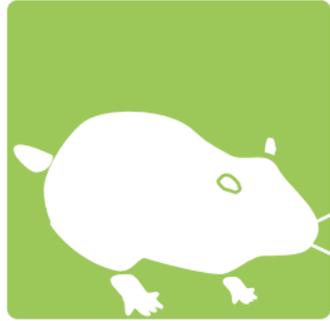


# Common Turfgrass Pests of Utah



# Common Turfgrass Pests of Utah

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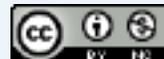
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## FOREWORD

This guide was developed to aid in the identification and management of common arthropods, diseases, vertebrate pests and weeds found in turf in Utah. It is not an exhaustive list of all turf pests in Utah.

After using this guide to identify a pest, verify the pest's identity using online resources or by contacting the Utah Plant Pest Diagnostic Lab.

- Phone: (435)-797-2435
- Email: [utahpestlab@gmail.com](mailto:utahpestlab@gmail.com)

Spreads in this guide include descriptions of:

- The pest, disease or weed identification.
- Signs and symptoms of turfgrass damage.
- Basic biology and life history of the pest, disease or weed.
- Integrated pest management recommendations.

### Pesticide Recommendations

Most of the pesticide recommendations in this guide are general and require additional product research by the user. Be aware that pesticide recommendations are subject to change at any time due to loss of registration, chemical or product discontinuation or changes in labeling. Consult the Utah Plant Pest Diagnostic Lab or your local Utah State University County Extension Office for current pesticide recommendations. By law, pesticide users are required to read and follow the pesticide product label.

# Abiotic Disorders

Turf can be adversely affected by both living (biotic) and non-living (abiotic) stressors. Biotic injury is a result of insect, mite, plant pathogen, animal, etc., activity. The primary focus of this guide is to identify biotic issues with turf. This section briefly covers some common abiotic disorders of turf in Utah.

Diagnosing abiotic disorders is difficult and requires knowledge of the turf species' susceptibility to pests and environmental conditions, turf and site history, past and current environmental and climatological conditions and human activities such as cultural and chemical management practices. Many abiotic disorders resemble those caused by biotic issues. Follow the general diagnostic steps below to determine if your turf is affected by a biotic or abiotic issue.

1. Properly identify the turf species involved.
2. Conduct a thorough inspection of the turf area.
3. Examine the soil profile and have a soil analysis conducted.
4. Identify and record symptoms.
5. Inspect the site and consider site history. Consider that abiotic issues may be a result of human, or other, activity occurring off-site (e.g., herbicide use by a neighbor).
6. Look for general patterns among affected plants at the plant and landscape level.
7. Determine the turf management history, including planting, cultural and chemical practices.
8. Compile information and make a diagnosis. A diagnosis may involve more than one abiotic issue, or a combination of abiotic and biotic causes.
9. Contact the Utah Plant Pest Diagnostic Lab or your local county extension agent or horticulture specialist for assistance diagnosing abiotic disorders.

The following section briefly discusses Utah's most common abiotic disorders of turf in Utah.

When diagnosing turf health issues, always consider the abiotic factors listed below as a possible cause for symptoms. Prolonged stress caused by abiotic disorders can lead to attack by a variety of pests, or turf dieback.

## Common Causes of Abiotic Disorders

- aspect (i.e., south and west sides receive more sun/heat)
- cold or hot temperature extremes
- construction
- dormancy (summer and winter)
- drought
- dull mower blades
- extreme soil temperatures (hot and cold)
- fertilizer burn
- herbicide drift
- improper turf selection for Utah or site
- improper planting or site preparation
- item damage (objects left on top of grass)
- layering (one type of soil laid on top of another)
- mechanical damage from lawn equipment, etc.
- misapplication of herbicides, or sterilants
- nutrient deficiency
- over/under application of fertilizers
- overwatering
- pet urine/feces
- restricted root zone (thick clay, layering, etc.)
- root competition from other plants/trees
- salt damage (deicing salt use or excessive fertilizer use)
- scalping
- site history (construction, etc.)
- soil compaction
- soil nutrient composition
- soil pH
- soil salinity
- soil texture
- sun/heat reflected off of glass or buildings
- sun/shade
- thatch
- underwatering
- water supply/composition

# Dormancy

## Description

Commonly used cool season turfgrasses in Utah respond to drought and excessive heat and cold by going dormant. Dormant lawns are not dead and will come out of dormancy with cooler temperatures and increased moisture. Dormancy is the grass's way of protecting itself against extreme temperatures and drought. If a lawn is watered regularly and it still goes dormant, it is likely due to excessive heat, not drought stress.

## Management

Select turfgrass species that are tolerant of Utah's temperature extremes and that have greater drought tolerance (see USU Extension publication "Turfgrass Cultivars for Utah" for more information). Follow recommended watering rates throughout the season to avoid drought stress. If grass goes dormant, apply about 1/2 inch of water every 2 weeks to prevent death to crowns and roots. Do not try to bring a lawn out of dormancy by overwatering. Mow grass between 2.5 and 3 inches and keep mower blades sharpened.



Lawn dormancy (Jake Debartolome, The University of Utah)



Lawn dormancy (Jake Debartolome, The University of Utah)

# Dull Mower Blades

## Description

Sharp mower blades cut through grass blades, while dull blades tear grass creating a shredded, ratty, brown appearance to the newly cut grass blades. Dull mower blades reduce turfgrass health by increasing water loss, healing time, stress, susceptibility to disease and decreasing photosynthesis and aesthetics.

## Management

Check mower blade wear on a weekly basis. Examine the tips of the turfgrass after mowing to look for a clean or a shredded/tattered cut. Sharpen dull blades as needed. For commercial lawncare professionals, blades should be sharpened every week to a month depending on mowing frequency. Homeowners should sharpen blades two or three times per season depending on blade damage and dullness.



Lawn damage from dull mower blades (Purdue Turf Tips, Purdue University Extension)



Lawn damage from dull mower blades (Jake Debartolome, The University of Utah)



Lawn damage from dull mower blades (Jake Debartolome, The University of Utah)

## Fertilizer Burn

### Description

Fertilizer misapplication can lead to striping or dead patches in the turf area. Fertilizer burn is more commonly associated with soluble nitrogen fertilizers with high salt indices, rather than slow-release formulations. Fertilizer burn occurs when fertilizer spreaders are incorrectly calibrated, when excessive application overlap occurs, or when the wrong amount of fertilizer is used or spilled leading to product over-application.

### Management

To avoid fertilizer burn, properly calibrate application equipment. Select fertilizers with a low salt index. If using quick-release fertilizers, use lower rates. For specific recommendations on fertilizing turf, see USU Extension publication "Lawn Fertilizers for Cool Season Turf." Fill application equipment on hard surfaces to prevent spills in the lawn. Sweep spilled nitrogen from hard surfaces to avoid runoff.



Fertilizer spill (Kelly Kopp, Utah State University Extension)



Fertilizer burn (Sten Porse, Wikimedia Commons)



Fertilizer misapplication (Glenn Hardebeck, Purdue University)

## Herbicide Damage

### Description

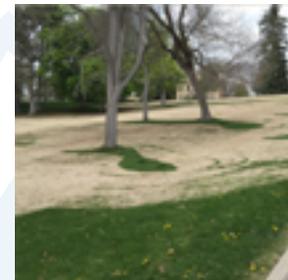
Herbicide injury to turf can be caused by the erroneous application or transfer of products on person or machine, herbicide residues in the soil, volatilization, application to cool season grasses during hot, dry weather, over-application, contamination of spray tanks from previous applications, and tank mix product incompatibilities. Symptoms often include turfgrass death, yellowing/browning, dead spots or patterns, curling leaves and stunted growth.

### Management

To avoid herbicide injury to turfgrass, select a product based on target weeds and carefully read and follow the product label. Calibrate application equipment. When adding herbicide to equipment, do not spill. Be careful not to walk or push/drive equipment through broad-spectrum herbicides and then walk on turfgrass areas. If using one spray tank for multiple uses, triple-rinse it prior to mixing herbicide. If mixing herbicides or herbicides and insecticides, check for incompatibilities prior to application.



Herbicide damage at the base of a tree (Joseph O'Brien, USDA Forest Service, Bugwood.org)



Herbicide damage (Paul Harris, Utah State University Extension)

## Improper Irrigation

### Description

Inadequate irrigation can lead to dormancy symptoms described in the Dormancy section on page 4. In Utah, frequent light, and frequent heavy irrigation are common. Light, frequent irrigation stimulates turf to grow shallow roots, and when combined with over-fertilization, can contribute to thatch development. Light, frequent irrigation can lead to increased susceptibility to hot, dry conditions. Over-irrigated turfgrass can suffer from a water-saturated root zone (particularly in heavy, clay or layered soils) that is deprived of oxygen. This can lead to turf stress, disease and dieback.

### Management

There are many resources available to assist Utahns with turfgrass irrigation. Use the USU Extension publication series, "Sprinkler Performance Testing," Utah Division of Water Resources Conservation Program web page "[conserwater.utah.gov/guide.html](http://conserwater.utah.gov/guide.html)," and a USU Extension water check through "[slowtheflow.org](http://slowtheflow.org)" to assist with turfgrass irrigation.



Under-irrigation resulting from an improperly designed irrigation system (Kelly Kopp, Utah State University Extension)



Under-irrigation (Kelly Kopp, Utah State University Extension)



Over-irrigation (Ryan Davis, Utah State University Extension)

## Layering/Compaction

### Description

Soil layers can have different textures which can impede water and root penetration, stressing turf leading to increased thatch buildup, root rot diseases, and turf death. Soil layering often occurs when new lawns are established from sod or seed. Improper site preparation of the existing soil can create layering when new soils or sod are simply laid on top of existing soil. Turf planted on top of deep organic (compost) materials can also create a layer that turf roots cannot grow through, leading to turf death. Compaction from foot or other traffic can also lead to hard soil layers that can negatively affect turf.

### Management

Determine the soil type and profile prior to planting grass seed. Amend soil as necessary to create a uniform soil profile prior to planting seed or laying sod. Deep-tine core aeration can help break up layers and increase penetration of water and gases into the root zone. When selecting sod, choose sod that was grown in soil that closely matches your existing soil and properly prepare the site.



Layering surface compaction (Kelly Kopp, Utah State University Extension)



Soil layers (Ryan Davis, Utah State University Extension)



Compacted soil in areas where lawn equipment frequently travels (Kevin Frank, Michigan State University)

## Pet Damage

### Description

Pets can damage turfgrass in a few ways. The most common pet damage occurs when dogs urinate in one spot, causing circular patches of dieback surrounded by lush green grass. Dilute urine or smaller amounts of urine can cause circular tufts of lush, green grass, especially in lawns that have not been fertilized. Persistent dog feces can smother small patches of turfgrass creating small, dead circles. Dogs that use the same area of the lawn frequently can compact soil and physically destroy turfgrass. Pet damage tends to be worse with larger animals.

### Management

Train pets to urinate and defecate in designated areas. Remove pet feces from turfgrass within a few days. Irrigate dead areas to leach urine salts prior to reseeding, or allow grass to naturally fill in. Fertilize two or three times per year to mask lush, green growth caused by urine and/or feces.



Widespread turf dieback from dog urine and feces (Karen Snover-Clift, Cornell University, Bugwood.org)



Concentrated turf dieback from dog urine (Fred Baker, Utah State University, Bugwood.org)



Dog urine spots (Ryan Davis, Utah State University Extension)

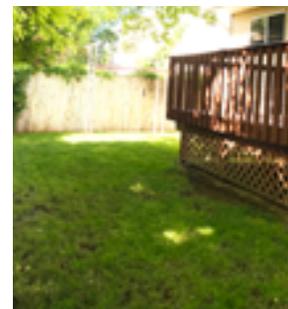
## Shade

### Description

Not all species of turfgrass perform well in shade. Light that passes through tree leaves is stripped of important wavelengths used by turfgrasses to produce energy needed for growth and health. Turfgrasses that are not adapted to shade eventually decline due to inadequate energy resources. In shaded areas, turfgrass may start to thin out and die back leaving exposed soil.

### Management

Select and plant turfgrass cultivars that are shade tolerant or plant a shade mix in shaded areas. Kentucky bluegrass is commonly used in turfgrass areas in Utah, but is only slightly tolerant of shade and may not survive in heavily shaded areas. Fine fescue is shade tolerant, but has a much thinner blade than Kentucky bluegrass. Turf type tall fescues have moderate shade tolerance and more closely resemble Kentucky bluegrass. More information on appropriate turf cultivars for Utah can be found in the USU Extension publication "Turfgrass Cultivars for Utah."



Shaded lawn damage (Jeff Catrina)



Thinning turf and exposed soil resulting from overshadowing (Jeff Catrina)



Thinning turf and exposed soil resulting from overshadowing (Jeff Catrina)

# Thatch

## Description

Thatch is living and dead turfgrass stems, stolons and rhizomes that occur just above the soil level. Thatch development can be caused by vigorously growing/high lignin-producing turf cultivars, over-fertilization, frequent and short-duration irrigation, compacted/layered soils, heavy, wet soils, or fungicides and insecticides that limit microorganism or earthworm function. Thatch over 1/2-inch in depth can be detrimental to a lawn, creating harborage for fungal pathogens and arthropods, reducing cold, heat, and drought tolerance and preventing penetration of pesticides and fertilizers.



Thatch (Ryan Davis, Utah State University Extension)



Thatch (Ryan Davis, Utah State University Extension)

## Management

To manage thatch, apply fertilizer based on turf needs, select low-thatch turf cultivars, promote deep rooting by watering deeply and infrequently, minimize the use of turf fungicides and insecticides, physically/mechanically remove thatch, top-dress turf with a compatible soil or organic material and core aerate in the fall or spring when grass is actively growing.

# Banks Grass Mite

*Oligonychus pratensis*

## Pest Description

- very tiny arachnids, less than 1/16 inch long, requiring a 10X lens to see the identifying features
- yellow to greenish tint with patchy black spots that cover the sides of the abdomen
- colonies often associated with webbing

## Host Plants, Diet & Damage

- specialist of grasses, including turfgrasses and corn
- mite feeding removes chlorophyll from cells leading to stippling (yellowish-brown spots on turf), silver discoloration and eventual turf desiccation
- webbing produced by mites may also be evident

## Biology, Life Cycle & Damaging Life Stage

- overwinter in soil, leaf litter and weeds as adults
- adults are active from late spring throughout the summer
- cream-colored, spherical eggs are laid in clusters on stems and leaves
- spider mites can have multiple, overlapping generations
- nymphs and adults are damaging

## IPM Recommendations

- Reduce drought-stressed plants with proper irrigation, since drought conditions favor spider mites.
- Manage grassy weed hosts.
- Avoid broad-spectrum pesticides that suppress beneficial mite predators.
- Management with pesticides can be difficult.
- Apply a pyrethroid (bifenthrin; lambda-cyhalothrin) to suppress banks grass mites.



Adult banks grass mite (F. C. Schweissing, Bugwood.org)



Adult banks grass mites (Whitney Cranshaw, Colorado State University, Bugwood.org)



Banks grass mite damage to turfgrass (Samuel Abbott, Utah State University)

# Billbugs

Sphenophorus spp.

## Pest Description

- bluegrass billbug, hunting billbug, Rocky Mountain billbug and Phoenix billbug
- adults: vary in size from the bluegrass billbug (3/16 – 1/4 inch) to the Rocky Mountain billbug (3/8 – 1/2 inch); brown, reddish brown, or black with a prominent snout
- larvae: legless and cream colored with a brown head

## Host Plants, Diet & Damage

- primarily cool season turf (Kentucky bluegrass, ryegrass, fescues, bentgrass)
- can affect warm-season turf (zoysiagrass, St. Augustinegrass)
- patchy brown turf which converges to larger patches

## Biology, Life Cycle & Damaging Life Stage

- overwinter as adults with some species also overwintering as late-stage larvae
- adults are active from spring through summer, depositing eggs into turf stems
- larval feeding occurs late spring into summer
- initial larval feeding occurs within the stem; later stages occur in the soil in the root zone
- pupate in soil and emerge as ground-dwelling adults
- typically one generation per year
- larvae are the damaging stage; adults have been shown to cause damage to turf in other regions of the U.S.

## IPM Recommendations

- Monitor adult activity with pitfall traps and larval presence by tugging on grass blades.
- Avoid drought-stressing turf, which favors billbug activity.
- Select resistant and endophyte-enhanced turf varieties.
- Apply a preventive insecticide (anthranilic diamide; neonicotinoid) to suppress populations in early spring.



Rocky Mountain billbug (left) and bluegrass billbug (right) (Joseph Berger, Bugwood.org)



Billbug life cycle (Samuel Abbott, Utah State University)



Left: Billbug damage to turfgrass (David Shetlar, The Ohio State University, Bugwood.org); Right: Linear pitfall trap used to monitor billbugs (Ricardo Ramirez, Utah State University Extension)

# Black Turfgrass Ataenius

Ataenius spp.

## Pest Description

- adults: small (3/16 inch long), black, shiny beetles
- larvae: tiny, c-shaped grubs; cream colored with a grayish rear end and brown head capsule; six thoracic legs
- larvae are tiny compared to other white grub species, about 1/4 inch long when mature

## Host Plants, Diet & Damage

- larvae feed on roots of turfgrasses including Kentucky bluegrass, annual bluegrass and bentgrass
- larval feeding leads to wilting and localized dry spots
- extensive damage is similar in appearance to larger white grub feeding

## Biology, Life Cycle & Damaging Life Stage

- adults overwinter in the soil and under leaf/wood debris
- adults are active early spring and deposit eggs into thatch and soil in early-summer
- larvae actively feed early to mid-summer
- second generation adults emerge mid- to late-summer
- up to two generations per year
- larvae are the damaging stage

## IPM Recommendations

- Maintain healthy plants with proper cultural practices.
- Monitor by sampling soil to search for larval stages.
- Apply a biopesticide that contains entomopathogenic nematodes or Beauveria fungal spores.
- Apply a preventive insecticide (anthranilic diamide; neonicotinoid).



Adult black turfgrass ataenius (Tom Murray, Bugguide.net)



Adult black turfgrass ataenius size comparison (Whitney Cranshaw, Colorado State University, Bugwood.org)



Black turfgrass ataenius larvae in soil (Whitney Cranshaw, Colorado State University, Bugwood.org)

# Chinch Bugs

Blissus spp.

## Pest Description

- adults: 1/10 inch long; black and white with fully developed, or reduced, wings that cross over the back
- nymphs: 1/64 inch long; bright red with a white band across the abdomen
- as nymphs mature, they are orange, brown, then black
- adults and nymphs have piercing-sucking mouthparts

## Host Plants, Diet & Damage

- feed on turfgrasses including Kentucky bluegrass, perennial ryegrass, fescues, bentgrass and zoysiagrass
- cause small to large patches of dead turf in mid- to late-summer; damage resembles drought stress

## Biology, Life Cycle & Damaging Life Stage

- overwinter as second generation adults in turf areas
- adults: active in spring and throughout summer
- insert eggs in turf crowns, behind leaf sheaths and in thatch
- second generation adults emerge early to mid-summer
- final generation of adults emerge in the fall
- can have two overlapping generations per year
- nymphs and adults are damaging

## IPM Recommendations

- Maintain healthy plants with proper cultural practices.
- Monitor using a flotation trap, where chinch bugs float from the turf in a pool of water created with a metal cylinder (metal can) pushed into the ground.
- Reduce drought-stressed plants with proper irrigation.
- Reduce heavy thatch.
- Consider planting endophyte-enhanced turfgrass.
- Apply a biopesticide containing entomopathogenic nematodes or Beauveria fungal spores to provide suppression.
- Apply an insecticide (neonicitinoid; pyrethroid).



Nymph and adult chinch bugs (Samuel Abbott, Utah State University)



Chinch bug damage to lawn (David Shetlar, The Ohio State University, Bugwood.org)



Chinch bug damage to lawn (David Shetlar, The Ohio State University, Bugwood.org)

# Crane Fly

*Tipula oleracea*

## Pest Description

- adults: ~ 1 inch long; grayish brown to tan; very long legs; resemble large mosquitoes
- larvae: 1 – 1 1/2 inches long; cylindrical, tapering toward the head; gray brown in color; legless with a hidden head and finger-like projections on the rear end; have a tough, leathery look to their “skin”

## Host Plants, Diet & Damage

- larvae feed on turfgrasses
- larval feeding appears as brown spots
- adult and larval emergence holes may be visible
- secondary damage can occur from birds and rodents digging up turf in search of larvae

## Biology, Life Cycle & Damaging Life Stage

- overwinter as larvae in the soil
- adults emerge from soil in early spring and late summer
- deposit eggs in turf over a 3 to 4-day period
- larvae primarily feed on turf roots and crowns during the spring and fall months
- on damp, warm nights, larvae feed on turf above ground
- there are two generations per year
- larvae are the damaging stage

## IPM Recommendations

- Monitor using a soapy-water flush and soil core sampling.
- Properly irrigate and fertilize.
- Provide adequate drainage and aeration to areas that are prone to standing water or heavy water saturation; chronically wet areas are predisposed to crane fly infestations.
- Apply a biopesticide containing entomopathogenic nematodes or *Beauveria* fungal spores to provide suppression.
- Apply an insecticide (pyrethroid) to provide suppression.



Adult marsh crane fly (Janco Tanis, Jancology.com, Bugwood.org)



Crane fly larvae (Brian McDonald, Oregon State University, Flickr.com)



Crane fly brown spotting damage and exit holes in turf (Adam Van Dyke, Professional Turfgrass Solutions LLC)

# Japanese Beetle

*Popillia japonica*

## Pest Description

- adults: 1/2 inch long; metallic green head and thorax; bronze wing covers; five white hair tufts along each side of the abdomen with an additional pair on the last segment
- larvae: 1/8 – 1 inch long; c-shaped; cream colored with a grayish rear end; yellow-brown head with three pairs of legs

## Host Plants, Diet & Damage

- more than 300 plant species of ornamentals, trees, shrubs, turfgrass and vegetables
- adults prefer leaves, flowers, fruit, and sometimes stems of rose, maple, elm, birch, linden, apple and stone fruits
- larvae prefer feeding on roots of turfgrasses, young ornamental trees and shrubs
- adults have chewing mouthparts, leaving skeletonized leaves, and chew holes in flower buds, fruits and stems
- larvae chew on roots, leaving turf yellow and brown

## Biology, Life Cycle & Damaging Life Stage

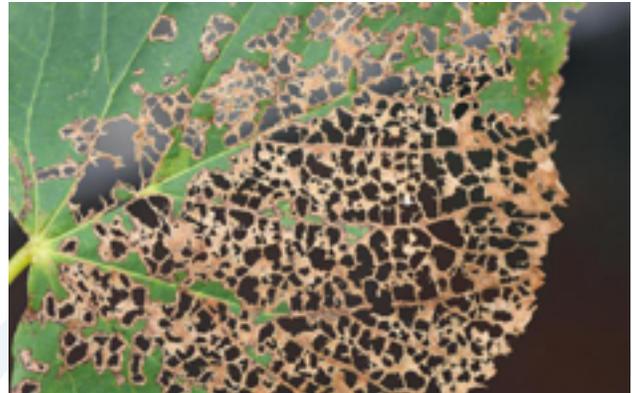
- overwinter as late-stage larvae in the soil
- pupate in the spring
- adults emerge late spring into summer
- females deposit eggs in soil around larval host plants
- one generation per year
- adult and larval stages are damaging

## IPM Recommendations

- Japanese beetles are invasive pests and are not established in Utah. Report sightings of this insect the Utah Plant Pest Diagnostic Lab or the Utah Department of Agriculture and Food.
- Maintain healthy plants through proper cultural practices.
- Apply a preventive insecticide (anthranilic diamide; neonicotinoid) to suppress populations.



Left: Adult Japanese beetle (David Cappaert, Bugwood.org); Right: Japanese beetle larva (USDA Agricultural Research Service, Bugwood.org)



Japanese beetle chewing damage to leaf (Steven Katovich, USDA Forest Service, Bugwood.org)



Japanese beetle larvae (white grub) damage to turf (M. G. Klein, USDA Agricultural Research Service, Bugwood.org)

# Leafhoppers

Draeculacephala spp.; Deltocephalus spp.

## Pest Description

- adults: 1/8 – 1/4 inch long; vary in color from whitish green, brown gray, to yellow; wings held tentlike over the back; one to two rows of spines on hind legs
- nymphs: smaller than adults, typically lime green in color; wings absent but wing buds present
- leafhoppers fly low over turf areas when disturbed by human or mechanical traffic

## Host Plants, Diet & Damage

- feed on turfgrasses
- feed on sap from leaf cells
- white to yellow stippling/flecking on leaves
- hopper burn: yellowing/bleaching dieback of turf
- rarely cause manageable damage

## Biology, Life Cycle & Damaging Life Stage

- overwinter as eggs inserted into plant tissue or as adults
- eggs hatch in spring and nymphs begin feeding
- overlapping life stages present during summer
- two or more generations per year
- nymphs and adults are the damaging stages

## IPM Recommendations

- Maintain healthy plants with proper cultural practices.
- Management or pesticide applications are not typically needed for leafhoppers in turfgrass even though leafhoppers may be noticeable.



Examples of leafhoppers. Top left: adult *Draeculacephala* leafhopper (Susan Ellis, Bugwood.org); Top right: Adult leafhopper (Jack Clark, UC Davis, Bugwood.org); Bottom left: Potato leafhopper nymph (Frank Peairs, Colorado State University, Bugwood.org)



*Deltocephalus* leafhopper adult (Charles Olsen, USDA APHIS PPO, Bugwood.org)



Examples of leafhopper damage on non-turfgrass plants. Top left: Leafhopper nymphs and damage (Whitney Cranshaw, Colorado State University, Bugwood.org); Top right: White apple leafhopper stippling (Whitney Cranshaw, Colorado State University, Bugwood.org); Bottom right: Western grape leafhopper damage (Eugene E. Nelson, Bugwood.org)



# May/June Beetles

Phyllophaga spp.

## Pest Description

- adults: 1/2 – 1 inch long and vary in color from light to dark brown to reddish brown
- larvae: 1/8 – 1 inch long; c-shaped; cream colored; grayish rear end; yellow-brown head with three pairs of legs

## Host Plants, Diet & Damage

- adults feed on foliage of broadleaf plants and conifers
- larvae feed on the roots of grasses, trees and shrubs
- larvae chew on roots, leaving turf yellow and brown
- severe root damage leaves turf with a spongy feel and turf that peels away easily from soil when tugged
- secondary damage can occur when animals, such as birds, dig up turf in search of white grubs
- adult damage is seen as holes in foliage

## Biology, Life Cycle & Damaging Life Stage

- overwinter as mid- to late-stage larvae in the soil or as newly emerged adults that remain in the soil until spring
- adults emerge late spring into summer to feed and mate, and deposit spherical, white eggs in the soil
- larvae initially feed on organic matter before feeding on roots; second year larvae cause most damage
- larvae move deeper in the soil in the fall to hibernate
- some species have a 2 to 3-year life cycle
- larval stages are damaging to turf

## IPM Recommendations

- Maintain healthy plants using proper cultural practices.
- Monitor by sampling soil to search for larval stages.
- Apply a biopesticide containing entomopathogenic nematodes or *Beauveria* fungal spores for suppression.
- Apply a preventive insecticide (neonicotinoid; anthranilic diamide) in spring.



Adult May/June beetles (Left: Emmy Engasser, Hawaiian Scarab ID, USDA APHIS ITP, Bugwood.org; Top right: David Stephens, Bugwood.org; Bottom right: Steven Katovich, USDA Forest Service, Bugwood.org)



May-June beetle larvae (white grubs) (Steven Katovich, USDA Forest Service, Bugwood.org)



Severe white grub feeding damage, causing turf to easily pull away (Ward Upham, Kansas State University, Bugwood.org)

# Sod Webworms/ Cranberry Girdler

*Crambus* spp., *Chrysoteuchia topiaria*

## Pest Description

- complex of multiple species of moths
- adults: 3/4 inch wingspan; snout protruding forward; forewings dull colored and striped with silver, gold, yellow, brown and black
- larvae: 3/4 – 1 inch; vary in color (beige, gray, brown or green); most are covered with dark spots and coarse hairs; typically associated with green frass and webbing

## Host Plants, Diet & Damage

- larvae feed on a number of grasses
- larvae clip grass blades at night just above the crown leaving areas of turf thinning
- subterranean sod webworm larvae, specifically, feed on crowns and roots causing similar damage as white grubs
- severe infestations can cause irregular turfgrass patches

## Biology, Life Cycle & Damaging Life Stage

- overwinter as larvae in silk-lined chambers in thatch
- larvae become active in spring
- one or two generations depending on species
- moths may emerge summer through fall
- subterranean sod webworms have one generation and moths emerge late spring to early summer
- female moths drop eggs over turfgrass in the evenings
- larvae are the damaging life stage

## IPM Recommendations

- Monitor larvae with a soapy-water flush, and adult flights just above the turfgrass in the evenings.
- Avoid drought-stressed turf and consider endophyte-enhanced turfgrass.
- Apply a biopesticide containing entomopathogenic nematodes or *Bacillus thuringiensis* to suppress populations.
- Apply a pesticide (carbamate; pyrethroid; organophosphate) when larvae are present.



Top left: Cranberry girdler; Top right: Lesser vagabond sod webworm; Bottom left: Western lawn moth (Andy Reago & Chrissy McClarren, Wikimedia Commons); Bottom right: Larger sod webworm (Jessica Louque, Smithers Viscient, Bugwood.org)



Top left: Cranberry girdler larva (Syngenta Turfgrass Encyclopedia); Bottom left: Common sod webworm larva (Samuel Abbott, Utah State University); Right: Sod webworm larva and fecal pellets (Ryan Davis, Utah State University Extension)



Sod webworm damage to turf (Steven Arthurs, University of Florida Institute of Food and Agricultural Sciences)

# Ascochyta Leaf Blight

*Ascochyta* sp.

## Hosts, Symptoms & Signs

- affects all species of grass
- leaves die back from the tip, resulting in brown patches of grass
- does not cause permanent damage
- symptoms can occur at any time but are more commonly seen during hot, dry weather
- top third of leaf blade dies back, and the area between diseased and healthy tissue is slightly constricted
- fruiting structures develop on dead grass blades

## Disease Cycle

- overwinters in plant debris and thatch
- spores are released from fruiting structures during wet weather and are dispersed by splashing water and lawn mowers
- infections occur on the newly cut end of the grass blade

## IPM Recommendations

- Reduce thatch with proper cultural practices.
- Improve water penetration by aerification.
- Maintain sharp mower blades to reduce wounding of grass; reduce mowing frequency during an outbreak.
- Implement a balanced fertilizer program; avoid excessive nitrogen, especially in the spring.
- Avoid drought stress as well as excessive irrigation.



Ascochyta leaf blight (Ned Tisserat, Colorado State University, Bugwood.org)



Ascochyta leaf blight symptom (Iowa State University Extension)



Ascochyta fruiting structures on dead grass (North Carolina State University)

# Cyanobacteria/ “Blue-green Algae”

## Hosts, Symptoms & Signs

- black layer on thatch or thinned grass
- problem in areas that are heavily shaded, have poor drainage and high levels of phosphorus
- in large numbers, they move up on grass blades or cover the ground
- release of toxins causes grass to turn yellow and sometimes die

## Disease Cycle

- blue-green algae are not algae, but are classified as cyanobacteria
- cyanobacteria can survive in habitats from aquatic to desert environments, including irrigated turfgrass
- cyanobacteria is most frequently found in wet, compacted, poorly drained, thin turf areas in shade, but may be found under drier conditions
- conditions that encourage cyanobacteria growth in turfgrass include warm temperatures, light that reaches the soil, excess moisture, soil layering, excess nitrogen and phosphorus

## IPM Recommendations

- Minimize shade and excessive moisture.
- Aerate compacted/layered areas.
- Increase height of cut.
- Avoid phosphorus-containing fertilizers.
- Apply a fungicide (Chlorothalonil) three times at 7 day intervals.

Note: QoI (Quinone outside inhibitor) fungicides such as Heritage and Insignia could make the problem worse.



Symptoms of cyanobacteria (Phil Colbaugh, Turfgrass Photo Diagnostics)



Cyanobacteria (John Kaminski, Penn State University, Slideshare.net)



Cyanobacteria (Grassstitcher, Pinterest.com)

# Fairy Rings

## Hosts, Symptoms & Signs

- can affect all lawns; do not directly attack grass

There are three types of fairy rings:

- type I: soil and thatch become hydrophobic and the grass dies; brown ring of dead grass
- type II: rings on the lawn that are 2 – 8 inches wide with lush green grass
- type III: mushrooms and puffballs are produced in the ring
- white fungal mycelium can be found in thatch and soil for all three types

## Disease Cycle

- disease cycle is not known

## IPM Recommendations

- Reduce thatch with proper cultural practices.
- Mask fairy ring; water deeply and fertilize to stimulate growth of grass around ring.
- For type II fairy rings, a wetting agent may be needed.
- Control with fungicide drenches is inconsistent.
- Soil replacement: remove soil about 20 inches to each side of the ring and up to 30 inches deep and replace with sterile soil. This is a very expensive management option.



Type I fairy rings (Lester E. Dickens, Bugwood.org)



Type II fairy ring (Claus Ableiter, Wikimedia Commons)



Type III fairy ring (Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org)

# Gray Snow Mold

*Typhula* sp.

## Hosts, Symptoms & Signs

- affects all grass types
- circular patches visible after snowmelt
- size of spots ranges from 1 inch to 2 – 3 feet
- leaves are matted and often white to gray mycelium is visible (disappears after desiccation)
- typically only leaves are infected
- plants regrow as soon as temperatures rise
- small, hard, reddish-colored fruiting structures (sclerotia) can be seen on grass; the sclerotia are the fungal survival structures

## Disease Cycle

- overwinters as sclerotia (hard balls of fungal tissue in plant debris)
- sclerotia germinate under wet and cold conditions
- resulting mycelium infects turfgrass under snow cover
- newly formed sclerotia overwinter again and cause new infections the following fall in the same location

## IPM Recommendations

- Avoid heavy nitrogen fertilizer in fall to avoid fast growth of grass before snowfall. Fertilizer should be applied a few weeks prior to dormancy to stimulate root growth.
- Mow until late fall to avoid snow falling on tall grass and weighing it down.
- Avoid compaction of snow by skis, etc., and large snow drifts.
- Apply a fungicide (azoxystrobin; iprodione; propiconazole) as a preventative treatment in fall; these fungicides are not useful as a curative treatment.



Gray snow mold (William Brown, Colorado State University, Bugwood.org)



Gray snow mold (Penn State Department of Plant Pathology and Environmental Microbiology Archives, Bugwood.org)



Snow mold (noricum, Flickr.com)

# Necrotic Ring Spot

*Ophiosphaerella korrae*

## Hosts, Symptoms & Signs

- main host is Kentucky bluegrass but annual bluegrass and red fescue can also be infected
- no spot or lesions on leaves; blackening of roots and stems; occasionally black fruiting bodies are found on infected tissue; roots are rotten

## Disease Cycle

- circular patches develop during cool wet weather that gradually enlarge to about 12 inches in diameter; during drought the spot can get as big as 2–3 feet
- the fungus becomes active when the temperature at 3-inch depth reaches 60–70°F on average
- occurs throughout the growing season

## IPM Recommendations

Control of necrotic ring spot is the same as for summer patch:

- Avoid drought stress.
- During hot weather, light daily irrigation is necessary to reduce heat stress.
- Maintain balanced and adequate fertility, especially nitrogen, potassium and phosphorus.
- There are some cultivars that have shown some resistance in trials on the east coast. The National Turf Evaluation Program website lists the trials: [http://www.ntep.org/data/kb05/kb05\\_11-9/kb0511t26.txt](http://www.ntep.org/data/kb05/kb05_11-9/kb0511t26.txt).
- Overseeding with perennial rye resolves the problem as perennial rye is resistant to the pathogen; other resistant cultivars are available in a variety of species.
- Apply a fungicide (azoxystrobin; propiconazole; thiophanate-methyl) for control. Most products need to be applied by a commercial applicator.
- Fungicide can be applied in the spring, but it needs to be applied before the fungus enters the roots (when the average soil temperature at 3 inches depth is between 60–70°F).



Necrotic ring spot (Howard F. Schwartz, Colorado State University, Bugwood.org)



Necrotic ring spot (Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org)



Necrotic ring spot (Howard F. Schwartz, Colorado State University, Bugwood.org)

# Pink Snow Mold

*Microdochium nivale*

## Hosts, Symptoms & Signs

- affects all grass species
- white to gray mycelium is sometimes visible (disappears after desiccation)
- exposure to light leads to spore production
- spores look pink in masses and give the disease its name

## Disease Cycle

- circular patches develop with long periods of cool, wet weather regardless of snow cover
- initial spot size less than 2 inches wide, but can enlarge indefinitely

## IPM Recommendations

- Avoid heavy nitrogen fertilizer in fall to avoid fast growth of grass before snowfall. Fertilizer should be applied a few weeks prior to dormancy to stimulate root growth.
- Mow until late fall to avoid snow falling on tall grass and weighing it down.
- Avoid compaction of snow by skis etc., and large snow drifts.
- Apply a fungicide (azoxystrobin; iprodione; propiconazole) as a preventative in fall; these fungicides are not useful as a curative.



Pink snow mold (John Kaminski, Flickr.com)



Pink snow mold infection (William Brown Jr., Bugwood.org)



Pink snow mold; note white-colored mycelium (Mary Ann Hansen, Virginia Polytechnic and State University, Bugwood.org)

# Rust

Puccinia sp.

## Hosts, Symptoms & Signs

- many types of grass are susceptible, including Kentucky bluegrass and perennial rye
- orange colored "dust" is seen on grass blades; the dust is orange spores that give the disease its name
- lawn that is stressed is more susceptible to the disease
- rust is more common in shaded and moist parts of the turf area

## Disease Cycle

- spores are dispersed through air, mowing, shoes and animals
- the fungus is most active during temperatures of 70-85°F

## IPM Recommendations

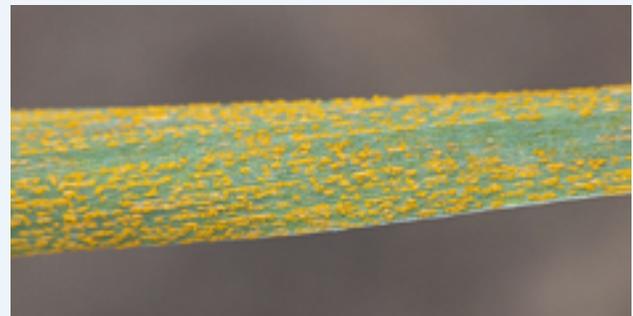
- Rust is mainly a cosmetic problem. It will not kill the grass.
- Fertilize and irrigate as needed to avoid stress. Irrigate in the morning so the grass is dry overnight.
- Mow frequently and remove clippings to remove new infection early, but do not mow below the recommended height.
- Prune trees to increase light in heavily shaded areas and increase air movement to reduce humidity.
- Fungicides containing azoxystrobin can be applied but are often unnecessary.



Rust (International Maize and Wheat Improvement Center, Flickr.com)



Stripe rust (Mourad Louadfel, Bugwood.org)



Orange rust spores (Rasbak, Wikimedia Commons)

# Slime Mold

## Hosts, Symptoms & Signs

- gray pustules or yellow-colored slime on grass and other plants
- slime molds are not pathogens

## Disease Cycle

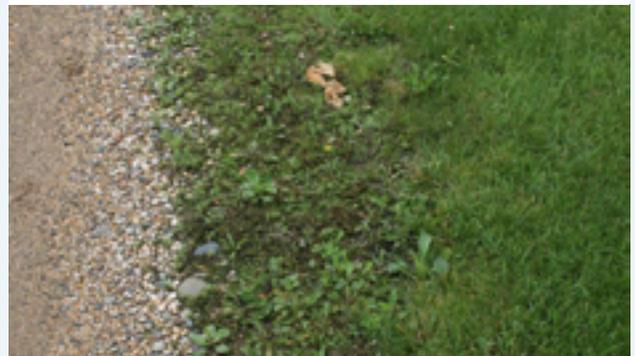
- the slime mold cells aggregate during reproduction under moist conditions and form fruiting structures; the fruiting structures are what cover the plants
- the spores disperse and the fruiting structures disappear within a few weeks

## IPM Recommendations

- Slime mold is an aesthetic issue. No treatment is necessary.



Slime mold (Iowa State University Extension)



Top and bottom: Slime mold fruiting structures (Larry Osborne, Bugwood.org)

# Summer Patch

*Magnaporthe poae*

## Hosts, Symptoms & Signs

- main host is Kentucky bluegrass and fine-leaf fescue
- very similar to necrotic ring spot; spots of summer patch are usually a little smaller than necrotic ring spot
- during extended hot weather (daytime temp. 82-95°F; nighttime temp. above 68°F) infected plants die fast

## Disease Cycle

- occurs from late spring to early fall, but infected patches can still be seen next season
- the fungus becomes active when the temperature at 3-inch depth reaches 60-70°F on average

## IPM Recommendations

Control of summer patch is the same as for necrotic ring spot:

- Avoid drought stress. During hot weather, light daily irrigation is necessary to reduce heat stress.
- Maintain balanced and adequate fertility, especially nitrogen, potassium and phosphorus.
- There are some cultivars that have shown some resistance in trials on the east coast. The National Turf Evaluation Program website lists the trials: [http://www.ntep.org/data/kb11/kb11\\_15-5/kb11\\_15-5.pdf](http://www.ntep.org/data/kb11/kb11_15-5/kb11_15-5.pdf).
- Overseeding with perennial rye resolves the problem as perennial rye is resistant to the pathogen; other resistant cultivars are available in a variety of species.
- Apply a fungicide (azoxystrobin; propiconazole; thiophanate-methyl) for control. Most products need to be applied by a commercial applicator.
- Fungicide applications can be done in the spring but need to be started before the fungus enters the roots (when the average soil temperature at 3 inches depth is between 60-70°F).



Summer patch (Lee Miller, University of Missouri, Bugwood.org)



Top and bottom: Summer patch (Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org)

# Ground Squirrels

Ictidomys; Urocitellus; Spermophilus

## Identification

- many sizes; bodies up to 11 inches long
- tails 2 – 9 inches long and less fluffy than a tree squirrel's
- brownish-gray fur
- burrow openings about 4 inches in diameter

## Nesting Habits

- live in colonies and build underground burrow systems
- populations range from 2 to 20 squirrels per acre
- active during the day
- hibernate during cold winter months
- burrows 5 to 30 or more feet long; 2 to 6 feet below soil surface; no soil plugs

## Diet

- grasses, alfalfa, grains, ornamental plants, seeds and nuts

## Significance

- burrowing activity can destroy lawns and other vegetation, collapse ditch banks and undermine building foundations
- carry a wide range of diseases
- strip bark from young trees

## IPM Recommendations

- If populations are small, use box traps, tunnel traps or Conibear traps when squirrels are active (February – October).
- Periodically monitor for signs of infestation, such as new burrows, and manage before the population becomes too large.
- Remove brush piles and debris.
- Prebait (bait traps without setting them) for a few days before setting traps.
- Bait with an appropriately labeled rodenticide, if necessary.



Wyoming ground squirrel (JTchagbele, Wikimedia Commons)



Belding's ground squirrel (Yathin S. Krishnappa, Wikimedia Commons)



Ground squirrel burrow entrance (Mary Burrows, Montana State University, Bugwood.org)

# Pocket Gophers

Geomyidae

## Identification

- 6 – 13 inches long
- light brown to brownish-black fur
- short, hairless tails
- incisor teeth always visible in front of mouth

## Nesting Habits

- construct underground burrows and leave fan-shaped mounds of excavated soil at the surface with a soil plug in the middle of the fan
- active year round
- usually only one individual per tunnel system except during mating season or when females have offspring

## Diet

- prefer dandelion roots, alfalfa, grasses, shrubs, roots and trees

## Significance

- damage lawns, gardens, sports and agricultural fields
- damage underground utility cables and irrigation pipes
- harm trees by stripping bark and chewing on roots

## IPM Recommendations

- Trap pocket gophers using two-pronged pincer traps in lateral burrows and closed box-style traps in main burrows.
- Surround trees and shrubs with 3/8-inch hardware cloth.
- Consider flood irrigation to help control gopher populations, if applicable.
- Bait larger populations by placing bait directly into burrows using a probe applicator.
- Monitor problem areas to assure trapping and baiting were successful and to quickly control new populations.



Pocket gopher (Ian Silvernail, Wikimedia Commons)



Pocket gopher mounds (USDA Forest Service, Bugwood.org)



Gopher burrow entrance (Ryan Davis, Utah State University Extension)

# Skunks

Mephitidae

## Identification

- striped skunks: black fur and two broad white stripes running the length of the body and about the size of a housecat
- spotted skunks: black with white markings and about half the size of a housecat
- release odorous spray (distance of 8 – 15 feet) when disturbed or cornered

## Nesting Habits

- build dens in brush piles, open irrigation pipes, storage areas, sheds, under structures, etc.
- solitary animals, except for mating and during winter
- most active at night

## Diet

- wide range of plant and animal material including berries, fruits, vegetables, insects, small rodents, reptiles, eggs and young birds

## Significance

- known carriers of diseases, such as rabies, and a variety of parasites
- may damage lawns and athletic fields by digging for food; leave bare patches and small cone-shaped holes
- odorous defensive spray

## IPM Recommendations

- Check local regulations for skunk management prior to control.
- Eliminate potential den sites and food sources outdoors.
- If a skunk enters a structure, do not harass or disturb it. Leave exits open to allow it to leave on its own.
- Contact a professional to trap and remove the skunk.



Striped skunk (Alfred Viola, Northeastern University, Bugwood.org)



Western spotted skunk (National Park Service, Wikimedia Commons)



Skunk damage to lawn (Ohio State University Extension)

# Voles

*Microtus* spp.

## Identification

- 3 – 6 inches long
- hairy tail with short hairs
- make runways/tunnels in turf, mulch, etc.

## Nesting Habits

- burrow in the ground along runways
- prefer areas of heavy ground cover

## Diet

- plants, tubers and bark

## Significance

- cause damage to turf and ornamental plantings
- occasionally enter buildings by accident, but do not become established indoors

## IPM Recommendations

- Reduce clutter outside.
- Use snap traps placed with triggers in vole runways.
- Eliminate weeds, ground cover, mulch and dense ornamental plantings that provide food and shelter during warm weather.
- Rodenticides may be necessary for control in large areas.



Vole size comparison (Manuel R., Wikimedia Commons)



Vole runways in turf (Ryan Davis, Utah State University Extension)

# Annual Bluegrass

*Poa annua*

## Description

- tufted; upright growth (up to 1 foot tall); leaves emerge from protective sheath with pointed and papery ligule
- narrow leaves (1 – 4 inches long, 1/16 – 3/16 inch wide); short flower heads (1 – 4 inches high) bear 3 to 6 seeds per branching stalk; light green in color

## Location

- common in lawn areas and planting beds

## Life Cycle

- winter annual or short-lived perennial grass: seedlings germinate when soil temperatures are below 70°F in late summer, early fall or early spring
- plants flower within 8 weeks of germination and continue to flower and produce seeds until the onset of hot temperatures in summer months
- dormant plants produce new blade growth during cool fall temperatures

## IPM Recommendations

- Annual bluegrass is difficult to control in lawn areas since it commonly produces seed close to the soil surface (flower heads cannot be mowed off like many other turfgrass weeds).
- Maintain maximum turfgrass vigor through appropriate management practices (see page 115 for more information); deep, infrequent irrigation will reduce seedling germination in lawn areas.
- Hand-pull plants in lawn areas prior to flowering.
- Apply appropriate pre-emergent herbicide prior to seed germination.



Annual bluegrass growth habit (Rasbak, Wikimedia Commons)



Annual bluegrass (Rasbak, Wikimedia Commons)



Annual bluegrass seeds (James Lindsey, Wikimedia Commons)

# Annual Ryegrass

*Lolium multiflorum*

## Description

- bunching growth habit growing 1 – 2 1/2 feet tall; clasping auricles
- leaves rolled in the bud; dark green with prominent veins

## Location

- landscape, roadsides, open spaces and occasionally lawns
- commonly planted in agricultural fields for weed suppression and included in lawn seed mixes as a temporary quick-establishing grass

## Life Cycle

- annual germination in late summer and fall

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Mow or cut plants to prevent developing seed heads in the summer.
- Apply an appropriate pre-emergent herbicide in early spring and again in mid-summer.



Annual ryegrass growth habit (Harry Rose, Flickr.com)



Annual ryegrass clasping auricle (Syngenta Lda, Flickr.com)



Annual ryegrass seed heads (Harry Rose, Flickr.com)

# Bermudagrass

*Cynodon dactylon*

## Description

- creeping grass with spike-like appendages alternately arranged along a thick wiry stem overlaid with papery sheaths; produces stolons (aboveground stems) and rhizomes (underground stems)
- flowers and seeds are produced on whorled spikes (three to seven spikes per stalk) 1 – 2 inches long

## Location

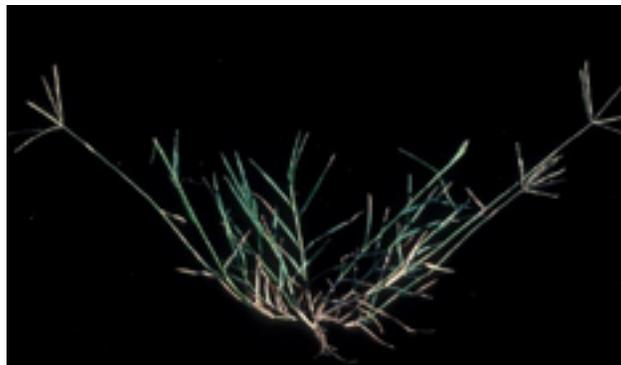
- forms weedy patches in lawn areas and plants; can invade planting beds

## Life Cycle

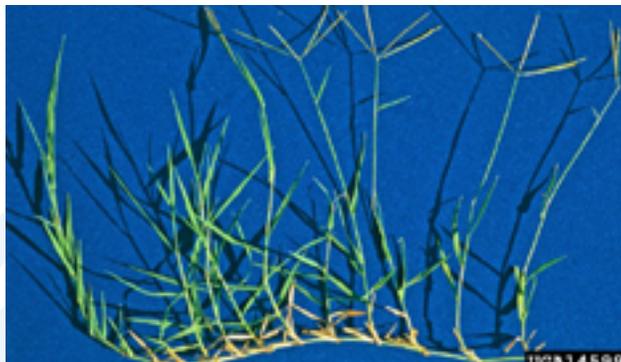
- warm season perennial grass with spreading stems that root at nodes (growing points) to form new plants; rhizomes can grow 6 inches or deeper into underlying soil
- bermudagrass grows aggressively during summer months but is dormant from early fall until late spring
- patches are easy to spot in cool season turfgrass because bermudagrass foliage turns brown when dormant

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information) and chemically treat weedy patches prior to re-seeding or sodding.
- Apply an appropriate post-emergent herbicide to actively growing plants. More than one herbicide application may be necessary to kill all spreading structures.
- More information on bermudagrass management can be found in the USU Extension publication "Bermudagrass in Utah Lawns."



Bermudagrass growth habit (Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org)



Bermudagrass aboveground and underground stems (Steve Dewey, Utah State University, Bugwood.org)



Left: Bermudagrass stem and flowers (Steve Dewey, Utah State University, Bugwood.org); Above: Bermudagrass flowers (Pedro Tenorio-Lezama, Bugwood.org)

# Black Medic

*Medicago lupulina*

## Description

- low, spreading habit; looks similar to other clover-like plants
- leaves have three small oval leaflets that are finely toothed on the edge
- yellow flowers in small rounded bunches

## Location

- landscape, lawn and open spaces

## Life Cycle

- annual or short-lived perennial
- flowers appear April through September

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- In severe infestations, apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf weed killer in the fall for control in lawn areas.



Black medic (Karan A. Rawlins, University of Georgia, Bugwood.org)



Black medic (Bruce Ackley, The Ohio State University, Bugwood.org)



Black medic habit (Forest and Kim Starr, Starr Environmental, Bugwood.org)

# Broadleaf Plantain

*Plantago major*

## Description

- low-growing, densely matted plant with dark green egg-shaped leaves that radiate away from a central point
- large leaves (3 – 7 inches long and 1 – 2 inches wide) have prominent veins and long stalks
- flower stalks are long (4 – 15 inches) and grow upright; the flower/seed head portions of the stalks have a tail-like appearance
- as flower/seed stalks mature, their color turns from greenish yellow to brown

## Location

- commonly grows in lawn areas but may also invade adjacent planting beds

## Life Cycle

- perennial that spreads by seed; seedlings germinate when soil temperatures reach 50°F and continue through the growing season
- flowers are produced 8 to 15 weeks after germination and plants continue to flower and produce seed from late spring to early fall

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information). Avoid bare patches in turfgrass to reduce seed germination.
- Hand-pull plants in lawn areas prior to flowering.
- Apply repeat applications of appropriate broadleaf weed killer in lawn areas (2,4-D most effective on mature plants) and over-seed any areas with exposed bare soil.



Broadleaf plantain growth habit (Lynn Sosnoskie, University of Georgia, Bugwood.org)



Broadleaf plantain growth habit (John Cardina, The Ohio State University, Bugwood.org)



Left: Broadleaf plantain flowers (Joseph M. DiTomaso, University of California - Davis, Bugwood.org); Right: Broadleaf plantain flowering structures (Ohio State Weed Lab, The Ohio State University, Bugwood.org)

# Bur Buttercup

Ranunculus testiculatus

## Description

- low-growing plant with light green, antler-looking leaves covered with white hairs
- small bright yellow flowers are singly produced on the tips of leafless stalks which grow taller than the leaves
- five petal flowers are succeeded by oval-shaped, spiny burs; each bur produces 5 to 80 seeds
- summer annual with germination in early spring when temperatures reach 41°F

## Location

- commonly grows in planting beds and lawn areas

## Life Cycle

- flowers are produced within 3 weeks of germination followed by burs
- plant foliage dries, turns brown and becomes brittle by early summer

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in planting beds prior to flowering.
- Apply an appropriate post-emergent herbicide to actively growing plants.



Bur buttercup growth habit (Bonnie Million, National Park Service, Bugwood.org)



Bur buttercup fruits (Bonnie Million, National Park Service, Bugwood.org)



Left: Bur buttercup lateral habit (USDA Forest Service, Wikimedia Commons); Right: Bur buttercup fruit (Curtis Clark, Wikimedia Commons)

# Common Chickweed

*Stellaria media*

## Description

- dense, low-growing plant with highly branched and slender stems that grow 4 – 20 inches long; root at nodes
- leaves: fleshy and elliptical with pointed tip; oriented opposite to one another on stems; up to 1 1/2 inches long
- small white flowers are star shaped (1/4 inch wide); each flower deeply separated (like rabbit ears) and shorter than sepals; five visible green sepals

## Location

- commonly grows in planting beds and occasionally in lawns

## Life Cycle

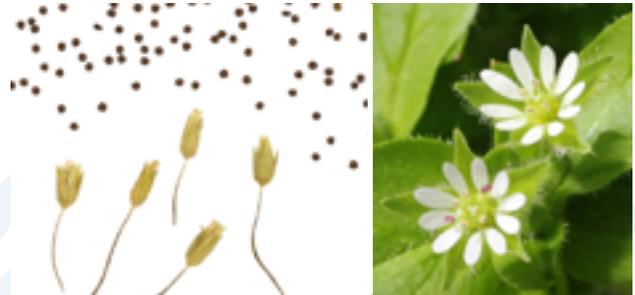
- summer or winter annual with peak germination in fall and early spring
- thrives in temperatures between 53°F and 68°F
- seedlings grow vigorously, flower and set seed within 5 weeks of germination; mature seeds immediately viable

## IPM Recommendations

- Maintain maximum turfgrass vigor through appropriate management practices (see page 115 for more information); deep, infrequent irrigation will reduce seedling germination in lawn areas.
- Hand-pull plants prior to flowering; manually remove underground structures to prevent re-sprouting.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply an appropriate post-emergent herbicide to actively growing plants.



Common chickweed growth habit (Hugo.org, Wikimedia Commons)



Left: Common chickweed fruit and seeds (Roger Culos, Wikimedia Commons);  
Right: Common chickweed flowers (Ryan Kaldari, Wikimedia Commons)



Common chickweed (Rebekah D. Wallace, University of Georgia, Bugwood.org)

# Common Groundsel

*Senecio vulgaris*

## Description

- upright growth (6 inches – 1-1/2 feet tall) with fleshy, ribbed stems that are often purplish
- stems are hollow and leaves are arranged alternately along stems; mature leaves are deeply lobed and fleshy
- flowers are long and cylindrical; yellow petals peak out of vase-shaped green sepals like a tube of lipstick; sepals peel back to reveal a dandelion-like, globe-shaped seed head

## Location

- commonly grows in planting beds but can sometimes be found in lawn areas

## Life Cycle

- winter annual with seeds that germinate in early to mid-spring and again in autumn
- flower production occurs 5 to 6 weeks after germination and seeds mature 5 to 11 days after flowering; mature seeds are immediately viable

## IPM Recommendations

- Hand-pull plants in lawn areas prior to flowering.
- Mowing is effective for control in lawn areas if the blade height is set close to the soil surface.
- Spot treat with an appropriate post-emergent herbicide.



Common groundsel (Robert Videki, *Doronicum Kft.*, Bugwood.org)



Left: Common groundsel seeds (Carol, Wikimedia Commons); Right: Common groundsel leaf (Ohio State Weed Lab, The Ohio State University, Bugwood.org)



Common groundsel seedling (Bruce Ackley, The Ohio State University, Bugwood.org)

# Common Lambsquarters

*Chenopodium album*

## Description

- upright, upward branching plant growing 4 inches – 6 feet tall
- leaf shape varies from coarsely toothed with shallow lobes (lower leaves) to narrow and linear shaped (upper leaves)
- inconspicuous small clumps of flowers
- can produce up to 72,000 seeds per plant

## Location

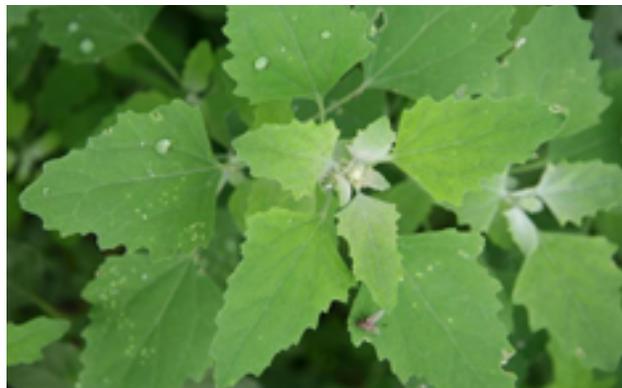
- landscape, lawn, cropland and open spaces

## Life Cycle

- annual; germinates in late spring
- produces flowers and seed in late summer and fall
- seeds can remain viable for over 20 years

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Mow or cut plants to prevent developing seed heads in the summer.
- Seed populations can be reduced by soil solarization prior to establishing a turf area.
- Apply an appropriate pre-emergent herbicide prior to seed germination.



Common lambsquarters leaves (Robert Videki, Doronicum Kft., Bugwood.org)



Common lambsquarters (Left: Robert Videki, Doronicum Kft., Bugwood.org; Right: The Ohio State University, Bugwood.org)



Left: Common lambsquarters flowers (Mary Ellen Harte, Bugwood.org); Above: Common lambsquarters seedling (Phil Westra, Colorado State University, Bugwood.org)

# Common Mallow

*Malva neglecta*

## Description

- low-growing (4 inches – 2 feet high) matted plant with deep branched taproot
- coin-shaped leaves are 1/2 to 1-1/2 inches in diameter, have wavy margins and one deep lobe that extends to thick hairy stem
- flowers are white to pink in color and have five petals and a funnel shape; fruit is shaped like a cheese wheel and houses 10 to 12 seeds

## Location

- commonly grows in planting beds and bare patches in lawn areas

## Life Cycle

- common mallow can be an annual, biennial or perennial based on growing conditions
- seeds germinate throughout the growing season with adequate moisture (mid-spring to early autumn)
- flowers and fruit are produced from early summer to mid-fall and mature plants may stay green throughout winter

## IPM Recommendations

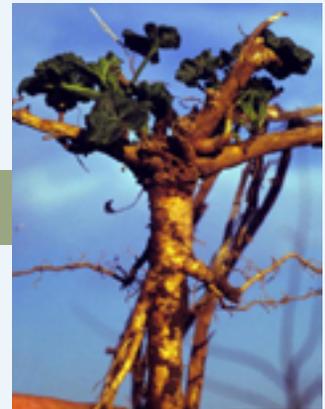
- Maintain maximum turfgrass vigor through appropriate management practices (see page 115 for more information). Avoid bare patches in turfgrass to reduce seed germination.
- Effective control must target both aboveground and underground plant structures.
- Hand-pull plants in lawn areas prior to flowering.
- Chemical control and mowing are both ineffective options for control of common mallow.



Common mallow growth habit (Howard F. Schwartz, Colorado State University, Bugwood.org)



Common mallow seedling (left) and common mallow flower (right) (Ohio State Weed Lab, The Ohio State University, Bugwood.org)



Common mallow taproot (Ohio State Weed Lab, The Ohio State University, Bugwood.org)

# Common Yarrow

*Achillea millefolium*

## Description

- low-growing plant with soft, feather-shaped leaves and upright flower stalks
- umbrella-shaped flower clusters contain five ray flowers surrounded by 10 to 20 disk flowers
- plants produce rhizomes (underground stems)

## Location

- commonly grows in lawn areas but may also invade adjacent planting beds

## Life Cycle

- spreading herbaceous perennial with flower production from mid-summer to early fall
- seeds mature by mid-autumn and are immediately able to germinate, particularly if temperatures are between 65-75°F
- flower stalks dry and leaves are dormant in winter months
- rhizomes resume growth in spring

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Effective control must target both aboveground and underground plant structures.
- Hand-pull plants in lawn areas prior to flowering.
- Mow or cut plants to prevent developing seed heads in the summer.
- Mechanical removal of aboveground foliage will not kill underground plant parts; manually remove underground structures to prevent re-sprouting.
- Spot treat with an appropriate post-emergent systemic herbicide when plants are actively growing. More than one herbicide application may be necessary to kill all spreading structures.



Common yarrow growth habit (Theodore Webster, USDA Agricultural Research Service, Bugwood.org)



Top left: Common yarrow with white flowers (Mary Ellen Harte, Bugwood.org); Top right: Common yarrow foliage (Steve Dewey, Utah State University, Bugwood.org); Bottom left: Common yarrow yellow flowers (John Ruter, University of Georgia, Bugwood.org)

# Creeping Woodsorrel

*Oxalis corniculata*

## Description

- creeping plant with 4-inch-tall hairy stems (although stems can grow to as long as 20 inches)
- leaves are often purplish and stalks are tipped with three heart-shaped leaflets; leaflets have hairy undersides
- leaves fold down on stems at night or when plants are stressed
- stem tips have one to five bright yellow flowers with five petals each; flowers are shaped like a shallow bowl
- flowers produce ribbed lantern-shaped seedpods that are long, green and hairy

## Location

- commonly grows in lawn areas and planting beds

## Life Cycle

- perennial that germinates at soil surface when temperatures are between 60-80°F
- seedlings grow vigorously and plants produce flowers and seeds throughout the remainder of the growing season; mature seeds are immediately viable

## IPM Recommendations

- Hand-pull plants in lawn areas prior to flowering.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf weed killer for control in lawn areas.



Creeping woodsorrel growth habit (Joseph M. DiTomaso, University of California, Bugwood.org)



Creeping woodsorrel fruit (left) and flowers (right) (Joseph M. DiTomaso, University of California, Bugwood.org)



Creeping woodsorrel seedling (Joseph M. DiTomaso, University of California, Bugwood.org)

# Dandelion

*Taraxacum officinale*

## Description

- low-growing plant with deep taproot
- leaves are long (2 – 12 inches) and a quarter as wide and radiate away from a central point; leaf margins are lobed and wavy
- flower stalks are hollow and bear a flower head with yellow petals; flowers mature to produce a delicate, globe-shaped seed head comprised of many seeds
- each brown, oblong seed is attached to a tuft of white fluff

## Location

- commonly grows in lawn areas and planting beds

## Life Cycle

- perennial with seedling germination throughout growing season
- flower production begins in mid-spring and continues throughout the growing season, although peak flowering occurs at temperatures between 60-70°F
- seed heads develop within 2 weeks of flowering and seeds are immediately viable
- new plants grow from taproot sections as short as 1 inch

## IPM Recommendations

- Maintain maximum turfgrass vigor through appropriate management practices (see page 115 for more information). Avoid bare patches in turfgrass to reduce seed germination.
- Effective control must target both aboveground and underground plant structures.
- Hand-pull plants in lawn areas prior to flowering and manually remove underground structures to prevent re-sprouting.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.



Dandelion growth habit (Howard F. Schwartz, Colorado State University, Bugwood.org)



Dandelion flower (left) and seeds (right) (Chris Evans, University of Illinois, Bugwood.org)



Dandelion leaves (Lynn Sosnoskie, University of Georgia, Bugwood.org)

# Downy Brome (Cheatgrass)

*Bromus tectorum*

## Description

- grass with upright growth (up to 2 feet tall) and flat blades that are hairy on both sides; ligules are membranous and ragged
- bristle-like flower/seed heads with soft, feathery appearance
- foliage changes color from green to purple to light brown as plant matures and available moisture declines in summer months

## Location

- planting beds and other under-maintained areas including lawn areas

## Life Cycle

- winter or summer annual; seedlings germinate in autumn or early spring
- rapid growth with seed production by late spring

## IPM Recommendations

- Hand-pull plants in lawn areas prior to flowering or mow a minimum of every 3 weeks throughout spring and summer months.
- Spot treat with appropriate post-emergent herbicide.



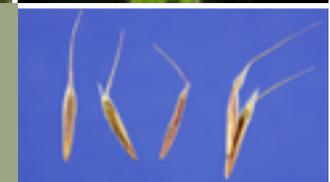
Cheatgrass growth habit (Chris Evans, University of Illinois, Bugwood.org)



Cheatgrass growth habit (Tom Heutte, USDA Forest Service, Bugwood.org)



Top left: Cheatgrass seeds (K. George and James Sebastian, Colorado State University, Bugwood.org); Top right: Cheatgrass ligule (Fred Fishel, University of Missouri, Bugwood.org); Bottom right: Cheatgrass seeds (Steve Hurst, USDA NRCS PLANTS Database, Bugwood.org)



# Field Bindweed

*Convolvulus arvensis*

## Description

- climbing or creeping vine with long twirling stems that can exceed 3 feet in length
- arrow-shaped leaves alternately arranged on stem; plants also produce extensive network of rhizomes (underground stems)
- white to pink funnel-shaped flowers (1 inch in diameter)

## Location

- climbing up or matting on adjacent plants or structures in lawn areas, planting beds or support structures such as fences

## Life Cycle

- non-woody perennial vine with seedling germination from early spring to late fall
- peak growth rate occurs when temperatures reach 57°F; aboveground shoots die back to ground in fall
- flowers last for 1 day and produce seed that can remain viable for up to 60 years

## IPM Recommendations

- Effective control must target both aboveground and underground plant structures.
- Frequently mow field bindweed in lawn areas to reduce plant vigor.
- Hand-pull plants in lawn areas prior to flowering.
- Mechanical removal of aboveground foliage will not kill underground plant parts; manually remove underground structures to prevent re-sprouting.
- Spot treat foliage with appropriate post-emergent systemic herbicide when plants are actively growing. More than one herbicide application may be necessary to kill all spreading structures.



Field bindweed growth habit (Steve Dewey, Utah State University, Bugwood.org)



Field bindweed growth habit (Howard F. Schwartz, Colorado State University, Bugwood.org)



Left: Field bindweed leaves (Robert Videki, Doronicum Kft., Bugwood.org); Right: Field bindweed flowers (Phil Westra, Colorado State University, Bugwood.org)

# Green Foxtail

*Setaria viridis*

## Description

- clump-forming habit; grows 4 inches – 3 feet tall
- short, fringed ligule; leaf buds are rolled lengthwise in a protective sheath
- cylindrical flower head with densely clustered floret
- produces 5,000-12,000 seeds per plant which can remain viable for 6 years
- tolerant of dry conditions

## Location

- lawns, gardens, cropland and open spaces

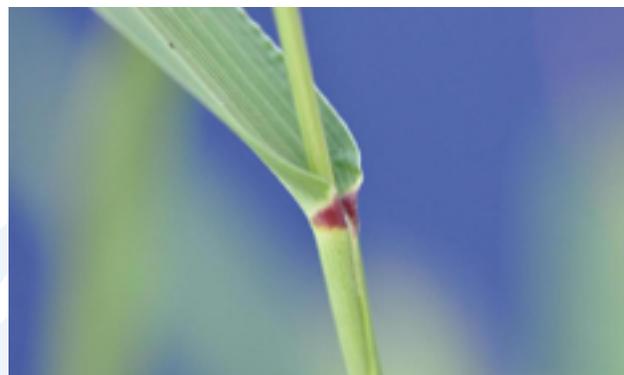
## Life Cycle

- annual; germinates starting in spring and anytime throughout the year
- seeds are able to germinate 2 to 4 months after maturing

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Apply an appropriate pre-emergent herbicide in early spring and again in mid-summer.
- Selective herbicides containing quinclorac are effective, but only within 2 to 3 weeks after germination.

Green foxtail (Steve Dewey, Utah State University, Bugwood.org)



Green foxtail sheath and collar (Bruce Ackley, The Ohio State University, Bugwood.org)



Green foxtail (Wendy Vandyk Evens, Bugwood.org)

# Henbit

Lamium amplexicaule

## Description

- plant grows 4 – 12 inches tall and is covered sparsely in fine hairs
- stems are square, typically purplish and branch at the base; leaves are round or heart shaped, arranged in pairs and have rounded teeth margins
- prominent veins are recessed in leaf blades
- flowers are small, dark pink and circle upper leaf axils
- if studied carefully, flowers resemble tiny orchid blooms with a white face and dark red spots

## Location

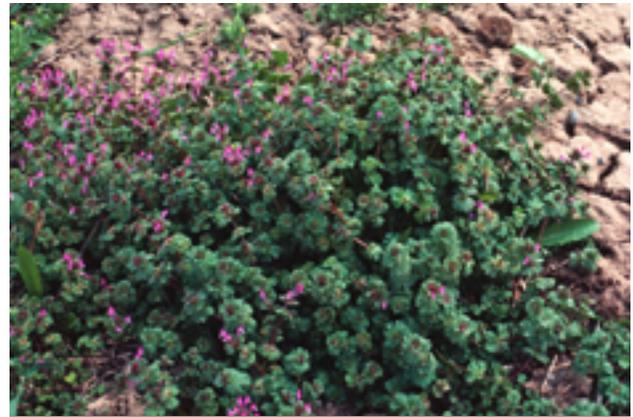
- commonly grows in planting beds and lawn areas

## Life Cycle

- a winter annual with seeds that germinate in the fall although a lesser portion of seeds may also germinate in early spring
- seedlings appear in early spring and flowers are produced by mid-spring to early summer (although some plants may flower in the fall)
- foliage dies in hot summer temperatures

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.



Henbit growth habit (Steve Dewey, Utah State University, Bugwood.org)



Above: Henbit (Nancy Loewenstein, Auburn University, Bugwood.org); Right: Henbit flowers (Ryan Kaldari, Wikimedia Commons)



Henbit seedlings (Left: Steve Dewey, Utah State University, Bugwood.org; Right: Ohio State Weed Lab, The Ohio State University, Bugwood.org)

# Large Crabgrass

*Digitaria sanguinalis*

## Description

- clumping grass with horizontal growth (when mowed) or upward growth up to 2 feet tall (when un-mowed)
- coarse and hairy leaf blades commonly tinged with purple; ligule is very short, jagged and membranous
- flowers and seeds are produced on whorled spikes (2 to 16 spikes per stalk) and are 2 – 6 inches long

## Location

- commonly grows in lawn areas and planting beds

## Life Cycle

- summer annual, warm season grass; seedlings germinate when temperatures reach 55°F and continue to germinate throughout the growing season
- flowers and seeds appear from mid-summer to first frost

## IPM Recommendations

- Maintain maximum turfgrass vigor through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Mow or cut plants to prevent developing seed heads in the summer.
- Apply an appropriate pre-emergent herbicide prior to seed germination.



Left: Large crabgrass (Steve Dewey, Utah State University, Bugwood.org); Right: Large crabgrass seedling (Charles T. Bryson, USDA Agricultural Research Service, Bugwood.org)



Large crabgrass growth habit (Doug Doohan, The Ohio State University, Bugwood.org)



Large crabgrass growth habit (Rebekah D. Wallace, University of Georgia, Bugwood.org)

# Persian Speedwell

*Veronica persica*

## Description

- small, low-spreading annual covered in short hairs
- leaves are rounded with three lobes and toothed margins
- small flowers (1/4 – 1/2 inch) have four petals and are light blue with a white center appearing lightly striped
- fruits are heart shaped and hairy

## Location

- gardens, lawns, cropland and open spaces

## Life Cycle

- summer or winter annual
- germinates primarily in early spring, but can germinate anytime through fall
- seeds are able to germinate immediately after maturing

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas when other options are limited.



Persian speedwell growth habit (Joseph M. DiTomaso, University of California - Davis, Bugwood.org)



Persian speedwell leaves (Joseph M. DiTomaso, University of California - Davis, Bugwood.org)



Persian speedwell (Robert Videki, Doronicum Kft., Bugwood.org)

# Pineappleweed

*Matricaria discoidea*

## Description

- small (6 –12 inches high) herbaceous annual with lacey leaves and a pineapple smell when disturbed
- seedlings grow as a rosette, then the plant branches upward into a small bush
- thrives in harsh soil conditions such as compacted soils and high traffic areas, but not shade
- will tolerate mowing

## Location

- gardens, lawns, cropland and open spaces

## Life Cycle

- summer annual; germinates in early spring and continues to germinate throughout the year
- flowers can be present all year beginning in late spring

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Pre-emergent herbicides are not always effective since germination can take place year round.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas when other options are limited.



Pineappleweed growth habit (John D. Byrd, Mississippi State University, Bugwood.org)



Top left and top right: Pineappleweed habit (Mary Ellen Harte, Bugwood.org); Bottom left: Pineappleweed (Bonnie Million, National Park Service, Bugwood.org)

# Purple Deadnettle

Lamium purpureum

## Description

- produces square-shaped stems that grow 4 – 16 inches tall; stems are branched at the base and purplish in color
- leaves are hairy, arrow shaped and oppositely arranged on stems; leaves have prominent veins that are recessed on blades and leaf margins are toothed
- leaves are clustered around stem tips and the uppermost leaves are smaller and reddish purple in color, giving the plant the appearance of vertically standing hooded figures
- flowers are small, purple and circle upper leaf axils; if studied carefully, flowers resemble tiny orchid blooms with a white face and purple spots

## Location

- commonly grows in planting beds and lawn areas

## Life Cycle

- a winter annual with seeds that germinate in the fall although a lesser portion of seeds may also germinate in the spring
- seedlings do not germinate during hot summer temperatures; purple deadnettle plants complete their life cycle before hot temperatures set in and seeds can germinate immediately as long as temperatures are not too high

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.



Purple deadnettle growth habit (Left: Robert Videki, Doronicum Kft., Bugwood.org; Right: Charles T. Bryson, USDA Agricultural Research Station, Bugwood.org)



Purple deadnettle foliage and flowers (Left: Ansel Oommen, Bugwood.org; Right: Chris Evans, University of Illinois, Bugwood.org)



Purple deadnettle seedlings (Bruce Ackley, The Ohio State University, Bugwood.org)

# Quackgrass

*Elymus repens*

## Description

- spreading habit; up to 1 – 3 feet tall if uncut
- thick, rolled leaves; blue green in color; clasping auricle similar to annual ryegrass
- spreading underground rhizomes
- appears to have a thicker blade growing slightly faster than common Kentucky bluegrass
- may be more prevalent in low-fertility and/or heavy clay or compacted soils

## Location

- landscape, lawn and open spaces

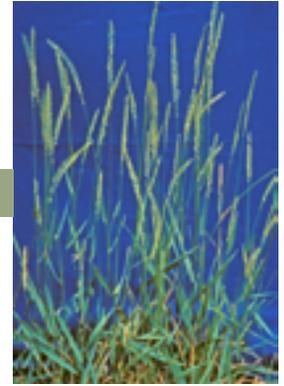
## Life Cycle

- aggressive perennial reproducing by seed or spreading by thin underground rhizome roots

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Hand-pull plants in lawn areas prior to flowering.
- Cultivation/tillage is not a good option since the underground stems will continue to grow after being cut.
- If quackgrass is aggressively competing with desirable plants, apply appropriate post-emergent systemic herbicide when plants are actively growing.

Quackgrass, Steve Dewey, Utah State University, Bugwood.org)



Clasping auricle and rolled leaf on quackgrass (The Ohio State University, Bugwood.org)



Quackgrass rhizome stems (Steve Dewey, Utah State University, Bugwood.org)

# Redstem Filaree

*Erodium cicutarium*

## Description

- a low-growing, densely matted plant with fern-like leaves that grow in a rosette form
- leaves have reddish stems and are covered in fine hairs
- flower stalks support two to twelve vibrant pink/purple flowers with five petals and a long, beak-like fruit
- other common names for redstem filaree include cranesbill, heronsbill and storksbill due to the resemblance of the flower and fruit to a bird's head

## Location

- commonly grows in planting beds and lawn areas

## Life Cycle

- winter annual or biennial that germinates in moist soil in temperatures between 40-70°F (spring to fall)
- seedlings that germinate late in the year remain dormant as a rosette during winter months
- growth resumes in early spring, and plants flower from mid-spring to mid-summer

## IPM Recommendations

- Hand-pull plants in lawn areas prior to flowering.
- Mowing is not an effective method for control of redstem filaree in established lawn areas since plants that are mowed will regrow. Mature plants can also be difficult to hand-pull.
- Apply an appropriate pre-emergent herbicide prior to seed germination.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.



Redstem filaree growth habit (Joseph M. DiTomaso, University of California - Davis, Bugwood.org)



Left: Redstem filaree foliage (Bonnie Million, National Park Service, Bugwood.org); Right: Redstem filaree growth habit (Forest and Kim Starr, Starr Environmental, Bugwood.org)



Left: Redstem filaree flowers and fruiting stems (Joseph Berger, Bugwood.org); Above: Redstem filaree flowers (Joseph M. DiTomaso, University of California - Davis, Bugwood.org)

# Shepherd's-Purse

*Capsella bursa-pastoris*

## Description

- small herbaceous plant with erect stems 1 – 20 inches tall
- most of the leaves are arranged in a rosette at the base of the plant
- small white flowers with four petals grow at the tips of branches
- after the flowers fade, stalks elongate, producing a flat purse-shaped seedpod

## Location

- gardens, lawns, cropland and open spaces

## Life Cycle

- summer or winter annual
- germination takes place primarily in spring and fall, but can take place throughout the year
- flowering and seed production can take place anytime from April through September

## IPM Recommendations

- Seed populations can be reduced by soil solarization.
- Cultivation is important in the fall to remove overwintering rosettes that would produce seed the following spring.
- Pre-emergent herbicides are not always effective since germination can take place year round.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.

Shepherd's-purse (Mary Ellen Harte, Bugwood.org)



Shepherd's-purse seedlings (Steve Dewey, Utah State University, Bugwood.org)



Shepherd's-purse seedpods (Steve Dewey, Utah State University, Bugwood.org)

# Star of Bethlehem

*Ornithogalum umbellatum*

## Description

- plant with long, slender, smooth, fleshy, hollow, dark green leaves; leaves resemble chives
- produces white bulbs buried deep in the soil profile
- flower stalks are 6 – 9 inches tall, leafless and smooth
- delicate white flowers are star shaped with six petals and yellow/green centers; blooms measure 1 inch in diameter; petals are oval-shaped with pointed tips; petal undersides have a wide green stripe running down the middle

## Location

- commonly grows in lawn areas and planting beds

## Life Cycle

- a bulb-forming perennial with leaves that emerge by mid-spring and flower production by late spring
- blooms last about 2 weeks; flowers open on sunny mornings and close by sunset
- after seedset, foliage dies back to the bulb by mid-summer

## IPM Recommendations

- Eradication of established star of Bethlehem patches in lawn areas is very difficult; mowing is not an effective method for control.
- Carefully dig out and remove bulbs and bulblets.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas.
- Apply herbicide to foliage in early spring when temperatures are at least 50°F and again in the fall for at least 2 consecutive years.



Star of Bethlehem flowers (top), seedlings (bottom left) and bulbs (bottom right) (Leslie J. Mehrhoff, University of Connecticut, Bugwood.org)

# White Clover

*Trifolium repens*

## Description

- dense creeping plant with 3 – 14-inch-long stems and stalks tipped with three round leaflets marked with white V-shape on the upper leaflet surface
- flowers are white to pink in color and sphere shaped (3/4 inch wide)
- as flowers fade they dry out and produce a 1/4 inch long seedpod covered in a brown husk of spent petals

## Location

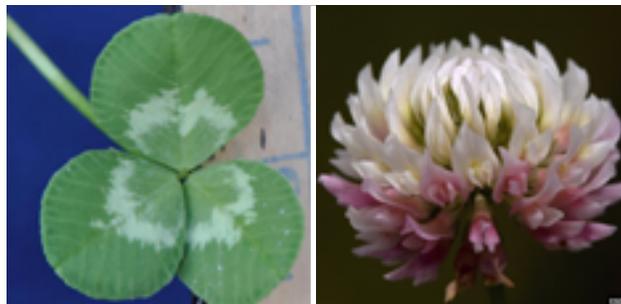
- commonly grows in lawn areas

## Life Cycle

- cool season perennial that germinates in the spring when temperatures reach 50°F; peak growth rate occurs between temperatures of 64-86°F
- flower production occurs by mid-spring and continues through the rest of the growing season
- as seeds ripen, flowers brown and droop downward and drop seeds 3 to 4 weeks after flower production

## IPM Recommendations

- Maintain maximum turfgrass vigor and density through appropriate management practices (see page 115 for more information).
- Mowing is not an effective method for control of clover in established lawn areas. Other control tactics can be combined with hand-pulling plants prior to seed maturation.
- Adjust fertilization program to include more nitrogen and less phosphorus when a soil test indicates low nitrogen and high phosphorus levels.
- Apply a selective post-emergent broadleaf herbicide for control in lawn areas; 2,4-D is not effective for control since it will only injure clover plants.



Left: White clover leaflets (Bruce Ackley, The Ohio State University, Bugwood.org); Right: White clover flower (David Cappaert, Bugwood.org)



White clover seeds (Bruce Ackley, The Ohio State University, Bugwood.org)



White clover growth habit (Chris Evans, University of Illinois, Bugwood.org)

## GLOSSARY

**Abdomen:** the posterior (rear) of three body segments of an insect; the other two body divisions are the head and thorax (middle segment).

**Annual:** a plant with a life cycle completed in one year or less (seed to seed).

**Auricle:** an appendage that projects on either side of the collar on many types of grass.

**Biennial:** a plant that lives longer than one season but fewer than two years.

**Clutch:** a group of eggs that are laid by an insect at the same time.

**Collar:** a thin band of growth tissue located where the blade meets the leaf sheath.

**Cover Spray:** a protective pesticide application applied to the leaves.

**Fruiting Bodies:** fungal structures that contain spores for reproduction.

**Instar:** the growth stage between two immature insect molts.

**Larva:** the immature stage of insect that undergoes complete metamorphosis; the larval stage follows the egg stage and precedes the pupal stage.

**Leaf Sheath:** lower part of the leaf that wraps around the stem covering the internode.

**Ligule:** membranous or hairy projection at the point where the grass leaf blade grows out of the leaf sheath.

**Mycelium:** the vegetative part of a fungus made up of a network of white threadlike filaments (hyphae).

## GLOSSARY

**Nymph:** the immature stage of an insect that undergoes incomplete metamorphosis. The nymph stages occur between the egg and adult stages.

**Overwinter:** the life stage in which an insect, disease, weed, etc., survives during the winter.

**Perennial:** a plant that lives longer than two growing seasons and renews growth year to year from the same root system.

**Pupa:** stage of insect development between the larva and adult in insects with complete metamorphosis.

**Pupate:** the process in which an insect larva develops into the pupa stage and then into an adult (complete metamorphosis only).

**Rhizome:** underground, horizontally-growing stem that produces new plants.

**Stippling:** insect feeding damage to foliage that gives leaves a yellow or brown speckled appearance.

**Stolon:** aboveground, horizontally growing stem that produces new plants.

**Systemic Insecticide:** insecticide that is translocated within a plant via root uptake, injection, or absorption through the bark or leaves.

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## Image References

Bugguide.net

Bugwood.org

Colorado State University Extension

Flickr.com

Iowa State University Extension

North Carolina State University

Ohio State University Extension

Slideshare.net

Syngenta Turfgrass Encyclopedia

Turfgrass Photo Diagnostics

University of Utah

University of Wisconsin Extension

Utah State University Extension

Wikimedia Commons

## Additional Resources

The following USU Extension publications provide additional recommended cultural management practices to maintain and improve the health of turfgrass. Search the titles below at [digitalcommons.usu.edu](https://digitalcommons.usu.edu).

- [Basic Turfgrass Care \(2011\)](#): Basic practices of turfgrass care including mowing, fertilization and irrigation.
- [Growing Turf on Salt-Affected Sites \(2002\)](#): Guidelines for growing turf on sites with high salt levels, including grass selection and management.
- [Irrigation System Maintenance \(2004\)](#): Maintenance recommendations to evaluate the effectiveness of your lawn irrigation system.
- [Lawn Fertilizers for Cool Season Turf \(2012\)](#): Appropriate lawn fertilization techniques for cool season grasses.
- [Living with Landscape Irrigation Restrictions \(1992\)](#): Water restrictions and proper irrigation techniques for conserving water in the landscape.
- [Renovate Your Lawn After a Long, Hot Summer \(2001\)](#): Recommendations for reviving your lawn after prolonged heat and drought conditions.
- [Simple Sprinkler Performance Testing \(county specific\)](#): Procedure for testing the performance of your lawn sprinkler to improve irrigation efficiency.
- [Turfgrass Cultivars for Utah \(2012\)](#): Guidelines for selecting the appropriate seed for site conditions.
- [Turfgrass Cultural Practices and Insect Pest Management \(2010\)](#): Cultural practices to prevent turf insect problems.

For help with your pest-diagnostic needs, please contact the Utah Plant Pest Diagnostic Lab at 435-797-2435 or [utahpestlab@gmail.com](mailto:utahpestlab@gmail.com).

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