

Weeds as Indicators of Environmental Conditions

The presence of certain weeds isn't accidental. Good weed management depends on understanding the underlying conditions that allow weeds to flourish. That may mean investigating soil conditions, mowing, moisture or shade conditions first

By Jeffrey F. Derr

Turfgrass managers know that turfgrass species are adapted to certain soil and light conditions. Bermudagrass grows best in full sun and creeping red fescue is adapted to shady conditions.

Weed species, just like our cultivated turfgrasses, are also often associated with certain environmental conditions. Understanding the association of weed species to the soil environment could help you identify an underlying soil problem. You can then correct the soil problem and the result will be enhanced turf growth. A more competitive turf will reduce weed density.

The presence of a specific weed species is not proof, however, that the associated soil condition exists at that site. Weeds are generally adapted to a range of growing conditions. They may even grow better in areas other than specific environments with which they are associated.

Prostrate knotweed (*Polygonum aviculare*) is often found in compacted soils such as paths worn in turf areas. This does not mean that prostrate knotweed only grows in compacted soil — in fact, it grows well under more favorable conditions. Turfgrass, however, may not survive under the stress of soil compaction, so prostrate knotweed is taking advantage of an ecological niche that cannot be exploited by our desirable lawn species.

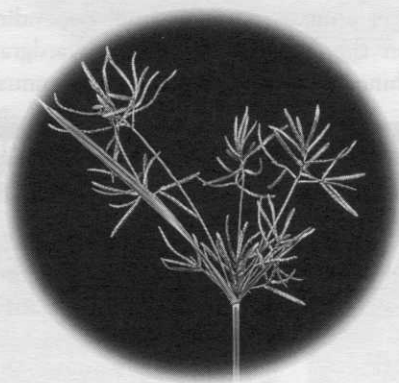
The appearance of a given weed species, such as height or color, can vary, depending upon the environment at that site. In compacted areas such as footpaths, prostrate knotweed is a small, prostrate, dark-green colored plant. When growing in undisturbed sites, it can have a lighter green color,

larger leaves, and a more upright growth habit.

Weeds common in wet sites

Certain weed species can thrive under wet soil conditions. Such areas may include land near ponds or streams, drainage ditches, poorly drained soils or sites that are frequently irrigated. Members of the sedge and rush families are commonly found in wet sites. Slender (path) rush (*Juncus tenuis*) is an example of a perennial weed in the rush family. More commonly, one finds members of the sedge family in wet turf sites.

Important turf weeds in the sedge fami-



Yellow or purple nutsedge

ly include yellow and purple nutsedge (*Cyperus excultus* and *Cyperus rotundus*), both perennial weeds that spread by rhizomes and tubers. Green kyllinga (*kyllinga brevifolia*) is another perennial sedge that spreads by rhizomes.

Certain annual weeds in the sedge family, such as annual sedge (*Cyperus compres-*



Annual bluegrass

sus), can infest turf areas. The annual sedges spread strictly by seed, making them somewhat easier to control than the perennial sedges, which spread vegetatively and by seed.

Two more grasses associated with wet sites are annual bluegrass (*Poa annua*), a winter annual or a perennial depending upon the subspecies; and barnyardgrass (*Echinochloa crus-galli*), a summer annual.

Certain perennial broadleaves can be found in wetter locations. They include:

- alligatorweed (*Alternanthera philoxeroides*),
- a pennywort (*Hydrocotyle* spp.),
- Virginia buttonweed (*Diodia virginiana*),
- pearlwort (*Sagina procumbens*), and
- moneywort (*Lysimachia nummularia*).

Pennywort is also referred to as dollarweed. Mosses and liverworts can grow under higher soil moisture as well. Cool, moist environments are conducive to growth of bittercress species (*Cardamine* spp.).

Certain types of these weeds, like compressed sedge, are probably not that competitive with turfgrass. I visited a site once, however, where the turf had been damaged by an herbicide application. The damage thinned the turf considerably, allowing for the germination and growth of annual sedge. Although this was a wet site due to the proximity to a lake and the soil type, the invasion by the sedge was probably due more to the turf injury caused by the herbicide.

Weeds common in compacted soils

As mentioned earlier, certain weed species can grow in compacted soil such as paths in parks, school grounds and other areas that receive heavy foot traffic. Weeds in this category include:

TABLE 1. WEEDS COMMON IN WET SITES

Alligatorweed
Annual bluegrass
Annual sedge
Barnyardgrass
Bittercress
Green kyllinga
Liverworts
Moneywort
Mosses
Pearlwort
Pennywort
Purple nutsedge
Slender (path) rush
Virginia buttonweed
Yellow nutsedge

TABLE 2. WEEDS COMMON IN COMPACTED SOIL

Annual bluegrass
Annual sedge
Broadleaf plantain
Corn speedwell
Goosegrass
Lespedeza
Prostrate knotweed
Slender rush
Spotted (prostrate) spurge

TABLE 1. WEEDS COMMON IN DROUGHT PRONE SITES

Bitter sneezeweed
Black medic
Broomsedge
Goosegrass
Lespedeza
Prostrate knotweed
Spotted knapweed
Spotted spurge
Yellow woodsorrel

- goosegrass (*Eleusine indica*),
- annual bluegrass,
- prostrate knotweed,
- spotted (prostrate) spurge (*Euphorbia maculata*),
- corn speedwell (*Veronica arvensis*),
- broadleaf plantain (*Plantago major*), and
- various lespedeza species.

Goosegrass is a summer annual grass.

Although this was a wet site due to the proximity to a lake and the soil type, the invasion by the sedge was probably due more to the turf injury caused by the herbicide.

Spotted spurge and prostrate knotweed are summer annual broadleaves. Corn speedwell is a winter annual, while broadleaf plantain is perennial. There are both annual and perennial lespedeza species.

Compacted soil could also be associated with poorly drained, wet sites, favoring the growth of species such as annual sedge and slender rush.

Keep in mind that these species can also grow in soil that is not compacted. Goosegrass, for example, is a common weed in cultivated soil. These species can survive under compacted soil conditions, although their growth may not be as robust compared to situations where they are growing under more favorable soil conditions.

Species in drought-prone sites

Some species can tolerate dry soil environments. Certain types of these species were listed earlier in the compacted soil section, such as spotted spurge, prostrate knotweed, lespedeza and goosegrass. Others that can grow under drier soil conditions include:

- yellow woodsorrel (*Oxalis stricta*),
- broomsedge (*Andropogon virginicus*),
- spotted knapweed (*centaurea maculosa*),
- bitter sneezeweed (*Helenium amarum*), and

- black medic (*Medicago lupulina*).

Yellow woodsorrel and spotted knapweed are perennial broadleaves. Broomsedge is a perennial grass while bitter sneezeweed and black medic are annual broadleaves. Species like yellow woodsorrel can grow in irrigated sites but may have a competitive advantage over turfgrass under dry soil conditions.

Weeds and mowing

Mowing height and mowing frequency both have a dramatic effect on weed species composition. Some weed species are most commonly found in specific types of sites:

Sites infrequently mowed — Chicory (*Cichorium intybus*), a perennial broadleaf, is found under such conditions, making it common in turf maintained along highways.



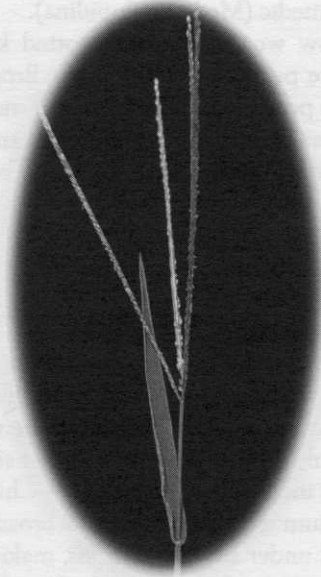
Broomsedge

Wild carrot (*Daucus carota*), teasel (*Dipsacus fullonum*), burdock (*Arctium minus*) and yellow sweetclover (*Melilotus officinalis*) all biennial broadleaves — will also grow in areas that are not mowed on a regular basis.

Sites frequently and closely mowed — A golf course green would be one example of this condition. Weeds found in this environment include annual bluegrass, goosegrass, smooth crabgrass (*Digitaria ischaemum*), common chickweed (*Stellaria media*), mosses and pearlwort.

Smooth crabgrass is a sum-

Species like yellow woodsorrel can grow in irrigated sites but may have a competitive advantage over turfgrass under dry soil conditions.



Smooth crabgrass

mer annual grass while common chickweed is a winter annual broadleaf. Pearlwort is a perennial broadleaf.

Weeds found in turf areas, such as home lawns, obviously can tolerate frequent mowing. For an annual weed to persist in turf, it must be able to produce seed below the mowing height or flower between mowings. Upright pigweed (*Amaranthus hybridus*) do not persist in frequently mowed turfgrass, although they may be found after the area has been tilled in a lawn renovation project.

Frequent mowing also is conducive to perennials with a prostrate growth habit, such as white cover or ground ivy (*Glechoma hederacca*).

Soil nitrogen and pH effects

Soil fertility may impact weed species composition. Soils high in nitrogen favor growth of plants such annual bluegrass and common chickweed.

Weeds adapted to low nitrogen conditions include:

- black medic,
- birdsfoot trefoil (*Lotus corniculatus*),
- white clover (*Trifolium repens*),
- corn speedweel, hawkweed (*Hieracium* spp.), and
- broomsedge.

Certain weeds can grow in acid soils. Reed sorrel (*Rumex acetosella*), a creeping perennial, is one example. Mosses can grow under low pH conditions. Broomsedge, a perennial grass, also grows in acidic, low nitrogen soils.

One may think that correcting a soil fertility of pH problem by liming or nitrogen application would cause these weeds to disappear. These weeds can grow under more favorable soil conditions, so additional inputs such as herbicide application may be required to remove these species from a site. Fertilization should make the turf more competitive, helping to limit re-invasion by these plants.

How sunlight affects weeds

The amount of sunlight reaching the soil surface can impact weed species composi-

TABLE 4. WEEDS FOUND IN SITES INFREQUENTLY MOWED

- Burdock
- Chicory
- Teasel
- Wild carrot
- Yellow sweetclover

TABLE 5. WEEDS ADAPTED TO CLOSE, FREQUENT MOWING

- Annual bluegrass
- Common chickweed
- Goosegrass
- Mosses
- Pearlwort
- Smooth crabgrass

TABLE 6. WEEDS COMMON TO SITES WITH HIGH SOIL NITROGEN

- Annual bluegrass
- Common chickweed

TABLE 7. WEEDS COMMON TO SITES WITH LOW SOIL NITROGEN

Birdsfoot trefoil
Black medic
Broomsedge
Corn speedwell
Hawkweed
White clover

TABLE 8. WEEDS FOUND IN ACIDIC SOILS

Broomsedge
Mosses
Red sorrel

TABLE 9. WEEDS COMMON TO SHADY AREAS

Ground ivy
Japanese stiltgrass
Poison ivy
Violets
Virginia creeper

tion. Some weeds are more commonly found in partial shade. Japanese stiltgrass (*Microstegium vimineum*) is a summer annual grass that is found in moist, shady conditions. The perennial broadleaf weeds ground ivy, violets, poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) are also associated with shady conditions. They also can be found growing in areas receiving little shade. However, they may establish better under cool, moist, shady conditions.

Most weed species grow well under full sun. Frequently, weeds that are troublesome in full sun are not that aggressive under shady conditions.

Yellow nutsedge and Bermudagrass (*Cynodon dactylon*) would be examples of weeds that are less of a problem when growing turf in shade. I was reminded of this issue when visiting a research site with one of our graduate students. He had difficulty establishing yellow nutsedge in his turf plots. Where the turf was killed by a

herbicide application to make alleyways between different plots in the study, yellow nutsedge grew vigorously. A thick, healthy turf will shade the soil, limiting the availability of light for growth of a full-sun species like yellow nutsedge.

Integrated pest management

Weeds are generally more adapted to adverse growing conditions than our desirable turfgrass species.

By correcting a soil problem, such as low pH, compacted soil or low nitrogen, we enhance the conditions for turf growth. Any factor that improves the competitiveness of turf will reduce weed populations at that site. Correcting the site problem may not eliminate the weeds currently present, especially for perennial species.

If we do not address the soil condition, however, and instead only apply a herbicide to the site, we can temporarily solve the weed problem. That weed will probably return to the sprayed area, however, if the site is not conducive to turf growth.

Weed scouting can be part of an integrated program to manage turf areas. Scout for winter weeds in spring when these species are in bloom and thus easier to identify.

Scout for summer annual and most perennials in late summer or fall when these species are in flowers. See if any of the weed species present at each site match any specific soil condition. Besides applying a chemical to control those weeds, also check soil pH, drainage, irrigation scheduling and other factors. Addressing these soil problems through actions such as liming, aeration and pruning trees to increase sun penetration can lead to an improved weed management plan.

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Soil fertility impacts weed species' composition. Soils high in nitrogen favor growth of plants such as annual bluegrass and common chickweed.