the fall. Examples include crabgrass and puncture vine.

Winter Annual – The seed germinates in late summer or fall; and lives over winter as small tufts or rosettes of leaves. It resumes growth in spring, matures seed early in the summer, and dies in summer heat. Examples include downy brome and shepherd's purse.

Keys to controlling annuals are preventing seed production, depleting the seed bank, and preventing germination.

- Timing is important.
- Winter annuals must be controlled before seed set in early summer.
- Summer annuals must be controlled before seed set in middle to late summer or early fall.
- The use of herbicides at the end of an annual's life cycle is often ineffective and does not make sense!
- Competition (from other plants and mulch) to prevent seed germination and seedling development.

Biennials

Requires two seasons to complete growth cycle. Seeds germinate in spring; the following season, the plant flowers and matures seeds in summer and fall before dying. An example is dame's rocket.

Keys to control are preventing seed production and depleting the seed bank, and preventing germination and seedling establishment.

Perennials

Simple Perennials have a root crown that produces new shoots every year. It depends upon seed production to spread. Examples include foxtail barley and dandelion.

Creeping Perennials propagate by seed, creeping above ground stems (stolons), and/or creeping underground stems (rhizomes). Examples include quackgrass and Canada thistle.

Keys to control are to prevent seed production and to kill the plant. Creeping perennials have a more extensive root system, and are harder to control.

IPM: Integrated Weed Management

“Integrated Pest Management, IPM, is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.” - the National IPM Network

The best weed control is prevention!

- Plant weed-free seed, sod, nursery stock
- Avoid using plant species known to be invasive
- Use weed-free amendments, topdressing
- Uses mulch where appropriate
- Maintain healthy, competitive plants
- Irrigate and fertilize appropriately

Methods of Control

Cultural Methods

Irrigation

Irrigation methods and frequency have a direct influence on weeds. Infrequent, deep irrigation drowns out many shallow rooted weeds. Sprinkler irrigation (wetting the entire soil surface) encourages weeds. Drip irrigation (keeping most of the soil surface dry) discourages weeds. Keep non-irrigated areas dry to help suppress weeds.

Lawn Mowing

Many common garden weeds will not survive the frequent mowing of a lawn. However, mowing the lawn too short (less than 2 inches for Kentucky bluegrass) encourage weeds as it reduces vigor of the grass.

Mulching

If maintained at adequate depths, mulching has many benefits including preventing weed seed germination. For wood/bark chips, a depth of three inches is best for weed control. Less is ineffective. Mulching may not effectively control established perennials growing from root.

Landscape Fabrics

In landscape management, landscape fabric with wood/bark chips or rock mulch above is common. However, it prevents soil improvement by organic breakdown, decreasing plant vigor. Weed seeds that germinate above the fabric layer will be difficult to pull and must be removed with herbicides. Use of landscape fabric

should be considered as a deferred maintenance technique rather than a low maintenance technique.

Crop Competition

Competition with the crops and weeds for light, water, nutrients, and growing space is an effective weed management tool. For example, mowing a cool season lawn (like Kentucky bluegrass) gives the lawn a growth advantage, shading out many weeds like crabgrass.

Block planting in the vegetable garden and close spacings in a flowerbed, with plants filling the bed space, helps suppress weeds.

Summary: Cultural Methods for Weed Management

Pros: This is the best long-term control as the gardener increases the conditions for desired plants to grow at the same time decrease the conditions for weeds.

Cons: Possibly more expensive and time-consuming; control may be slow.

Mechanical Methods

Tilling / Cultivating

Tilling or cultivating effectively controls 90% of annual and biennial weeds if done before seed set. It also brings a new set of weed seeds to the soil surface ready to germinate. When tilling for weed control, use only shallow cultivation. Deep tilling can damage crop roots. Cultivating/tilling may actually propagate most perennial weeds.

Hand Pulling

Hand pulling is quick when pulled while the weeds are small, and it is effective for small infestations. A few minutes on a weekly basis to keep the garden weed free will be more effective than a long weed pulling session as the weeds get large. For many gardeners, pulling weeds is a great way to vent stress. With hand pulling, most weed species require that they be pulled out by the roots. The weed will readily regrow if just the tops are removed. It is essential that weeds are removed before they go to seed, filling the seed bank. Some weed species, like purslane, must be removed from the garden bed. It can reroot if left in the garden.

Mowing Naturalized and Low Maintenance Areas

Mowing is a common weed management tool in natural areas and lower maintenance sections of a yard, reducing the unsightly appearance of the yard and fire hazard.

String Trimming (“Weed Whacking”)

Use of a string trimmer is a form of weed management by mowing. It can be effective in preventing weeds from going to seed. However, it can sow seeds if done on weeds with seeds.

Flame (Propane Torch)

Flaming off weeds with a propane torch is a common practice in production agriculture and has limited application in landscape maintenance due to fire hazards. During the flaming process, heat from the flame is transferred to the plant tissues, increasing the thermal energy of the plant cells and resulting in coagulation of cell proteins if the temperature is above 50°C. Exposing plant tissue to a temperature of about 100°C for a split second (0.1 second) can result in cell membrane rupture, resulting in loss of water and plant death. Thus, the weeds do not need to be burned up, but rather just scorched. Flaming works best on very young weeds.

It is rather expensive and many not be cost effective in some production agriculture situations. It presents a fire and explosion hazard; use with caution. Fire prevention measures prohibit the use of flaming in many communities.

Burning

Burning of fields and ditch banks is a weed management tool in production agriculture. Generally, a permit is required. Most communities prohibit burning of weeds inside city limits.

Solarization

Solarization is a method of heating the soil to kill roots, weed seeds, and soil borne insects and diseases near the soil surface. In regions with hot summer temperatures, it is effective in open areas with full sun. However, do not solarize the soil in the rooting area of trees, shrubs, and other desired plants. Steps include the following:

1. Remove vegetation and cultivate the soil to a six inch depth.
2. Sprinkle irrigate the area.
3. Cover the area with 4 mil clear plastic. Bury the edges of the plastic all the way around the plot.
4. Leave in place for three weeks during the summer heat of July and August.
5. After removing the plastic, avoid deep cultivation what would bring up weed seeds, insects, and disease pathogens from deeper soils.

Summary: Mechanical Method

Pros: Mechanical methods can be quick, inexpensive, environmentally friendly, and effective on small weed seedlings.

Cons: Mechanical methods have limited effectiveness on many established perennials, and could be detrimental at wrong time.

Biological Methods

Biological methods include the use of carefully screened insects to attack portions of the weed (i.e., stems, seeds, flowers, etc.). Development of biological methods with insects is rather complex and must be used with caution. The introduced insects must survive and become established in the new ecosystem. The insects need to reduce the weed population, but cannot entirely eliminate it as the weeds as that would eliminate the insect's food supply. The insects must not attach beneficial plants. The insects must not become insect pest. A great example of biological methods that failed is earwigs. They were intentionally introduced into the United States as a biological control agent and have since become a pest.

Biological methods also include the grazing of sheep, cows, horses, or goats. The purposeful use of grazing animals to control weed patches can be extremely expensive.

Pros: Biological methods can be an inexpensive, long-term control solution. It can be environmentally friendly and require little labor.

Cons: Biological methods are not always effective, may require a large population of weeds to maintain insect populations (will not work in backyard setting), and does not eradicate weeds. Insects can sometimes attack non-target plants.

Herbicides (Chemical Methods)

The use of herbicides is the use of chemicals that disrupt key physiological processes in plants, leading to plant death. Among the various herbicides, many different modes of action are found.

Pros: Use of herbicides is generally effective (if the correct herbicide is used), cost-effective, and provides quick control.

Cons: Use of herbicides can be environmentally problematic when incorrectly applied. Proper use includes proper selection of the specific herbicide for the weeds and for the growing crops in the area, timing of application, correct application rates, correct application procedures, and application safety measure to protect the application and non-target plants. Some require special licensing and may not be used in a home landscape or garden setting.

Be sure to follow the label, it is the law. Components of the herbicide label include the following:

- Trade Name
- Common name
- Chemical name
- Signal Words (Danger, Warning, Caution)
- Use instructions
 - Weeds controlled
 - Plant tolerances

- Application rate(s)
- Application timing
- Application technique
- Application restrictions
- Safety
 - Applicator
 - Bystanders, pets
 - Wildlife
 - Non-target plants

How Herbicides Are Applied

- **Broadcast** application refers to a uniform application over a treatment area.
- **Spot treat** refers to application to a specific area, such as directly to individual weeds.
- **Foliar** application refer to application to the leaves
- **Soil incorporation** refers to tilling or watering the herbicide into the soil after application.

Types of Herbicides

- **Systemic or Translocated** herbicides move internally in the plant. They must be applied during period of active growth with adequate water. Systemic herbicides are especially good for many perennials. Examples include glyphosate (Round-up), and 2,4-D.
- **Contact** herbicides only desiccate the portion of the plant that is contacted. Contact herbicides are most effective on annuals. Examples include vinegar and diquat.
- **Pre-emergent** herbicides are applied to soil prior to weed seed germination, killing germinating seeds. They will not kill growing weeds. Application timing is critical. For example, to control crabgrass in lawns, pre-emergent herbicides need to be applied late April to early May before the crabgrass germinates, about the time that common lilac blooms. Most require soil incorporation by irrigation.

Some desired crops germinating from seeds may also be killed. For example, do not apply pre-emergent herbicides prior to seeding or laying sod. Uniform application and strict adherence to application rate are essential for attaining good weed control and for preventing injury to landscape plants.

- **Post-emergent** herbicides are applied to foliage of actively growing plants. Example include 2,4-D, and glyphosate (Round-up).
- **Selective** herbicides control a limited group of plants, like monocots versus dicots.
- **Non-selective** herbicides are effective on a broad range of plants.

Examples of Common Herbicides Used in the Home Landscape

Selective Herbicides for Broadleaf Weed Control in Lawns

Examples: 2,4-D, MCPP and MCPA, Banvel (dicamba), and Confront

Caution:

- Avoid drift and ground water movement to non-target crops. Tomatoes and grapes are extremely sensitive to 2,4-D products.
- Do not use with temperatures above 85°F.
- Do not broadcast apply under trees. Spot individual weeds.
- Banvel and Confront have higher toxicity on some shade trees including honeylocust, linden, and Japanese pagoda.
- Keep pets off treated area until lawn dries.
- Low human toxicity. Stay out of area until lawn dries.

Non-Selective Herbicides for Control of Herbaceous Plants

Example: Glyphosate (Round-up). Note: Many Round-up products in the home garden trade have a combination of other herbicides added for quicker kill or longer holding potential.

Caution:

- Requires application to leaf tissue. No soil action. Do not spray the ground.
- Neutralized up contact with soil. Mix only with drinking quality water. The dirt in non-potable water may neutralize the product.
- Effective on most herbaceous plants. May or may not be toxic on woody plants.
- Low human toxicity, but avoid skin contact.
- Extremely toxic to dogs. Keep dogs out of treated area until spray dries.

Pre-Emergent Herbicides to Check Germinating Weeds in the Lawn

Examples: Balan, Betasan (bensulfide), Dacthal (DCPA, Ronstar (oxadiazon), Tipersan (siduron), etc.

Cautions:

- Require soil incorporation by irrigation.
- Do not apply prior to seeding or sodding. (Refer to label direction.)

Approach to Clients Having Weed Problems

- The weed must be correctly identified.
- What is the landscape setting (lawn, vegetable garden, flowerbed, shrub border, hardscape)?
- What is the health of the plants where the weeds are growing?
- What is the degree of weed infestation (by numbers, area, time, nearby sources of weeds)?

- What management has been done to date?
- Cultural issues: How is the area being managed (water, mowing, etc.)?
- Indicator species: Certain weeds “indicate” overwatering, too much/too little fertilizer, etc.
- Do they use mulch, where appropriate?

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