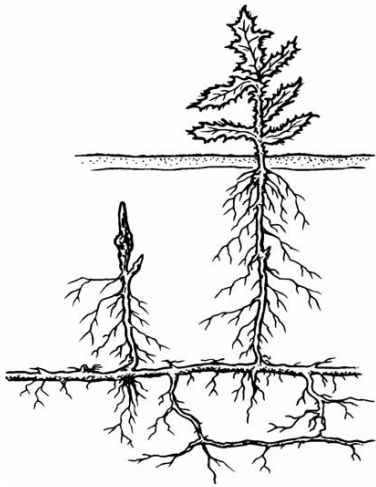




MASTER GARDENER

COLORADO STATE UNIVERSITY
EXTENSION



Weed Management

Class Reading / Reference

CMG GardenNotes on Weed Management

- Weed Management, #351
- Weed Identification, #352
- Weed Associations with Specific Environments and Cultural Conditions, #353
- Homework: Weed Management, #354

Learning Objectives

Students will be able to:

- Define what a “weed” is from the perspective of the home landscape
- List the problems that weeds can cause in the home landscape
- Describe why plants become weeds in the home landscape
- Understand the difference between noxious, exotic, native and invasive weeds
- Describe environmental, ecological and cultural/management factors that contribute to landscape weed problems
- Understand why weed identification is important and what resources are available to assist in weed identification
- Describe the different weed life cycles and how that knowledge is vital for developing weed control strategies
- Describe the different landscape settings in which weed problems arise, and how each of those settings each can present a unique set of weed management challenges
- Understand the principles of Integrated Pest Management (IPM) and how to apply those principles to managing specific landscape weed problems
- Describe cultural and management techniques for control of landscape weeds
- Describe the different types of herbicides and how/when each type can most effectively be used as part of a weed management program

Authors: Tony Koski, Ph.D., Irene Shonle, Ph.D., Kurt Jones, and David Whiting, Colorado State University Extension

- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
- Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.
- No endorsement of products mentioned is intended nor is criticism implied of products not Mentioned
- Copyright 2002-2018. Colorado State University Extension. All Rights Reserved. *CMG*
- *GardenNotes* may be reproduced, without change or additions, for nonprofit educational use.

Revised December 2010

Weed Identification and Management Resources

CSU Extension Resources

Extension Fact Sheets

- Control of Annual Grassy Weeds in Lawns, #3.101
- Musk Thistle, #3.102
- Weed Management for Small Rural Acreages, #3.106
- Leafy Spurge, #3.107
- Canada Thistle, #3.108
- Diffuse and Spotted Knapweed, #3.110
- Russian Knapweed, #3.111
- Biology and Management of the Toadflaxes, #3.114
- Cheatgrass and Wildfire, #6.310

CSU Turf web site at www.csuturf.colostate.edu

- Turf fact sheets
- Identification and Management of Perennial Weedy Grasses in Lawns
- Broadleaf Weed Control in Home Lawns

Weed Identification Books

- *Weeds of the West*. 2000. T. Whitson. CSU Extension, Publication XCM-147.
- *Weeds of Colorado*. 1997. R. Zimdahl. CSU Extension, Publication 521A.
- *Weeds of California and Other Western States*. 2007. DiTomaso, J. M. and E. A. Healy. Univ. Calif. Agric Nat. Res. Publ. 3488.
- *Aquatic and Riparian Weeds of the West*. 2003. Joseph M. DiTomaso and Evelyn Healy.
- *Color Atlas of Turfgrass Weeds*. 2008. L. B. McCarty, John W. Everest, David W. Hall, and Tim R. Murphy
- *Weed Control in Turf Grass and Ornamentals*. 2008. A. J. Turgeon, L. B. McCarty, and Nick E. Christians

Online Weed Identification Keys

- North Carolina State University at <http://www.turffiles.ncsu.edu/turfid/itemsselector.aspx>
- U. California Extension at http://www.ipm.ucdavis.edu/PMG/weeds_intro.html
- Michigan State University at <http://www.msuturfweeds.net/>

Other Weed Management Resources

- **Colorado Natural Areas** - Creating an Integrated Weed Management Plan: A Handbook for Owners and Managers of Lands with Natural Values at <http://parks.state.co.us/NaturalResources/CNAP/Publications/>
- **Colorado Weed Management Association** (www.cwma.org)
- **Colorado Department of Agriculture, Noxious Weed Program (Noxious Weed Lists and Photos)** <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1167928159176>

- **IPM – Principles of Landscape Weed Management**
<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7441.html>
- **Solarization for Landscape Weed Management**
 - http://vric.ucdavis.edu/pdf/soil_solarization.pdf (a treatise on soil solarization)
 - <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74145.html> (solarization for gardens)
 - http://solar.uckac.edu/new_page1.htm (solarization resource website)
 - <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pni7441-tbl4.html> (common garden and landscape weeds controlled by solarization)
- **Invasive Plants:** University of California – Definition of Invasive Plants
<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74139.html>

Review Questions

1. What “makes” a plant a weed, and what problems can weeds cause in the home landscape?
2. List/describe a few of the major types of landscape plantings/settings in which weed problems arise and how they might differ in terms of weed management solutions?
3. What are some plant characteristics that allow certain plants to become landscape weed problems?
4. Describe at 4 ways by which weeds may be introduced into the home landscape.
5. Explain what the “seed bank” is and how it factors into weed management decisions.
6. Give an example of a setting/location in YOUR OWN home landscape where weeds almost never occur – and explain why.
7. How do winter annuals and summer annuals differ? How does understanding this difference affect management strategies for each type?
8. For which type of weeds (life cycle, age) and in which landscape situation is the use of citric acid/acetic acid/botanical oil herbicides most effective? Least effective?
9. For which types of weeds (life cycle and age) is cultivation (hoeing) most effective? Least effective?
10. How can water/irrigation management be used to lessen weed problems in the home landscape?
11. How effective is mowing and string-trimming for weed management?
12. What is solarization? In what garden situations is it most effectively used?
13. How effective is landscape fabric for controlling weeds?
14. Why is mulch effective for weed control? Which types of mulch are 1) most and 2) least effective for weed control?
15. Why are biological control weed control products not used more often for landscape and garden weed management?
16. What is the difference between systemic and contact herbicides – and in which landscape situations (or on what types of weeds) would each be used most effectively?
17. How do preemergent herbicides work – and for which types of weeds (think life cycle) are they most effectively and commonly used?
18. What is the difference between selective and non-selective herbicides? Give examples of where each might be most effectively used.
19. What are some reasons that herbicides do not always control weeds as expected?
20. How would strategies for the management of BINDWEED and PURSLANE in a vegetable bed differ?



MASTER GARDENER

COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #351

Weed Management

- Outline:
- What makes a plant a “landscape weed”, page 1
 - What characteristics make weeds successful, page 2
 - Seed bank, page 2
 - How do weeds get into our landscapes, page 3
 - Noxious weeds, page 3
 - Weed life cycles, page 4
 - IPM: integrated weed management, page 5
 - Methods of control, page 5
 - Cultural methods, page 5
 - Irrigation, page 5
 - Lawn Mowing, page 5
 - Mulching, page 5
 - Landscape fabrics, page 5
 - Crop competition, page 6
 - Summary: cultural methods, page 6
 - Mechanical methods, page 6
 - Tilling / cultivation, page 6
 - Hand pulling, page 6
 - Mowing naturalized and low maintenance areas, page 6
 - String trimming “weed whacking”, page 7
 - Flaming (propane torch), page 7
 - Burning, page 7
 - Solarization, page 7
 - Summary: mechanical methods, page 7
 - Biological methods, page 8
 - Herbicides (chemical methods), page 8
 - How herbicides are applied, page 9
 - Types of herbicides, page 9
 - Examples of common herbicides used in the home landscape, page 10
 - Approach to clients having a weed problem, page 10
-

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?

Authors: Tony Koski, Ph.D., Irene Shonle, Ph.D., David Whiting, and Kurt Jones, CSU Extension

- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating
- Extension programs are available to all without discrimination
- No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.
- Copyright. Colorado State University Extension. All Rights Reserved. *CMG GardenNotes* may be reproduced, without change or additions, for nonprofit educational use with attribution.

Revised December 2011



CMG GardenNotes #352

Weed Descriptions

INDEX	Bouncingbet, <i>Saponaria officinalis</i> , page 7
	Canada thistle, <i>Cirsium arvense</i> , page 8
	Common mallow, <i>Malva neglecta</i> , page 2
	Common purslane, <i>Portulaca oleracea</i> , page 2
	Common tansy, <i>Tanacetum vulgare</i> , page 8
	Crabgrass, <i>Digitaria sanguinalis</i> , page 2
	Creeping woodsorrel = Oxalis, <i>Oxalis corniculata</i> , page 8
	Curly dock, <i>Rumex crispus</i> , page 7
	Dame's rocket, <i>Hesperis matronalis</i> , page 5
	Diffuse knapweed, <i>Centaurea diffusa</i> , page 5
	Downy brome = Cheat grass, <i>Bromus tectorum</i> , page 4
	Field bindweed, <i>Convolvulus arvensis</i> , page 9
	Green foxtail, <i>Setaria viridis</i> , page 2
	Hoary cress, <i>Cardaria draba</i> , page 9
	Kochia, <i>Kochia scoparia</i> , page 3
	Leafy spurge, <i>Euphorbia esula</i> , page 10
	Musk thistle, <i>Carduus nutans</i> , page 6
	Myrtle spurge, <i>Euphorbia myrsinites</i> , page 7
	Netseed lambsquarters, <i>Chenopodium berlandieri</i> , page 3
	Orange hawkweed, <i>Hieracium aurantiacum</i> , page 10
	Oxeye daisy, <i>Chrysanthemum leucanthemum</i> or <i>Leucanthemum vulgare</i> , page 10
	Prickly lettuce, <i>Lactuca serriola</i> , page 6
	Prostrate knotweed, <i>Polygonum aviculare</i> , page 3
	Prostrate spurge, <i>Chamaesyce maculate</i> , page 4
	Purple loosestrife, <i>Lythrum salicaria</i> , page 11
	Quackgrass, <i>Elytrigia repens</i> , page 11
	Redroot pigweed, <i>Amaranthus retroflexus</i> , page 4
	Russian knapweed, <i>Centaurea maculosa</i> , page 11
	Russian olive, <i>Elaeagnus angustifolia</i> , page 12
	Scentless chamomile, <i>Matricaria perforata</i> , page 4
	Shepherd's purse, <i>Capsella bursa-pastoris</i> , page 5
	Spotted knapweed, <i>Centaurea maculosa</i> , page 7
	Tamarisk, <i>Tamarix ramosissima</i> , page 13
	White clover, <i>Trifolium repens</i> , page 12
	Wild violet, <i>Viola spp.</i> , page 12
	Yellow sweet clover, <i>Melilotus officinalis</i> , page 6
	Yellow toadflax, <i>Linaria vulgaris</i> , page 12

Summer Annuals

Common Mallow, *Malva neglecta*

- Most frequent in cultivated ground, gardens, newly seeded lawns, or stressed lawns that lack density; found at 4,500 to 7,000 feet in elevation
- Prostrate, low-spreading annual, biennial, or perennial; deep taproot; foliage similar to geranium, pinkish-white flowers, fruits look like small round wheels of cheese
- Increase turf density
- Pull plants from moist soil
- Pre-emergent herbicides are effective
- Post-emergent herbicides can be effective

Common Purslane, *Portulaca oleracea*

- Summer annual, found in newly seeded or thinning, non-vigorous lawns and also in cultivated garden sites; up to 8,500 feet in elevation
- Smooth, thick, succulent, alternate (to sub-opposite) edible leaves; small yellow flowers in leaf axils; stems are smooth and reddish; plant is sprawling, prostrate, forming dense vegetative mats from shallow fibrous root system
- Increase turf density
- Pulls easily when soil is moist; easily re-roots after cultivation—remove and dispose of plant
- Pre-emergent herbicides may be helpful
- Post-emergent herbicide use is more effective when plants are young; difficult to kill with an herbicide when larger

Crabgrass, *Digitaria sanguinalis*

- Low-growing, prostrate, summer annual grass; leaf blades wider and lighter green color than Kentucky bluegrass with leaf sheaths with long stiff hairs
- Base of stems are often reddish-purple in color; plant spreads by rooting at the lower stem nodes as well as by seed; forms seedheads below mowing height; seedheads are composed of slender, finger-like spikes
- Crabgrass is less prevalent when turf has good density; mowing too low promotes crabgrass seed germination; maintain mowing height at 2.5 to 3 inches.
- A pre-emergent herbicide applied correctly and at the proper time should provide control; do not use a pre-emergent herbicide on a newly-seeded or sodded lawn or when overseeding a lawn
- Post-emergent “crabgrass killer” sprays are not effective unless crabgrass plants are at the young seedling stage

Green Foxtail, *Setaria viridis*

- A summer annual grass with wider blades and a lighter green color than Kentucky bluegrass
- Faster growing than Kentucky bluegrass; seedheads (known as spikes) have bristles that give it a fuzzy appearance; may form a seedhead despite regular mowing
- Foxtail is much less prevalent when turf has good density; resod or reseed bare spots

- A pre-emergent herbicide applied correctly and at the proper time should provide control; do not use a pre-emergent herbicide on a newly-seeded or sodded lawn or when overseeding a lawn
- Post-emergent herbicides will kill foxtail seedlings (but not mature plants)

Kochia, *Kochia scoparia*

- Very prevalent in disturbed soils, cultivated fields, gardens
- In spring, seedlings have alternate leaves; lower leaves often wider than upper leaves; underside of leaves hairy, margins hairy
- Flowers are yellow, inconspicuous; seed production occurs from July to October
- Stems are 1 to 6 feet tall
- In fall, entire plant first becomes reddish-brown, then brown, becomes “tumbleweed”
- Germinates early; use pre-emergent herbicides before soil temps reach 38°F
- Post-emergent herbicides can be effective
- Mulch inhibits seedling development

Netseed Lambsquarters, *Chenopodium berlandieri*

- Summer annuals prevalent in disturbed soils, gardens, cultivated fields, waste areas
- Extremely variable in appearance; stems 1 to 6 feet tall, grooved, often reddish tinged; undersides of leaves whitish, mealy (mottled, granular appearance)
- Flowers inconspicuous, greenish, at tips of stems and leaf axils; seed production occurs from July to September
- Edible when plant is young and tender
- Competitive weed with rapid growth and high water use
- Can be hoed or pulled when young
- Pre-emergent herbicides applied at the right time in spring can provide good control
- Post-emergent herbicides can be effective
- Mulch inhibits seedling development

Prostrate Knotweed, *Polygonum aviculare*

- Prostrate summer annual from a thin taproot; tough, durable plant common along sidewalks, in turf that is stressed and less vigorous, and in gardens; found to 9,500 feet in elevation
- Thrives in dry, compacted soils or wherever there is excessive foot traffic
- Forms a tough, wiry mat of stems that are enlarged at each joint as well as a papery sheath at each leaf node; to differentiate from spurge, broken stem does not produce a milky sap; leaves and stems are not hairy, and leaves are alternate
- Flowers small, white, inconspicuous; found where leaf meets stem; produces many seeds
- Annual core aeration spring and/or fall will reduce knotweed infestation
- Apply pre-emergent herbicides in late fall/winter (knotweed can germinate in February or March)
- Post-emergent herbicides are mostly ineffective after plants become larger

Prostrate Spurge, *Chamaesyce maculate*

- Prostrate summer annual forming dense mats; found in thinning, less vigorous turf
- Leaves are opposite and each leaf has a reddish-purple spot in the center; small pinkish flowers in leaf axils; stems and leaves are both hairy; sap is milky latex; some people develop a rash after skin contact with sap
- Increase turf density
- Plants can be pulled and bagged if soil is moist; wear gloves because of the sap
- Post-emergent herbicides can be effective

Redroot Pigweed, *Amaranthus retroflexus*

- Coarse, summer annual; fast growing to 12 to 36 or more inches tall; dependent on moisture received
- Alternate leaves vary in appearance, but have prominent veins and midrib
- Lower stem reddish or red-striped; roots pink-red even down the taproot
- Flowers/seedheads at top of plant; prickly; produces many small black seeds
- Very toxic to cattle and swine
- Found in waste areas, gardens, disturbed soils, and in turf if thin and patchy in quality
- Hoe or pull from moist soil before seedheads mature; bag plants if pulled later
- Easy to kill with most herbicides, but apply according to label directions well before seedheads mature; herbicides suggested only where large numbers of plants exist or where large areas are infested

Scentless chamomile, *Matricaria perforata*

- Noxious weed in Colorado List B
- Annual forb that can persist as a biennial or shortlived perennial
- Stems of the plant are green, erect, often branched, glabrous, or slightly pubescent, and can range in height from 6 to 20 inches tall
- Leaves are alternate, 1 to 2 inches long, slightly pubescent or glabrous, and are finely divided into several short thread-like segments
- Terminal flowers are 0.75 to 1.25 inch in diameter, with a daisy-like appearance consisting of white petals surrounding a central yellow core
- Key to control is reducing seed production; hand pulling is effective, but may not be practical in larger patches; mowing conducted early in the growing season before plants flower and prior to seed production will reduce populations
- Maintaining healthy stands of desirable vegetation can also be an effective control measure because scentless chamomile seedlings cannot tolerate intense competition
- Post-emergent herbicides can be effective

Winter Annuals

Downy Brome/Cheat Grass, *Bromus tectorum*

- Noxious weed in Colorado (List C)
- Winter annual, extremely abundant in intermountain west; after maturity can become a fire hazard, especially when dry; found at 4,000 to 9,000 feet in elevation
- Leaf sheaths and blades are covered by dense soft hairs

- Droopy seedheads develop in spring; long awns; prolific seed producer; plants turn reddish brown in early summer (mid to late June), and then fade to a blond color
- Competes vigorously with other perennial grasses for moisture because of its winter and early spring growth habit; root growth during winter can occur until soil temperature goes below 37°F
- Hand-pulling effective for small infestations—repeat pulling over the season is necessary, as seeds will germinate irregularly; extract as much root as possible to prevent re-growth
- Infrequent in mowed turf; in the landscape, glyphosate (Round-up and others) works well in early spring prior to seedhead appearance; best when non-target species are dormant

Shepherd's Purse, *Capsella bursa-pastoris*

- Small winter annual with small white flowers early in spring; common in cultivated gardens and roadsides; common up to 9,000 feet in elevation
- Slender stems from basal rosettes; leaves are hairy below, smooth above, and often deeply lobed; seed pods are heart-shaped (or purse-shaped); seed production from April to September
- Hand-pulling or hoeing before seed set is very effective—get on it early!
- Post-emergent herbicides should be labeled for use in turf grass

Biennials

Dame's Rocket, *Hesperis matronalis*

- Noxious weed in Colorado (List B)
- Can be a short-lived perennial
- Was introduced as an ornamental
- Flowers have four petals, are purple or white, clustered in loose stalks, and fragrant
- Mature plants range from 1 to 3 feet tall
- Can be aggressive in the landscape
- Pulling or cutting flower heads before seed set will control the plant, but this will need to be repeated for several years to exhaust seed bank
- For larger infestations, post-emergent herbicides can be effective
- Do not buy seed mixes that contain this plant

Diffuse Knapweed, *Centaurea diffusa*

- Noxious weed in Colorado (List B)
- A biennial, short-lived perennial, or occasionally an annual
- The plant develops a single shoot (stem), 1 to 2 feet tall that is branched toward the top; first year rosette leaves and lower shoot leaves are finely divided; leaves become smaller toward the top of the shoot and have smooth margins
- Many solitary flowering heads occur on shoot tips; they are about one-eighth inch in diameter and 0.5 to 0.66 inch long; flowers usually are white but may be purplish; involucre bracts are divided like teeth on a comb and tipped with a slender spine that makes them sharp to the touch; sometimes the bracts are dark-tipped or spotted like spotted knapweed; the long terminal spine differentiates diffuse from spotted knapweed
- It reproduces and spreads from seed—keep from going to seed; hoeing or hand pulling before the plant goes to seed can accomplish this
- For larger areas, post-emergent herbicides can be effective

- Cultural controls include revegetating with desirable grasses
- Biological controls include the seedhead flies *Urophora affinis* and *U. quadrifasciata* and root-feeding insects such as the diffuse knapweed root beetle (*Sphenoptera jugoslavica*), the yellow-winged knapweed moth (*Agapeta zoegana*), and the knapweed root weevil (*Cyphocleonus achates*)

Musk Thistle, *Carduus nutans*

- Noxious weed in Colorado (List B)
- Musk thistle is a biennial or winter annual that can grow up to 8 feet tall
- Leaves are up to 10 inches long, dark green with a light green midrib, spiny, and deeply lobed; often have a white margin
- Solitary, lightly spiny, and nodding flower heads develop at the stem tips in midsummer and grow to a diameter of 1.5 to 3 inches and are deep rose to violet
- The key to control is not to let the plant go to seed; herbicides and hand pulling the rosette are both effective
- Applications should be made in late spring/early summer and again in the fall

Prickly Lettuce, *Lactuca serriola*

- Biennial or winter annual to 48 inches tall from a large taproot; invades disturbed garden soils
- Cut stems/leaves exude a “milky juice”; more common in areas from 4,500 to 6,000 feet
- Upper leaves lobed like oak leaves and are often twisted to lie in a vertical plane, also known as “compassplant” because leaves may “point” to north and south; lower leaves often not as lobed; leaves have prominent spines on back side of midrib
- Small yellow daisy-like flowers on elongated stems; seedheads are like those of dandelion
- Hoe or pull from moist soil before yellow flowers mature
- Easy to kill with most herbicides, especially when younger; apply according to label directions well before seedheads mature; herbicides suggested only where large numbers of plants exist or where large areas are infested

Yellow Sweet Clover, *Melilotus officinalis*

- Biennial herbaceous plants; second year plants grow 3 to 5 feet high and are bush-like; sweet clovers are very fragrant
- Leaves are alternate, divided into three finely toothed leaflets; middle leaflet grows on a short stalk
- Flowers are crowded densely at the top 4 inches along a central stem; each flower is attached by a minute stalk
- There are one or two hard small seeds per flower; they stay viable in the soil for 30 years
- Strong taproot
- Can be good forage; however, moldy hay made from yellow sweet clover (or hay made from drought stressed or frost-damaged plants) is toxic to livestock (contains coumarin which converts to dicoumarin, a blood thinner)
- The key to controlling sweet clovers is to keep them from flowering and then concentrate on depleting viable seeds in the soil
- Hoe, hand pull, or spray with post-emergent herbicide when young

Simple Perennials

Curly Dock, *Rumex crispus*

- Leaves emerge from stout taproot in spring
- Elongated leaves have wavy (curly) margins.; leaves mostly basal, with long petioles
- Stems 2 to 4 feet tall, reddish, ridged; nodes sheathed with clear membrane
- Flowers greenish, May
- Winged fruits on flowering stems, reddish-brown
- Habitat—Fields, roadsides, railroads, waste ground, disturbed sites, turf/landscape
- Dig taproot, must remove at least 75% of the taproot to control
- Post-emergent herbicides can be effective

Myrtle Spurge, *Euphorbia myrsinites*

- Noxious weed in Colorado (List A)
- Mat-forming perennial to 9 inches tall
- Escaped ornamental; formerly sold as a drought-tolerant ground cover
- Blue-green succulent leaves form a “donkey tail”; has chartreuse bracts (“flowers”)
- For small infestations, dig or pull out clumps with caution; white latex sap from stems and leaves can cause severe dermal reactions—always wear gloves if hand pulling
- For larger infestations, use an herbicide; the best time to treat myrtle spurge with herbicide is during late fall
- *Eradication of all plants is required throughout Colorado.* If you see it, contact your county weed supervisor or the state weed coordinator!

Spotted Knapweed, *Centaurea maculosa*

- Noxious weed in Colorado (List B)
- A short-lived, noncreeping perennial that reproduces from seed (primary means of spread)
- Produces one or more shoots that are branched and 1 to 3 feet tall; rosette leaves can be 6 inches long and deeply lobed
- Leaves are similar to diffuse knapweed
- Lavender to purple flowers are solitary on shoot tips and about the same size as diffuse knapweed flowers; involucre bracts are stiff and black-tipped; the tip and upper bract margin have a soft, spine-like fringe and the center spine is shorter than others
- For control measures, see diffuse knapweed

Creeping Perennials

Bouncingbet, *Saponaria officinalis*

- Noxious weed in Colorado (List B)
- An escaped ornamental, aggressive in landscapes and wild areas
- Spreads aggressively through rhizomes and seeds
- White to pink five-petaled flowers are clustered at the ends of branches
- Leaves are opposite, smooth, and have three veins from base
- Mature plants are up to 3 feet tall

- Saponins in plant are toxic to livestock
- Can be controlled by mowing or pulling several times a year—before seed production
- Post emergent herbicides can be effective

Canada Thistle, *Cirsium arvense*

- Noxious weed in Colorado (List B)
- Colony-forming creeping perennial spreading primarily by horizontal roots (can grow as much as 18 feet in one season!) and to a lesser degree by seed; found from 4,000 to 9,500 feet in elevation
- Flowers are purple and are borne in clusters; spiny foliage with variable leaf shapes; when mowed in a lawn, will not develop full height and flower
- Highly invasive species; control is difficult because of its extensive root system; pulling generally is not effective due to the tremendous reserves in the root system; *regular, persistent* pulling may gradually starve root system; shoots should be pulled as they are noticed, as all shoots (leaves) are producing food reserves
- Increase density and competitiveness of turf
- Post-emergent herbicides can be effective
- Vinegar is a contact herbicide and will only brown leaves; these will be replaced by new shoots; frequent applications may be effective
- Biocontrol insects include a seed head weevil, a stem-mining weevil, and a gall-forming fly; these may not be significantly effective alone but can provide good results when combined with other control methods; biocontrol insect releases are best suited to large acreage infestations; backyard releases are generally impractical

Common Tansy, *Tanacetum vulgare*

- Noxious weed in Colorado (List B)
- Introduced from Europe as an ornamental and medicinal herb
- Found in yards, along roadsides, stream banks, and in waste places
- Spreads by rhizomes, can reach 3 to 4 feet tall
- Flowers are button-shaped and yellow in flat-topped clusters
- Leaves are deeply divided into narrow leaflets and rank smelling
- Is toxic to livestock, although unpalatable
- Mowing before seed production can limit spread, although it may have to be repeated several times in a season to prevent regrowth from rootstocks
- Hand pulling in damp soil can remove small infestations; wear gloves; will readily regrow from fragments in soils
- For larger infestations, post-emergent herbicides can be effective

Creeping Woodsorrel/Oxalis, *Oxalis corniculata*

- Prostrate, creeping perennial from slender taproot; stems root where they touch the ground
- Leaves have a shamrock appearance; plants often mistaken for a clover; leaves may “fold up” at night or on cloudy days; leaves turn purplish with the arrival of cooler weather in fall; some plants may have purplish leaves year-round
- Small yellow flowers
- Fruits “explode” when mature, scattering seed often more than 10 feet
- More common in thin, less vigorous turf given too frequent, light irrigation; increase turf density
- Pre-emergent herbicides may be helpful

- Post emergent herbicides can be effective

Field Bindweed, *Convolvulus arvensis*

- Noxious weed in Colorado (List C)
- Creeping perennial; found as high as 10,000 feet in elevation; general range 4,000 to 8,000 feet
- Vining, sprawling, prostrate growth habit; may climb by twining around fence wire or around stems of other plants; not shade tolerant but drought tolerant due to large roots; leaves are arrowhead-shaped; attractive, white or pink bell-shaped flowers that resemble morning glory from late June until frost
- Increase density and competitiveness of turf
- Control is difficult because of its extensive root system, which can penetrate the soil profile to a depth of 20 feet; seeds also can remain viable for 20 to 50 years; pulling generally is not effective due to the tremendous reserves in the root system; *regular, persistent* pulling may gradually starve root system; shoots should be pulled as they are noticed, as all shoots (leaves) produce food reserves
- Post-emergent herbicides can be effective
- The bindweed mite has been used as a biological control with some success; initial impact is reduction of growth and limited flower and seed production; mowing moves mites around and stimulates plant growth for mites to feed on; survival is better in drier settings; excessive moisture may limit establishment; contact your local Colorado State University Extension office for information

Hoary Cress (White Top), *Cardaria draba*

- Noxious weed in Colorado (List B)
- A creeping perennial that reproduces by seed and creeping roots; one of the earliest perennial weeds to emerge in the spring
- It grows erect from 10 to 18 inches high and has a white color
- The alternate leaves clasp the stem and are oval or oblong with toothed or almost smooth margins; the leaves are often covered with very fine white hairs; each leaf is 0.5 to 2 inches long with blunt ends
- The flowers are white, one-eighth inch across, and numerous in compact flat-top clusters, which give the plant its name; each heart-shaped seed pod contains two oval, finely pitted, red-brown seeds each about one-twelfth inch long
- Due to the rhizomes of this perennial weed, mechanical control provides minimal control; diligent digging can provide control of very small infestations; hand pulling of above-ground plant parts is ineffective; successful digging requires complete plant removal within 10 days after weed emergence throughout the growing season for 2 to 4 years; cultivation 6 inches deep must be repeated within 10 days of weed emergence throughout the growing season for 2 to 4 years
- Revegetate with desirable vegetation
- Post-emergent herbicides can be effective

Leafy Spurge, *Euphorbia esula*

- Noxious weed in Colorado (List B)
- An erect plant that grows 1 to 3 feet tall
- Leaves are bluish-green with smooth margins, 0.25 inch to 0.5 inch wide, and 1 inch to 4 inches long
- Umbel flowers are surrounded by heart-shaped, showy, yellow-green bracts (an umbel looks like the stays of an umbrella if it is held upside down); flowers occur in many clusters toward the top of the plant; seeds are round to oblong, about one-twelfth inch long, gray or mottled brown with a dark line on one side
- Leafy spurge contains a white milky latex in all plant parts; latex distinguishes leafy spurge from some other weeds (e.g., yellow toadflax), particularly when plants are in a vegetative growth stage
- Leafy spurge has an extensive root system that is abundant in the top foot of soil, and it may grow 15 feet deep or more; roots contain substantial nutrient reserves that allow the weed to recover from stress, including control efforts; many vegetative buds along roots grow into new shoots
- Use a combination of methods to control leafy spurge; vigorous grass helps weaken leafy spurge through competition
- Post-emergent herbicides can be effective

Orange Hawkweed, *Hieracium aurantiacum*

- Noxious weed in Colorado (List A)
- Shallow, fibrous roots
- Leaves are hairy, spatula shaped, up to 5 inches long, and basal
- Extensive stolons create a dense mat that practically eliminates other vegetation—makes mechanical control very difficult once established
- Stems and leaves exude a milky latex when cut or broken
- Up to 30 half-inch red to orange flowers appear in late May or June
- Post-emergent herbicides can be effective
- *Eradication of all plants is required throughout Colorado. If you see it, contact your county weed supervisor or the state weed coordinator!*

Oxeye Daisy, *Chrysanthemum leucanthemum* or *Leucanthemum vulgare*

- Noxious weed in Colorado (List B)
- A perennial from rhizomes with characteristic “daisy-like” flowers
- Plants initially develop as a basal rosette; lower rosette leaves occur on petioles and are from 1.5 to 6 inches long; leaves are lobed
- Flowers are white with a yellow center and range from 1.25 to 2 inches
- Oxeye daisy should be mowed as soon as flowers appear to reduce seed production; root systems are shallow and the plant can be dug up and removed; hand removal will have to be continued for several years because seeds may remain viable in the soil for a long time
- Post-emergent herbicides can be effective
- Native daisies are a good, non-invasive garden alternative

Purple Loosestrife, *Lythrum salicaria*

- Noxious weed in Colorado (List A)
- Escaped ornamental, aggressive in riparian areas
- Square stem, whorled leaves
- Purple-magenta flowers with five to seven petals in long racemes
- If left unchecked, a wetland may become a monoculture of loosestrife
- Control of small infestations can be managed through digging all the plants and roots—this will need to be monitored for a few years
- Large infestations should be controlled with an aquatic-labeled herbicide
- *Eradication of all plants is required throughout Colorado.* If you see it, contact your county weed supervisor or the state weed coordinator!

Quackgrass, *Elytrigia repens*

- Noxious weed in Colorado (List B)
- Very aggressive creeping perennial grass especially in moist soils; found from 4,500 to 9,000 feet in elevation; spreads by seeds and invasive rhizomes (underground stems)
- Rhizomes are yellow-white, with brown sections; rhizome ends are sharp-pointed and can penetrate hard soils; base of leaf blade with claw-like appendage that clasps the stem
- Believed to be allelopathic (release of a chemical that inhibits growth of nearby plants)
- Mechanical control is difficult as any rhizome segment produces new plants
- A few quackgrass plants can be spot-sprayed with glyphosate, or individual blades can be painted with glyphosate; note that glyphosate will kill any bluegrass it contacts; repeat applications will likely be needed
- Renovate severely infested lawn areas—spray area with glyphosate; repeat applications will likely be needed; ensure that quackgrass is killed before areas are resodded or reseeded

Russian Knapweed, *Centaurea maculosa*

- Noxious weed in Colorado (List B)
- Creeping perennial that reproduces from seed and vegetative root buds
- Emerges in early spring, bolts in May to June, and flowers through the summer into fall
- Shoots or stems are erect, 18 to 36 inches tall, with many branches; lower leaves are 2 to 4 inches long and deeply lobed; upper leaves are smaller, generally with smooth margins, but can be slightly lobed; shoots and leaves are covered with dense gray hairs
- The solitary, urn-shaped flower heads occur on shoot tips and generally are 0.25 to 0.5 inch in diameter with smooth papery bracts; flowers can be pink, lavender, or white
- Has vertical and horizontal roots that have a brown to black, scaly appearance, especially apparent near the crown
- Toxic to horses; allelopathic to other plants
- The key to Russian knapweed control is to stress the weed and cause it to expend nutrient stores in its root system
- An herbicide alone will usually not effectively manage Russian knapweed; combine treatment with perennial grasses sown in late fall; tillage is necessary to overcome the residual allelopathic effects of Russian knapweed

White Clover, *Trifolium repens*

- Creeping perennial that forms runners that root at nodes

- Many people like clover in lawns, while others find white flowers and the bees they attract objectionable
- A legume that fixes nitrogen, so it is often found in lawns having low fertility
- Increase turf density with proper watering, mowing, and fertilization
- Post-emergent herbicides can be effective

Wild Violet, *Viola* spp.

- Heart-shaped leaves on long petioles, purple flowers in spring; may also spread by rhizomes
- Difficult to control due to resistance to many herbicides
- Improve light penetration to shaded areas by pruning trees and shrubs
- Mow lawn higher to increase competition from grass
- Best control may be to pull plants when ground is moist
- Post-emergent herbicides can be effective

Yellow Toadflax, *Linaria vulgaris*

- Noxious weed in Colorado (List B)
- Yellow toadflax is a perennial that spreads sideways by underground rhizomes and by seeds
- Flowers are small, yellow, look like snapdragons, and bloom mid-late summer; leaves are linear
- Some people confuse a native plant, golden banner, with toadflax, but golden banner blooms very early and has three leaves, like a clover
- Yellow toadflax is difficult to control; its extensive root system lets it recover from control attempts
- Yellow toadflax is very variable, genetically; therefore the effectiveness of herbicides is also variable
- Hand pulling can be effective on small patches, especially in gravelly soils when you can pull a large part of the root; it will need to be pulled for several years; pull *before* it goes to seed
- Post-emergent herbicides can be effective

Woody Plants

Russian Olive, *Elaeagnus angustifolia*

- Noxious weed in Colorado (List B)
- Small tree 10 to 25 feet tall originally planted as an ornamental and for windbreaks
- Leaves are narrow and appear silvery
- Branches have long thorns 1 to 2 inches in length
- Small sweet smelling yellow flowers are followed by a berry-like fruit which is spread by birds
- Has become a serious weed in low-lying pastures, meadows, and waterways
- The most effective control is to cut the tree and immediately paint the stump with a herbicide
- Silver buffalo berry is an excellent native alternative plant

Tamarisk, *Tamarix ramosissima*

- Noxious weed in Colorado (List B)
- Tamarisk was sold as an ornamental plant for gardens during the 1800 and 1900s; tamarisk has now spread to most of the western United States, displacing the native cottonwoods and other plants
- Plants can grow to 6 inches tall during the first 2 months and can grow over 18 feet tall; the taproot can reach 100 feet down with a root spread of up to 150 feet; adventitious roots can produce new trees when buried!
- Mature tamarisk trees can produce millions of pollen-size seeds dispersed through wind and water; seeds can germinate while floating and establish themselves on wet banks within 2 weeks; newly formed sand banks are particularly susceptible; trees may reproduce in the first year, but typically they reproduce during the second year
- It is very “thirsty”—one tree can use up to 300 gallons per day, and it alters hydrologic conditions in riparian areas
- Salt glands on the leaves release salt, increasing salinity of soil
- Tamarisk is difficult to control; single treatment approaches to control tamarisk have not proven feasible because no method completely eliminates tamarisk or its regeneration; use revegetation in conjunction with other methods
- The saltcedar leaf beetle, *Diorhabda elongaa*, has been released on some stands, and has shown to be fairly effective

Authors: Irene Shonle, Ph.D. with Kurt Jones and Tony Koski, Ph.D., CSU Extension

- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
- Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.
- No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.
- Copyright. Colorado State University Extension. All Rights Reserved. *CMG GardenNotes* may be reproduced, without change or additions, for nonprofit educational use with attribution.

Revised December 2011



MASTER GARDENER

COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #353

Weed Associations with Specific Environments and Cultural Conditions

Compacted Soils

annual bluegrass (*Poa annua*)
common chickweed (*Stellaria media*)
goosegrass (*Eleusine indica*)
knotweed (*Polygonum aviculare*)
mouse-ear chickweed (*Cerastium vulgatum*)
prostrate spurge (*Euphorbia supina*)

Dry Soil

black medic (*Medicago lupulina*)
dandelion (*Taraxacum officinale*)
bindweed (*Convolvulus spp.*)
kochia (*Kochia scoparia*)
stinkgrass (*Eragrostis cilianensis*)

Dry, Infertile Soils

black medic (*Medicago lupulina*)
yarrow (*Achillea millefolium*)

Moist or Poorly Drained Soils

annual bluegrass (*Poa annua*)
bentgrasses (*Agrostis spp.*)
common chickweed (*Stellaria media*)
crabgrasses (*Digitaria spp.*)
goosegrass (*Eleusine indica*)
ground ivy (*Glechoma hederacea*)
mouse-ear chickweed (*Cerastium vulgatum*)
violets (*Viola spp.*)
yellow nutsedge (*Cyperus esculentus*)

Moist, Fertile Soils

annual bluegrass (*Poa annua*)
curled dock (*Rumex crispus*)
henbit (*Lamium amplexicaule*)
yellow woodsorrel (*Oxalis stricta*)

Moist, Infertile (Low N) Soils

black medic (*Medicago lupulina*)
plantains (*Plantago spp.*)
white clover (*Trifolium repens*)

Low Mowing Height

annual bluegrass (*Poa annua*)
crabgrasses (*Digitaria spp.*)
yellow woodsorrel (*Oxalis stricta*)
white clover (*Trifolium repens*)

New Seedlings (Spring/Summer)

annual bluegrass (*Poa annua*)
barnyardgrass (*Echinochloa crusgalli*)
crabgrasses (*Digitaria spp.*)
purslane (*Portulaca oleracea*)
foxtail (*Setaria spp.*)

New Seedlings (Fall)

henbit (*Lamium amplexicaule*)
storksbill (*Erodium cicutarium*)
shepardspurse (*Capsella bursa-pastoris*)
annual mustards (many)

Old Lawns (25-30+ years)

bentgrasses, redtop (*Agrostis spp.*)
orchardgrass (*Dactylis glomerata*)

Shady Lawns

annual bluegrass (*Poa annua*)
common chickweed (*Stellaria media*)
ground ivy (*Glechoma hederacea*)
mouse-ear chickweed (*Cerastium vulgatum*)
nimblewill (*Muhlenbergia shreberi*)
violets (*Viola spp.*)

Formerly Agricultural/Farm Land

barnyardgrass (*Echinochloa crusgalli*)
bindweed (*Convolvulus spp.*)
Canada thistle (*Cirsium arvense*)
foxtail (*Setaria spp.*)
quackgrass (*Elytrigia repens*)
smooth brome grass (*Bromus inermis*)

Author: Dr. Tony Koski, Extension Turf Specialist, Department of Horticulture & LA, Colorado State University

- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
- Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.
- No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.
- Copyright. Colorado State University Extension. All Rights Reserved. *CMG GardenNotes* may be reproduced, without change or additions, for nonprofit educational use with attribution.

Revised November 2007

Useful Weed ID Books, Keys, and Apps for Use in Colorado

Keys (online, web-based)

University of Missouri Weed ID

- Web-based key: <https://weedid.missouri.edu/>
- Apps (free) also available for iPhone/iPad and Android devices
- 400+ weeds in database
- Agriculture orientation, but works for landscape weeds and turf/weedy grass ID

Virginia Tech Weed Identification

- Web-based: <https://weedid.cals.vt.edu/>
- 740+ weeds in database

Apps

PlantNet Plant Identification

- plantnet.project.org
- Choose “USA” or “Canada” for location (but many international regions can also be selected)
- Take a photo, or load an existing photo that you’ve taken (and is stored on your phone), of a weed
- Works very well for dicot weeds (especially when flowering), but also does well with grasses
- Free

LeafSnap

- Image matching app (take a photo with your phone, or load an existing image)
- Works very well for dicot weeds (especially with flowers); does fairly well with grasses
- Free (but premium version available for purchase)

ID Weeds

- This is the University of Missouri phone/tablet app
- A true key (not image-matching)
- Over 400 weeds
- Agricultural orientation, but can work well for urban landscape plants
- Dicot and grassy weeds; also sedges and rushes
- Useful for turfgrass and weedy grass ID
- Free

iNaturalist

- Search in iTunes or Google Play stores for “iNaturalist”
- Image-recognition; take a photo or load an existing one stored on your device
- Not as intuitive as LeafSnap or PlantNet (click on “What did you see?” under your pic)
- Works very well for dicot weeds, with or without flowers; works well on grassy weeds
- Free

Montana Grasses

- A guide to over 200 native and introduced grasses commonly found in the Rocky Mountain region
- For both Android and IOS devices
- Cost is \$4.99

Idaho Grasses

- Field guide to 60 grasses (range, native) found in Idaho and the Rocky Mountain region
- For both Android and IOS devices
- Cost is \$7.99

Colorado Wildflowers Guide

- More than 500 common flowering plants found in Colorado
- DOESN'T have many/most plants considered to be weeds in Colorado lawns and gardens
- Search by flower color, bloom time, or location
- Can also search using photo recognition
- For both Android and IOS devices
- FREE
- Web site has search capacity (no photo recognition) <http://www.easterncoloradowildflowers.com/>

Books

Wildflower identification books can be useful; they won't be listed here. The following are weed ID books.

Weeds of California and other Western States (2007)

- Very useful for most of the western and midwestern U.S.
- 2 volumes; 1,760 pages total (comes with a CD of all weed photos)
- ISBN-13: 978-1-879906-69-3
- Has a dichotomous key
- Both volumes together cost \$65 (new); <https://anrcatalog.ucanr.edu/Details.aspx?itemNo=3488>

Weeds of the Northeast (1997)

- Very useful for east and northeast (west to Wisconsin – so complements Weeds of California)
- 408 pages; has a dichotomous key
- ISBN-13: 978-0801483349
- \$30 (new) <https://www.amazon.com/Weeds-Northeast-Richard-H-Uva/dp/0801483344/>

Identifying Turf and Weedy Grasses of the Northern United States (2005)

- Useful for ID of turfgrasses and weedy grass of northern, midwestern, northeast, eastern, and western U.S. lawns (not useful for southeastern U.S. or Hawaii)
- Has a dichotomous key
- 64 pages; from University of Illinois Extension

Cost new is \$11.75 with shipping; <https://pubsplus.illinois.edu/product/commercial-horticulture/identifying-turf-and-weedy-grasses-of-the-northern-united-states>

Weed Management in the Home Lawn

Dr. Tony Koski, Extension Turf Specialist



Weeds occur in every lawn, but they seldom become problems in well-managed, vigorously growing turfgrass. Proper site preparation and turfgrass selection before planting are essential to give a new lawn a healthy start. Once a lawn is established, poor maintenance practices that weaken it - such as improper irrigation, fertilization, or mowing - are the primary factors likely to predispose it to weed invasion. Activities that lead to compaction also contribute significantly to turfgrass stress, making it easier for weeds to invade.

An integrated weed management program can reduce most weed populations to tolerable levels and prevent large, unsightly weed patches. Total eradication of weeds is not a realistic or necessary goal for most lawns. With proper maintenance a lawn can be practically free of weeds without the extensive use of chemicals.

WEED IDENTIFICATION

Identifying weeds and knowing their life cycles are essential to management. Three general categories of weeds may be found in lawns: broadleaves, grasses, and sedges. Take care to distinguish annual weedy grasses (crabgrass, foxtail, barnyardgrass) from similar-looking perennial weedy grasses (quackgrass, brome grass, bermudagrass) because the approaches to their management (both cultural and if using herbicides) are often quite different. Broadleaf weeds can be annual (purslane, spurge) or perennial in their growth habits, which might require a different approach to their management (type and timing of herbicide applications, for example).

The life cycle of weeds may be annual, biennial, or perennial. Annual weeds are commonly identified as either winter (cool-season) or summer (warm-season) annuals and survive only one season. If not controlled before they flower, they can produce seed that will sprout the following year or sometimes in the same growing season. In mild climates or in lawns that are influenced by microclimates, cool-season annuals may be found growing in summer or year-round (chickweed, for example). Perennial weeds survive for many years, and though they produce seeds, most survive and reproduce vegetatively by creeping stems (stolons and rhizomes), tubers, or roots. Perennial weeds are the most difficult to control once established because they often have deep, extensive root and rhizome systems that store energy - enabling them to re-grow if pulled or treated with herbicides.

WEED MANAGEMENT IN ESTABLISHED LAWNS

Weeds often invade turfgrass that is over- or under-watered, improperly fertilized, mowed incorrectly, or highly compacted. Lawns that have been weakened by plant diseases or insect pests are also likely to become weedy because there is more open space for a weed to establish. Many weed problems can be prevented with proper lawn maintenance - or good maintenance can prevent the problem weed(s) from becoming worse. The most troublesome weed species that invade turfgrass are often associated with specific conditions (compaction, low fertility, too dry, too wet, shady, salty, etc.). Identifying the weed species present may give an indication of the underlying problem responsible for the occurrence of the problematic weeds.

Irrigation

Many lawns are watered incorrectly. Poor irrigation practices can weaken turfgrass, allowing weeds to invade. To maintain a healthy lawn, uniform water coverage is needed. Sprinkler heads that are broken, obstructed, or set too low or too high may not reach all areas of the lawn and can result in dry or dead spots in an otherwise healthy turfgrass.

In general, deep, infrequent irrigation will encourage healthier root growth, dense turf, and can reduce weed seed germination. Light, frequent watering is only required when the turfgrass has just been planted and the root system is developing. Watering established turfgrass lightly and frequently creates a shallow-rooted lawn, making it less durable and allowing shallow-rooted weeds such as crabgrass grow more easily – even if a preemergence herbicide is used. Allowing the soil surface to partially dry out between watering events can be useful for reducing weed pressure.

Mowing

Mowing some grasses too short and/or not frequently enough can weaken the turf and increase the potential for weed invasion. In general, bluegrass, ryegrass, fescue and buffalograss lawns should be mowed at a height of 2.5 to 4 inches. Mow grasses more frequently when they are actively growing. A standard guide is to remove no more than 1/3 of the leaf blade at each mowing. If too much is removed at one time, it can take some time for the grass to recover, giving weeds a chance to invade.

Fertilizing

Most bluegrass and tall fescue lawns need to be fertilized 2-4 times a year while they are actively growing, with no more than 1 pound of actual nitrogen per 1,000 square feet per application. Lawns that are older 10+ years or older require less fertilizer (1-2 times yearly) than newer lawns. Recycling grass clippings into the lawn when mowing can also reduce the need for fertilizer application significantly.

Thatch and Compaction Management

Regular thatch and compaction management will help keep your turfgrass healthy, easier to water and fertilize, and more competitive against weeds. Thatch is a layer of organic matter (stems, stolons, roots) that develops between the turfgrass blades and the soil surface on some lawns (bluegrass especially). A thin layer of thatch (1/2 inch is OK) is normal and even beneficial; it can help provide wear/traffic tolerance if you have dogs and/or children that play in the lawn. Some people prefer to use a thatching machine (aka “power-rake”) to remove thatch, while others use core cultivation (aka “aeration”) to manage thatch. The advantage to using aeration is that you will also help reduce soil compaction – which is sometimes a contributing factor towards excessive thatch accumulation (roots don’t grow deeply into soil that is too compacted and/or wet). Lawns on heavy clay soils or lawns with heavy foot or equipment traffic may need to be aerated twice yearly (spring and fall) while lawns with little activity may only need to be aerated once a year or less. Aerate when the turfgrass is actively growing, in the spring or fall (avoid the hottest months of summer). Power-raking is best done in the spring before the grass begins active growth – allowing time for it to regrow in the spring and early summer.

Herbicides for Broadleaf Weeds

The easiest weeds to control in grass lawns are YOUNG (small) annual broadleaf and grassy weeds, like crabgrass, foxtail, spurge and purslane. Generally these herbicides are postemergence, systemic herbicides containing combinations of two or three active ingredients, such as dicamba, mecoprop, or 2,4-D, and are very effective in controlling numerous broadleaf weeds without damaging the grass. Triclopyr is also an effective broadleaf herbicide that is found in products for more difficult-to-control weeds. Newer herbicides carfentrazone, sulfentrazone, and quinclorac also have broadleaf weed activity and are often formulated with the other broadleaf herbicides to increase the speed or spectrum of weed control (and they may provide control of some grassy weeds and sedges). If crabgrass or other annual grassy weeds are present, it’s essential the quinclorac be listed on the herbicide label.

Broadleaf herbicides are also effective against perennial broadleaf weeds, although more than one application may be necessary. Be aware that many postemergence broadleaf herbicides are prone to drift in the air and may contact desirable plants, especially when applications are made in windy conditions or when temperatures exceed 80-85 F. Also be aware that certain broadleaf herbicides, such as dicamba and triclopyr, can be absorbed by tree roots growing in lawns and may cause tree injury if applied too many times during the growing season (more than twice) or at excessively high rates. Always consult the herbicide label for recommended rate usage and application frequency to avoid injury to non-target landscape plants.

Herbicides for Grass Weeds

Annual grasses such as crabgrass, foxtail, and barnyardgrass can be effectively controlled in established lawns with preemergence herbicides such as benefin, bensulide, dithiopyr, pendimethalin, and prodiamine. The key to success for all preemergence herbicides is to apply the herbicide 2 to 4 weeks prior to weed germination. Pre-emergence herbicides must be thoroughly watered into the lawn as soon as possible after application, and cultural practices that encourage annual grassy weeds must be modified to favor the turfgrass (most importantly, mow at 2.5-4 inches). Be aware that overseeding or reseeding lawns may not be possible for several weeks or months after applying a preemergence herbicide. It is more difficult to control annual weedy grasses growing in established lawns with postemergence herbicides. Products containing quinclorac are available to control crabgrass, foxtails, and barnyardgrass infestation.

Herbicides for Newly Seeded Lawns

Special care should be taken when applying herbicides on newly seeded lawns because of the sensitivity of seedling plants. Among the preemergence herbicides, only mesotrione can be used on newly seeded or established cool-season turfgrass for control of broadleaf seedlings and warm-season grassy weeds such as crabgrass, foxtails, and barnyardgrass. Mesotrione is combined with a starter fertilizer to be used at planting and is available to home gardeners as Scotts Turf Builder Starter Food For New Grass Plus Weed Preventer. Postemergence herbicides selective for broadleaf weeds can be used once the turfgrass has produced several tillers and has been mowed two or three times.

Weed and Feed Products

Some fertilizer products contain either preemergence or postemergence herbicides (or both) for weed control (usually crabgrass prevention or broadleaf weed control). Use these combination products only when the lawn has a known weed problem and not every time you fertilize. Be sure the active ingredient in the product is one that will control the weed species causing your problems and also that the timing of the application is right. There is no point in applying preemergence herbicides after the majority of target weeds have emerged. Weed and feed products for existing weeds (dandelion, clover, thistle, etc) must be applied to wet grass and weeds; follow all label instructions in order to get good weed control and to avoid turf injury.

Corn Gluten Meal for Organic Weed Control

This is a waste product left over from the processing of corn and is often marketed for weed control. It has high nitrogen content (9-10 percent nitrogen by weight) and makes for a good organic nitrogen fertilizer. Research conducted at a number of universities across the U.S. suggests that the use of corn gluten meal as an organic weed control product provides little to no reliable control of crabgrass and other weeds. However, corn gluten meal may help in weed management because its fertilizer effect makes the turfgrass more competitive against weed invasion. Corn gluten meal has no effect on already emerged weeds.

Herbicide Success Tips

Lawn and garden companies market their own brand names of herbicides. These trade names are so numerous and change so often that they cannot all be listed in this publication. Shop for herbicides by looking for the common name or active ingredient that appears on the label in small print under the title “Ingredients.” Unlike brand names, common names for active ingredients do not change from company to company. Different products will vary in the percentages of active ingredients they contain. Some products are formulated as ready-to-use to allow for the convenience of no mixing, others as granules, and many others as higher-concentration liquid sprays that require mixing with water.

Follow all label directions carefully and only apply herbicides at the time of year and at the rates recommended. Be sure the herbicide is effective against the weed you are trying to control and that it is recommended for your type of lawn. Improper use could injure or kill desirable turfgrass or other plants in the landscape.

Remember that many broadleaf weed herbicides are prone to drift, volatilization (forming a gas at temperatures greater than 80 F), or can be injurious to shallow tree and shrub roots growing in the lawn. Do not apply herbicides under hot, dry, or windy conditions as they could injure turfgrass or nearby ornamentals.

Selective Preemergence Herbicides (*Herbicides applied before weeds emerge*)

Common Name	Sample trade name(s)	Comments
benefin + trifluralin	Team 2G	Controls grasses and some broadleaves; has extended grass control; has some turfgrass species restrictions
dithiopyr	Crabgrass & weed preventer (many brands – often combined with fertilizer)	Controls many grasses and broadleaves (e.g., oxalis, spurge); (has postemergence activity on young crabgrass); safe for most turfgrass species
isoxaben	Bayer Season Long Weed Control for Lawns; Gallery	Controls broadleaves (e.g., oxalis, spurge) and has very minimal activity on grasses; has some turfgrass species restrictions
mesotrione	Scotts Turf Builder Starter Food for New Grass Plus Weed Preventer; also Tenacity	Controls grass weeds and yellow nutsedge in newly seeded lawns; several turfgrass species restrictions
pendimethalin	Scotts Halts Crabgrass Preventer	Controls grasses (very effective on crabgrass) and some broadleaves; has some turfgrass species restrictions; often included with fertilizers
prodiamine	Sta-Green Crab-ExPlus with Lawn Fertilizer	Controls grasses (very effective on annual bluegrass and crabgrass) and some broadleaves (spurge)

Selective Postemergence Herbicides (*Herbicides applied after weeds emerge*)

Common Name	Sample trade name(s)	Comments
Mixtures of 2,4-D, dicamba, and mecoprop (MCP)	Trimec Lawn Weed Killer Spectracide Weed Stop Ortho Weed B Gon Weed Killer for Lawns products	Many brand names and formulations available; combines 3 active ingredients and controls most broadleaves (weak on oxalis); dicamba products may harm ornamentals if roots are in lawn or drift occurs
mixtures of 2,4-D, 2,4-DP, dicamba, MCP, carfentrazone, quinclorac	Bayer All in One Weed & Crabgrass Killer Gordon's Speed-Zone Lawn Weed Killer Monterey Crab-E-Rad Plus Ortho Weed B Gon Weed Killer products Spectracide Weed Stop for Lawns plus Crabgrass Killer	Many brand names and formulations available; combines 2-4 active ingredients and controls most broadleaves and some weedy grasses; dicamba products may harm ornamentals if roots are in lawn or drift occurs
Mixture of 2,4-D, dicamba, MCP, sulfentrazone, quinclorac	Roundup for Lawns	Very broad spectrum weed control: broadleaf weeds, annual grassy weeds, yellow nutsedge.
halosulfuron	Sedgehammer, Monterey Nutgrass Killer II	Effective on sedges
mesotrione	Tenacity	Safe for use on both seedling and established turf. Do not use on bermudagrass or fine fescue lawns unless damage can be tolerated. Provides good control of annual grassy weeds (crabgrass, foxtail, barnyardgrass) and some perennial grassy weeds (bentgrass, windmillgrass, nimblewill).
quinclorac	available combined with other broadleaf weed herbicides Drive XLR8, Quinclorac	Selectively removes some weedy grasses and broadleaves from many established turfgrasses; some turfgrass species restrictions. Will control fountaingrass in cool-season lawns.
sulfentrazone	Ortho Nutsedge Killer for Lawns	Effective on yellow and purple nutsedge, green kylinga, and several hard to control broadleaves such as curly dock, knotweed, plantain, spurge, wild garlic, wild onion, woodsorrel (oxalis)
triclopyr	Monterey Turflon Ester Turflon	Controls broadleaves (especially clover, oxalis) and suppresses bermudagrass in cool-season lawns; not for use on warm-season turfgrass species
triclopyr + MCPA + dicamba	Monterey Spurge Power Ortho Weed B Gon Weed Killer for Lawns products	Controls a broader spectrum of broadleaves (e.g., spurge, wild violet, dandelion); not for use on warm-season turfgrass species

Inclusion of product names does not imply any endorsement or that the products will work effectively, nor does exclusion of any product names imply criticism of the product. Please contact author with corrections, or to have additional products added to these lists.

Tony Koski tony.koski@colostate.edu

Draft version 2
May 2019

Indicator Weeds

Compacted Soils

annual bluegrass (*Poa annua*)
common chickweed (*Stellaria media*)
goosegrass (*Eleusine indica*)
knotweed (*Polygonum aviculare*)
mouse-ear chickweed (*Cerastium vulgatum*)
prostrate spurge (*Euphorbia supina*)

Dry Soil

black medic (*Medicago lupulina*)
dandelion (*Taraxacum officinale*)
bindweed (*Convolvulus spp.*)
kochia (*Kochia scoparia*)
stinkgrass (*Eragrostis cilianensis*)

Dry, Infertile Soils

black medic (*Medicago lupulina*)
yarrow (*Achillea millefolium*)

Moist or Poorly Drained Soils

annual bluegrass (*Poa annua*)
roughstalk bluegrass (*Poa trivialis*)
barnyardgrass (*Echinochloa crusgalli*)
bentgrasses (*Agrostis spp.*)
common chickweed (*Stellaria media*)
crabgrasses (*Digitaria spp.*)
ground ivy (*Glechoma hederacea*)
mouse-ear chickweed (*Cerastium vulgatum*)
violets (*Viola spp.*)
yellow nutsedge (*Cyperus esculentus*)

Moist, Fertile Soils

annual bluegrass (*Poa annua*)
curled dock (*Rumex crispus*)
henbit (*Lamium amplexicaule*)
yellow woodsorrel (*Oxalis stricta*)

Moist, Infertile (Low N) Soils

black medic (*Medicago lupulina*)
plantains (*Plantago spp.*)
white clover (*Trifolium repens*)

Low Mowing Height

annual bluegrass (*Poa annua*)
crabgrasses (*Digitaria spp.*)
yellow woodsorrel (*Oxalis stricta*)
white clover (*Trifolium repens*)

New Seedlings (Spring/Summer)

annual bluegrass (*Poa annua*)
barnyardgrass (*Echinochloa crusgalli*)
crabgrasses (*Digitaria spp.*)
purslane (*Portulaca oleracea*)
foxtail (*Setaria spp.*)

New Lawn Seedlings (Fall; winter annuals)

henbit (*Lamium amplexicaule*)
storksbill, red-stem filaree (*Erodium cicutarium*)
shepardspurge (*Capsella bursa-pastoris*)
annual mustards (many)

Old Lawns (25-30+ years)

Bentgrasses, redtop (*Agrostis spp.*)
Orchardgrass (*Dactylis glomerata*)

Shady Lawns

annual bluegrass (*Poa annua*)
roughstalk bluegrass (*Poa trivialis*)
bentgrasses (*Agrostis spp.*)
common chickweed (*Stellaria media*)
ground ivy (*Glechoma hederacea*)
mouse-ear chickweed (*Cerastium vulgatum*)
nimblewill (*Muhlenbergia shreberi*)
violets (*Viola spp.*)

Formerly Agricultural/Farm Land

barnyardgrass (*Echinochloa crusgalli*)
bindweed (*Convolvulus spp.*)
Canada thistle (*Cirsium arvense*)
foxtail (*Setaria spp.*)
quackgrass (*Elytrigia repens*)
smooth brome grass (*Bromus inermis*)



Vegetable Garden Weed Management

Tony Koski, Extension Turf Specialist

Weeds compete with vegetables for light, water and nutrients, can interfere with harvesting and may increase the potential for vegetable disease problems. Complete elimination of weeds in the vegetable garden is neither realistic nor necessary. Effective weed management can employ several strategies, depending on weed species involved and personal preferences regarding use of pesticides and other weed management tools.

Understand the Sources of Weeds

- Weed seed exists in all garden soils
- Manure, compost, and other soil amendments often contain weed seed
- Imported topsoil will always contain weed seed (no matter claims to the contrary), and may contain rhizomes, bulbs and other plant parts that may grow into a weed
- Plant-based mulch materials (straw, hay, grass clippings) may contain weed seed
- Weed seed can be moved into gardens by wind, water, humans or animals
- Weeds may move from other areas of your landscape, adjacent fields, neighboring landscapes by above- (stolons, runners) or below-ground (rhizomes) laterally growing stems
- It is impossible to prevent or eliminate weeds – but persistent, proper management can result in a nearly weed-free vegetable garden
- Soil disturbance (tilling, digging, hoeing, pulling weeds, foot traffic) encourages weed seed germination

Preventing Weed Growth

Weed prevention is always preferable to (and easier than) having to manage weeds after they have begun growing. Prevention involves a combination of practices – cultural and chemical (optional) – which create conditions unfavorable for weed growth.

Cultivation Practices

- Soil disturbance encourages weed seed germination by exposing buried seed to light – a stimulus for seed germination (buried seeds don't germinate)
- Consider preparing soil (tillage, amendment incorporation) for planting 3-4 weeks prior to planting and control emerging weeds ("fallowing")
 - As weeds emerge, but prior to planting, cultivate **SHALLOWLY** to kill seedling weeds
 - Kill emerging weed seedlings with synthetic or "natural" herbicides (see below)
 - Kill emerging weed seedlings by flaming (see below)
- If herbicides or flaming aren't options, mulch immediately following tillage
- If soil doesn't require amendment prior to planting, consider use of a broadfork to loosen soil (this reduces weed seed movement to the surface of the soil)



Plant Spacing

- Use recommended plant spacing to create competition for weeds
- Consider the use of block planting to increase competition against weeds
- The critical weed-free period for most warm-season vegetables is about 45 days after planting, after which time plant canopy will be big enough to shade the weeds and inhibit their growth. Thus, early-season weed control is critical
- Squash, corn, potatoes, cabbage, broccoli, tomatoes are strong competitors against weeds
- Lettuce, carrots, peppers, onions, peas, radish are poor competitors against weeds



Mulch

- Will smother existing weeds and/or prevent germination of weed seeds
- Grass clippings are ideal mulch for vegetable gardens
- Hay and straw can be effective mulch, but may introduce weed seeds to the garden
- Wood chips and sawdust should be used sparingly; their decomposition can increase the need for nitrogen
- Newspaper and cardboard can be used between rows (must be weighed down)
- Plastic mulch can be used to increase soil temperature for warm-season crops
- All mulches will reduce water loss and irrigation needs (especially plastic mulch)

Irrigation Practices

- Overhead sprinkler irrigation, which also applies water to soil where plants are not growing, will encourage weed growth
- Drip irrigation wets a lesser amount of soil and encourages less weed growth
- When drip irrigation and mulch are used together, weed problems in the vegetable garden are significantly reduced
- Use of drip irrigation will reduce the potential for disease occurrence and spreading of disease pathogen by splashing
- Drip irrigation will produce equivalent yields but uses less water than overhead irrigation





Thermal Weeding (flaming, steam, boiling water)

- Used on fallowed seedbeds before vegetable seedlings emerge
- Can be used between rows after vegetable emergence
- Burning and/or fire hazard is an obvious concern
- Most effective on seedling broadleaf weeds; less effective on grasses and sedges
- Not effective on perennial weeds unless repeated

Solarization

- Soil is covered with clear plastic (gets hotter than black plastic) for 4-6 weeks to kill weeds, weed seeds, and some plant pathogens
- Can be very effective if done during warmest time of the year
- Garden can't be used during solarization process
- Any subsequent tillage will bring weed seeds to surface (only seeds in surface 2-3 inches will be killed)



Herbicides for Use in Vegetable Gardens

Synthetic

- Glyphosate (Roundup, Kleenup, many other names)
 - Non-selective; postemergence
 - Systemic; good for perennial weed control
 - No root activity; no soil residual
 - No activity on seeds
- Trifluralin (Preen)
 - Preemergence
 - Kills germinating seeds
 - Will not control weeds you can see
 - Short residual (6-8 weeks)
 - Soil disturbance will reduce effectiveness

"Natural"/Organic

- Corn gluten meal (CGM)
 - VERY limited preemergence activity – if any
 - Short residual (4-6 weeks), if any
 - Contain 10% nitrogen
 - Rates and application frequency recommended for weed control may encourage excessive vegetable growth
- Soaps, essential oils, acetic acid, iron sulfate
 - Non-selective (can damage desirable plants)
 - Disrupt leaf cuticle; burns leaves
 - Not systemic; full coverage of weed is essential
 - Most effective on seedlings; **PERENNIALS WILL GROW BACK**
 - Must be reapplied for control of larger/perennial weeds



Managing Difficult Perennial Weeds in the Home Landscape



The four most difficult weeds encountered in the home landscape – lawns, vegetable gardens, flower and shrub beds – include four perennial weeds: bindweed, Canada thistle, quackgrass and bermudagrass. Though these are very different species, they behave similarly as weeds in the landscape. All are non-native, deep-rooted perennials that spread by underground rhizomes (bermudagrass also spreads above-ground by stolons or runners). While all can produce seed, the main way that they spread in the landscape is by their laterally growing stems. They all can survive – and even thrive – without any supplemental irrigation and will persist through the longest and most severe droughts because all four produce extremely deep roots (as deep as 6 feet or more). **The key to eradicating these perennial weeds is to interrupt/prevent photosynthesis and depleting stored energy by forcing the plant to continuously produce new shoots, leaves, and roots.** By reducing the plant's ability to re-supply underground energy reserves via photosynthesis, it uses up energy by constantly re-growing new leaves, stems, and roots.

MULCHING prevents photosynthesis and forces the plant to use energy to push leaves and stems through the mulch layer

- Deeper mulch (3-6 inches) is more effective
- Sheet mulching (using newspaper or cardboard) under a layer of soil or other mulch can be very effective – but weeds will grow laterally and emerge at the borders of the sheet mulched area
- Pull/cut plant tops (or spray with appropriate herbicide) as soon as they grow through the mulch
- Persistent, diligent removal of new growth that emerges through and at the borders of the mulch will result in successful control – but this may take years (especially if herbicides are not used)

CULTIVATION (plowing, tillage, hoeing, pulling) can be effective if performed diligently and persistently through consecutive growing seasons

- Will be more effective if done in conjunction with herbicides
- Cultivation will disturb the weed seed bank and may lead to other weed problems

SOLARIZATION can be an effective tool for managing these perennial weeds

- Subsequent tillage of a solarized area may result in germination of buried, unkilld seeds
- Weeds can still infest the solarized area from its borders

BIOCONTROLS

- Biocontrols never result in total eradication of the weed; rate of weed population reduction can be slow
- There are no biocontrols for quackgrass or bermudagrass
- Bindweed mite (*Aceria malherbae*) can be effective where bindweed receives no irrigation
- For more information on using bindweed mites go to:
http://www.colostate.edu/Dept/CoopExt/Adams/weed/bindweed_mite.html



HERBICIDES can be effective when used with the above management tools

- Glyphosate (Roundup, Kleenup, many other product names) is the only synthetic POSTEMERGENT herbicide that can legally be applied to vegetable gardens by the home gardener for control of these perennial weeds
- Glyphosate can provide excellent perennial weed control when used with mulching and cultivation practices
- Corn gluten meal will be ineffective for managing perennial weeds, and may increase their aggressiveness because nitrogen in CGM may stimulate weed growth
- Use of acetic acid/vinegar and other “natural”/organic weed control products will only be effective if used repeatedly and in conjunction with other management tools described above

Natural Herbicides for Landscape Weed Management

*Tony Koski, Extension Turf Specialist
Colorado State University*

Increasing demand for alternatives to traditional, synthetic weed control products like glyphosate and 2,4-D has resulted in the development and sales of many “natural” or “organic” products for controlling lawn, garden and landscape weeds. Relatively little research has been conducted to evaluate their efficacy (compared to traditional herbicides), and how these new herbicide alternatives can be used most effectively. More and more shelf space is being dedicated by retailers to herbicides that are considered by some to be less-toxic alternatives.

The alternative weed-control products contain oils (clove oil, eugenol, and d-limonene), soaps (pelargonic acid), acids (acetic, citric) or iron compounds (chelates). All of them function in essentially the same way: they destroy the leaf cuticle and the integrity of leaf cells, causing cell leakage that can lead to rapid leaf death. These are often referred to as “burn-down” herbicides. While very fast-acting (symptoms often appear within a few hours of application), effectiveness is dependent on good coverage. All of these are contact herbicides that kill only green parts of the plant they contact. The lack of systemic activity limits their effectiveness for the control of weeds having extensive root systems or underground storage structures such as rhizomes, tubers, or bulbs; perennial broadleaf and grassy weeds like thistle, bindweed, quackgrass, and bermudagrass are not controlled easily using these products. These herbicides work most effectively on small weeds (seedlings) and annuals that haven’t grown too large.

Users of these alternative herbicides should also be aware of the fact that many of these products have the potential to cause skin irritation, and eye or lung problems if not used with caution. Minimally, eye protection and gloves should be worn when using these natural herbicides, even if they are listed as exempt products. Horticultural vinegar (20% acetic acid) products can be quite hazardous to handle.

Effectiveness of the alternative, contact herbicides can be increased by:

- ensuring good spray coverage
- applying in warm/hot weather (at least 75° to 80°F), and with minimal cloud cover
- adding surfactants to improve coverage and to reduce “beading” of droplets on leaves
- treating when weeds are small/young
- repeating applications (especially important for larger and/or perennial weed²⁰)

Essential oil herbicides

WeedZap (45% clove oil + 45% cinnamon oil)

Bioganic Broadleaf Killer (2% clove and thyme oil; 1% sodium laurel sulfate; 10% acetic acid)

Burnout II (12% clove oil, 8% sodium laurel sulfate, vinegar, citric acid)

EcoSmart Weed and Grass Killer (sodium laurel sulfate and eugenol; 2-phenethyl propionate)

GreenMatch EX (50% lemon grass oil)

Repellex Weed-A-Tak (8% clove oil; 8% cinnamon oil; 4% citric acid)

Citrus oil-based herbicides

Avenger

GreenMatch (55% d-limonene)

Worry Free Weed and Grass Killer (70% citrus oil)

Acid-based herbicides

WeedPharm (20% acetic acid)

AllDown (23% acetic acid; 14% citric acid)

C-Cide (vitamin C-based product)

Natural Guard (citric acid and soybean oil)



The acetic acid concentration for herbicidal use should be about 10 to 20%. Household/culinary vinegar is about 5% acetic acid and isn't effective for controlling most weeds.

Fatty acid-based herbicides (aka herbicidal soaps)

Scythe

Safer Moss and Algae Killer

Safer Fast Acting Weed and Grass Killer

Monterey Herbicidal Soap

Natria Weed and Grass Killer

Iron HEDTA herbicides

Bayer Advanced Natria Lawn Weed Control 26.5% (concentrate)

Fiesta Turf Weed Killer 26.5% (concentrate)

Iron-X Selective Weed Killer for Lawns 26.5% (ready to use)

Ortho Elementals Lawn Weed Killer 1.5% (ready to use)

Whitney Farms Lawn Weed Killer 1.5% (ready to use)



Iron X!™ Selective Weed Killer for Lawns

- ✓ Fast and effective.
- ✓ No unpleasant odor.
- ✓ Works in cool weather down to 50°F.
- ✓ Can be used on new lawns after grass emergence.
- ✓ Can be used to spot treat problem areas.
- ✓ People and pets can enter treated area when spray dries.
- ✓ See results in hours.

Active Ingredient	By Wt.
Iron HEDTA (FeHEDTA)	26.52%
Other Ingredients	73.48%
Total	100.0%

KEEP OUT OF REACH OF
CHILDREN

CAUTION

EPA Registration No. 67702-26-56872
EPA Establishment 56872-OH-001

Inclusion of product names neither implies effectiveness, nor endorsement by the author or Colorado State University. Not all products described may be commercially available, and the active ingredient content may be changed by manufacturers. Read CAREFULLY and follow all label instructions whenever using any pesticides. 7/2015 ver 2