1980

Summer 1980

K. A. Hurto

Ruth Foster

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SUMMER 1980

BETTER TURF THROUGH RESEARCH AND EDUCATION
Dear Readers:

I would like to thank the many readers who responded to my request for information on the controversy of sand top dressing of golf greens in New England. We, of the "Turf and Lawn Grass Council", hope our information will benefit you.

I particularly wish to send a salute to Richard H. Lee of Chestnut Hill, Mass. graduate of Stockbridge Class of 1930; my first contact as editor of the "TURF BULLETIN".

The exceptionally mild 1979-80 New England winter ("The winter that wasn't.") has left our Rye grass alive and Bent and Bluegrass in good shape.

We hope you enjoyed the 49th Annual Turf Conference and I look forward to seeing you at our Turfgrass Research Field Day on June 25th 1980.

Malcolm J. Chisholm, Jr.
Principles of Turfgrass Weed Control

III. Broadleaf Weeds

By K. A. Hurto

The occurrence of broadleaf weeds in a turfgrass community reflects the environmental conditions influencing the growth and development of plant species in a turf. Soil, climate, other living organisms including disease-causing agents and insects, and cultural practices affect the ability of desirable turfgrass species to compete and survive. Selection of adapted turfgrasses and use of proper management practices enable the turfgrass community to effectively utilize edaphic and environmental factors essential to the growth and development of a vigorous, healthy turf. Deficiencies or excesses in turfgrass management programs create imbalances in the turf ecosystem, weakening the competitive ability of the desired turfgrasses, and enable undesirable plant species — weeds to invade the turf.

Certain weed species are indicative of site conditions limiting turfgrass adaptation and persistence (Table 1). For example, common chickweed (Stellaria media) is a creeping annual that is adapted to moist, shaded sites. Thus, its presence in Kentucky bluegrass turfs adjacent to buildings or under trees indicates that light conditions and air circulation are affecting turfgrass persistence. Simply controlling this weed does not preclude its reencroachment unless additional steps are taken to provide a favorable environment for turfgrass growth. Selective pruning of the tree canopy can improve light conditions and air circulation under trees. Another approach would include selecting grasses such as rough bluegrass (Poa trivialis) which are better adapted to moist, shaded environments than Kentucky bluegrass. If only the weed is controlled and environmental conditions limiting the growth of turfgrasses are not corrected, other weeds such as ground ivy (Glechoma hederacea) which are more difficult to control will fill the void rather than desired turfgrasses.

Proper management of the soil environment is also essential to turfgrass growth. Infertile soils, acidic soils, and compacted soils reduce turfgrass vigor, enabling weeds to establish and compete with them. Soils should be routinely tested and lime and fertilizers applied to maintain proper soil pH and nutrient levels. Recently completed studies at Penn State indicate that soil pH and phosphorus levels influence weed development in Kentucky bluegrass turfs. Sites which did not have lime or phosphorus added during establishment had a higher incidence of dandelion encroachment than soils limed and fertilized to raise soil pH and phosphorus to recommend levels. Soil compaction reduces the competitive ability of a turf, enabling prostrate knotweed and other weeds to invade the site. Proper traffic distribution and irrigation practices can prevent soil compaction and associated weed problems. On athletic fields, irrigation should not be performed earlier than two days before major events. On school grounds, where drainage is a problem, attempts should be made to distribute play during practice and close fields on rainy days.

Turfgrass weed control programs include management practices which prevent weed invasion and provide a favorable environment for turfgrass growth. Fertilization and irrigation practices should be programmed to meet the cultural requirements of the turf. Quite often, homeowners have recurring broadleaf weed problems because of improper fertilization practices. Routine fertilization at recommended rates reduces broadleaf weed infestation of lawns and other turf sites.

Healthy, properly managed turfgrass communities are rarely invaded by broadleaf weeds since they are not very competitive as seedlings in established turfs. However, once established, they are difficult to control culturally and must be controlled with a herbicide.

The use of selective postemergence herbicides for broadleaf weed control in turf is a relatively safe and effective procedure. Before applying any herbicide, identification of the weeds present is essential since weeds differ in their susceptibility to postemergence herbicides. Consulting with your extension specialist or referring to labels and extension bulletins on turfgrass weed control will provide valuable information for herbicide selection. Herbicides currently registered for broadleaf weed control in turf are listed in Table 2. These herbicides are formulated as either granular "weed and feed" mixtures, which are applied to wet foliage using a drop-spreader, or as foliar sprays.

Table 1. Broadleaf weed indicators of site conditions limiting turfgrass adaptation and persistence.

<table>
<thead>
<tr>
<th>Indicator Plant</th>
<th>Site Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>red sorrel (Rhumex acetosella)</td>
<td>acidic and infertile soils</td>
</tr>
<tr>
<td>buckhorn plantain (Plantago lanceolata)</td>
<td>low fertility</td>
</tr>
<tr>
<td>black medic (Medicago lupulina)</td>
<td>low fertility</td>
</tr>
<tr>
<td>white clover (Trifolium repens)</td>
<td>moist soil, low nitrogen</td>
</tr>
<tr>
<td>ground ivy (Glechoma hederacea)</td>
<td>moist soil, shade</td>
</tr>
<tr>
<td>chickweed (Stellaria media)</td>
<td>moist soil, shade</td>
</tr>
<tr>
<td>prostrate knotweed (Polygonum aruculare)</td>
<td>compacted soil</td>
</tr>
</tbody>
</table>

Table 2. Recommended postemergence herbicides for broadleaf weed control in turf.

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Rate/Acre</th>
<th>Active ingredient</th>
<th>Examples of Weeds Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromoxynil</td>
<td>1/8 - 1/4 lb.</td>
<td>weed control</td>
<td></td>
</tr>
<tr>
<td>2,4-D</td>
<td>1 - 2 lb.</td>
<td>dandelion, plantain, dock</td>
<td></td>
</tr>
<tr>
<td>Dicamba</td>
<td>1/2 - 1 lb.</td>
<td>knotweed, chickweed</td>
<td></td>
</tr>
<tr>
<td>MCP</td>
<td>2 - 3 lb.</td>
<td>clover, chickweed</td>
<td></td>
</tr>
<tr>
<td>2,4-D + Dicamba</td>
<td>1 + 1/4 lb.</td>
<td>provide broadspectrum</td>
<td></td>
</tr>
<tr>
<td>2,4-D + MCP</td>
<td>1 + 1 lb.</td>
<td>weed control in</td>
<td></td>
</tr>
<tr>
<td>2,4-D + Dicamba + MCP</td>
<td>1 + 1/8 + 1/2 lb.</td>
<td>established turf</td>
<td></td>
</tr>
</tbody>
</table>

*Consult extension publications for detailed weed control recommendations.

Postemergence herbicides should be applied when weeds and the turf are actively growing. Preferably, broadleaf weeds should be treated when they are young...
and should coincide with climatic conditions which are conducive to lateral spread of the turf. Thus, late spring or early fall applications are preferred (although recent studies at Rhode Island indicate that fall applications are more effective than spring) since cool-season turfgrasses will rapidly fill in voids resulting from destruction of broadleaf weeds.

Herbicide effectiveness is affected by several factors besides plant age. If weeds are under moisture stress, herbicide uptake by the plant is inhibited, therefore reducing control (Figure 1). Applying herbicides when temperatures are high will alter herbicide selectivity, increasing the potential for turfgrass injury. The optimum time to treat weeds is in the morning when wind speeds are low (prevents drift of herbicide to non-target sites) and the plant is not under climatic stress.

Herbicides combinations are often used to broaden the spectrum of weed control; also, combinations provide better herbicide activity than if applied singularly. Always read the pesticide label and follow directions carefully since manufacturers formulate herbicide combinations differently. Consequently, the amount of active ingredient will vary depending on formulation.

In May of 1979, the EPA issued emergency suspension of all sales and uses of silvex because of suspected carcinogenic effects of dioxin (a contaminant formed during the manufacture of silvex) present in silvex. The ban on silvex has affected broadleaf weed control programs, since several weeds including henbit, mallow, pennywort, speedwell, prostrate spurge, woodsorrel, and yarrow were best controlled with silvex. Most other weed species are controlled with 2,4-D, dicamba, or MCPP either singularly or in combination. Dicamba is an effective substitute for silvex for control of most weeds, but its greater mobility in soils can cause leaching problems. Avoid using dicamba around trees or near shrubs because there is a risk of severely injuring or killing these valuable ornamentals.

One weed which has been extremely difficult to control in Veronica filiformis. Studies in New York and Pennsylvania indicate that this weed is best controlled by applying 16 pounds of Dacthal 75 WP per acre at full flower stage in late spring.

Newly seeded turfs are often invaded by weeds including purslane, lambsquarter, pigweed, and ragweed. Most of these weeds are removed with frequent mowings. If severe infestation appears to be crowding out turfgrass seedlings, it is recommended that bromoxyll or bromoxynil + dicamba be applied when weeds are still juvenile for effective control. Use of 2,4-D should be delayed until after the third or fourth mowing since turfgrass seedlings are injured by it.

In summary, the demand for quality turf under increasing use will most likely increase the incidence of weeds in your turf. Developing sound weed control programs requires that turf managers understand weed ecology. Herbicides are not substitutes for proper cultural practices. Rather, they should be used as a component in weed control programs which provide a favorable environment for turfgrass growth.
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To Stop Leaks, First Find Them

Leak detection equipment has improved with advances in electronics, providing the pipe system manager with more effective underground search tools.

Rapid and precise location of leaks in pipe systems transmitting water and other fluids has always been a key element in effective pipe system management. And the current focus on conservation further heightens the need for quick leak detection and repair.

Basically, pinpointing the location of a known or suspected leak means 'listening' to the sounds produced by leaks and tracing those sounds to their source. These sounds derive from three distinct origins. One is the friction of the escaping liquid against the leak orifice, generating a relatively steady sound in the 500 to 1000 Hz range. The second source is the impact of the fluid upon the surrounding soil. Finally, the turbulent movement of soil and rock particles resulting from the pressure of the liquid produces a third, more irregular sound of lower frequency.

Electronic leak detection equipment operates by using sensitive microphones or transducers to pick up these sound patterns traveling along the pipe or through the ground. The signals can be amplified and electronically processed to produce an audible sound in headphones and generate visible indicators, such as movement of meter needles.

The detection process is made difficult by two elements, however. First, sound transmission is affected by factors such as leak size, pipe diameter and type fluid pressure, and soil conditions. Further, background sounds frequently interfere with the identification of the specific sounds produced by the leak. These background sounds include normal flow through the system, pump and meter noises, and sounds from the external environment — vehicles, pedestrians, and wind, for example.

It is in effectively minimizing the effects of these factors that the latest detection equipment demonstrates re-
cent technological strides. The new units boast broader fre-
quency ranges and increased amplification capabilities.
High gain, solid-state amplifiers allow the units to be used
not only with steel and cast iron pipe, but with lesser sound
conductors such as PVC, cement, or asbestos-insulated
pipe. Further, various types of probes make detection
easier whether the pipe lies in sand, clay, gravel, water-
filled cavities, or is buried six feet or more beneath con-
crete or asphalt. Finally, and perhaps more importantly,
modern leak detection devices permit discrete filtering out
of many of the background sounds competing with the
sound of the leak itself.

Beyond reliance upon detection equipment and
manufacturer-supplied expertise, there are several steps the
system manager can take to speed leak detection when the
need arises. Extremely important is the implementation of
regular programs to ensure maintenance of accurate
records covering the entire system. According to one leak
detection expert, David Hayslip of Detection Services of
Los Gatos, California, most system blueprints are sadly
out of date. Hayslip says that, in his 20 years of ex-
perience, he's seldom found accurate diagrams over two
years old.

“Additions, deletions, abandoned branches and the
like often not properly documented,” Hayslip maintains.
“Having reliable documentation to work with can substan-
tially reduce survey time required.”

Hayslip believes that periodic checks of the entire
system with leak detection equipment are an essential part
of overall system management. Periodic surveys not only
contribute to continual updating of system diagrams, but
also provide operators with the experience needed to
become familiar with normal background sounds within
the system. Hayslip points out that it is the recognition of a
sound that is “different” that leads to rapid pinpointing of
leaks. Such recognition can be difficult unless the operator
is familiar with the character and level of normal system
sounds. Finally, of course, periodic surveys frequently un-
cover leaks that otherwise might go undetected.
Forty-Ninth Turf Conference
Bigger and Better Than Ever

The Forty-Ninth Annual Turf Conference and Industrial Show was the most successful so far. We recorded over fifteen hundred in attendance and had just enough room for the one hundred and fifty-eight exhibitors. The lecture hall, seating over eight hundred, needed additional chairs. We were honored by many prominent speakers from throughout the field, topped off by Dean Denison from the Stockbridge School of Agriculture who, as always, put things in the proper perspective. Dr. Troll is preparing some special surprises for next year’s half century of Turf Conferences in New England.

Editor
Turfgrass Research Field Day

June 24, 1981

Raindate: June 25th

Schedule of Activities

9:00 - 10:00 A.M. Registration
10:00 - 10:15 Welcome — Dr. John Denison, Dean, Stockbridge School
10:15 - 12:00 Field Tour of Turfgrass Research
12:00 - 1:30 P.M. Box Luncheon on Top of Mt. Sugarloaf

1:30 - 3:00 Guest Speakers
Dr. Kirk Hurto, Assistant Professor
University of Massachusetts
James T. Snow, Senior Agronomist
Northeast Region: United States Golf Association

Informal Discussion Period

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Herbicides
Insecticides
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Turf clipping recycling studies on turfgrass nutrition
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Slocum, R.I. Suffield, Conn. Litchfield, N.H.
The gypsy moth *Lymantria dispar*, which is one of our more destructive forest insects, may also be one of our more serious shade tree pests. Since its accidental introduction from Europe into Massachusetts in 1869, outbreaks have occurred at intervals of a few to many years. Originally, outbreaks caused severe forest tree damage in Massachusetts but in recent years moderate forest tree weakening is the rule while shade trees suffer more stress and perhaps eventual death.

Severe infestation usually results in partial defoliation of conifers (evergreens) as well as deciduous trees. Complete defoliation of conifers may kill them in one season with the exception of pitch pine, which requires a longer period to be killed. One should do nothing for control if he or she is willing to tolerate defoliated trees, tree stress, possible tree death from the immediate defoliation, longer range injurious effects from secondary pests, a general mess of bits of chewed leaves, caterpillar excrement (pessets dropping from trees) caterpillars crawling on the trees and later on/or in the house and property for a few weeks annually over a period of three or four years. If these penalties are unacceptable then there is a wide choice of control materials available and many skilled professional-arborist applicator who may be consulted to provide relief and protect trees.

Typically, a population builds up for three or four years and, by then, the abundant caterpillars are so stressed by competition for food that, when weather conditions are suitable, they succumb to a virus disease. The disease so reduces their numbers that a troublesome build up is not seen again for a number of years. It is during these early years after a population collapse that the gypsy moth parasites, which are chiefly different species of wasps and flies, exert their greatest benefit. Eventually though, the parasites can no longer keep the increasing insect population in check and once again an expanded outbreak occurs. There seems to be no specific act that triggers an outbreak and the time interval between outbreaks remains unpredictable.

Properly planned control programs will reduce infestations and protect trees and provide relief to home owners during peak outbreaks of the pest. No attempt should be made to eradicate gypsy moth since this is not possible, at least with present knowledge.

**Description:** The male gypsy moth is dark brown with blackish bands across its forewings. The female moth is nearly white and has wavy blackish bands across its forewings. The mature caterpillar is hairy and about 1 1/2 -2 1/2 inches long. The head has yellow markings, the body...
is slate colored, and on the back there is a double row of five pairs of blue spots followed by a double row of six pairs of red spots. The pupae is reddish brown with a sprinkling of reddish hairs.

**Distribution:** The gypsy moth has now become established over all of New England and also parts of New York, Pennsylvania, New Jersey and Delaware. Current outbreaks (1979-1980) in Massachusetts are generally located along routes 128 and 495 in the east with some on Cape Cod and along the Connecticut River Valley in the west.

**Life history and habits:** The gypsy moth has one generation a year and spends the winter in the egg stage. The eggs hatch in early May about the time the shadbush (Amelanchier spp.) blooms. This occurs about May first in most of the state and about May 10 on Cape Cod. The newly hatched caterpillars sometimes lower themselves from tree branches on threads. At this time, they may be blown about by the wind. Some may be blown a few miles, but usually the distance is mostly a matter of a few hundred yards. Local and relatively long distance spread can occur in this way. Also egg masses, larvae (caterpillars) and pupae are often attached to objects such as vehicles and firewood, upon which they may then be moved long distances.

The caterpillars, hatched as above, feed until early July when they transform into pupae. Moths start to emerge from pupation about July 4th. The males are strong fliers but the females emerge, mate and lay their eggs near their place of pupation. The eggs are laid shortly after mating and may be deposited at any place or height in the tree or on numerous other nearby objects. Egg masses that are lower down, near or upon the ground, are more easily seen. This fact may lead some people to believe that they are absent in the upper part of the tree. The egg masses are covered with tan colored scales from the female's abdomen and each mass may contain 100-1000 eggs.

**Host plants:** The gypsy moth may feed on a wide variety of trees and shrubs but oak, willow, linden, apple and larch are favored. Large hungry caterpillars will also eat pine, hemlock, spruce and, sometimes, maple. For the most part, ash, locust and sycamore are not fed upon.

**Tree injury:** While forest trees in general in Massachusetts will not be immediately killed by a typical outbreak, they will be weakened. Shade trees will be weakened and may be killed; especially, if they are already weakened by some other factors, including environmental complications. Healthy deciduous trees should be able to withstand partial defoliation for two or three successive years without being killed but they will be weakened, while conifers may be killed in one season. Once weakened, trees may then become susceptible to attack by borers and to fungi, especially the shoe string root rot fungus (Armillaria mellea). Death associated with this fungus may occur many years later, after infestation with gypsy moth. Thus death is not solely attributable to the gypsy moth. Many shade trees are even now suffering from previous outbreaks of gypsy moth of many years ago. It is suggested that shade trees, especially partly defoliated ones, be given adequate water, as needed, every year and fertilizer in alternate years to aid in maintaining or improving tree vigor.

**Natural control or non-chemical treatment:** Gypsy moth eggs are very resistant to cold and temperatures of at least minus 25°F are required to kill them. The eggs are also very resistant to heat. Therefore, the eggs must be burned rather than scorched, to be sure they are dead from exposure to this treatment. Intensive efforts have been made to establish introduced parasites in this country and several species are presently busily at work. Predaceous beetles are also well established in the United States and likewise, a lethal polyhedral virus is usually present. This virus causes the disease that brings about a population collapse. These agents eventually help to suppress an outbreak of gypsy moth.

**Applied control:** The gypsy moth is a very hardy pest. Dormant sprays of superior oil as commonly recommended for insect control (i.e. 2-3 gal/100 gal water) will not kill the eggs. Creosote applied by brush is effective for egg kill, but care should be used not to let an excess soak into the tree bark since it will kill whatever living tree tissue it touches. Scraping eggs off the bark and allowing them to remain on the ground will not kill the eggs. Usually so few eggs can be killed by any manual method that in heavy infestations this egg killing will still not prevent tree...
defoliation. There will always be many eggs that are missed and small caterpillars may also be blown in by the wind. Rubbing, wire brushing, hammering, scraping, often result in only limited egg control and burning with a propane torch often does more harm to the tree bark then the caterpillars would do. None of the manual methods are practical in tall trees.

Routinely, the larger caterpillars (4th instar) crawl down the tree trunk during the day and crawl back up again at night. This allows some of them to be captured if folded burlap is wrapped around the tree trunk for a trapping place. This may help, particularly in light infestations, but the benefit may be chiefly psychological. The caterpillars often wander about prior to pupation. It is at this time that they crawl onto and/or into homes, creating an extensive nuisance. It is too late then to do anything for control but battle them with a broom as a matter of good housekeeping.

If local control is desired, there are spray materials which can be applied when the caterpillars are small, about mid-May. The larger they become the harder they are to kill.

Some insecticides which are registered for gypsy moth control are:

Carbaryl (Sevin), a methyl carbamate type insecticide, is registered for use on many kinds of fruit, vegetable and ornamental plants. Carbaryl labeling carries a caution signal word and spray deposits are lethal to insects for about five days. It is useful against many kinds of insects, including caterpillars, lacebugs, periodical cicada, earwigs, some scale crawlers, some aphids and some leaf miners. It is particularly effective against Japanese beetle adults, elm leaf beetle, and birch leaf miner. It is very toxic to honeybees and application to blossoms, particularly white clover and linden, should be avoided. Carbaryl produces severe injury or death to Boston Ivy and Virginia creeper. Repeated applications thereon may also contribute to a buildup of mites and should be avoided.

Carbaryl is available as a liquid suspension or wettable powder. If used, beekeepers nearby should be forewarned so that hive openings may be screened appropriately for a few hours so as to alleviate the hazard of beehive contamination.

Acephate (Orthene), an organic phosphate-type insecticide, is registered for use and is effective against a very wide range of insects on vegetables, ornamentals and flowers. It has low volatility which extends the time it remains lethal to insects. This period is ten to fifteen days. Its labeling carries the signal word of caution. It is available as a 75 percent crystalline powder.

Imidan a phosphate-type insecticide, is registered for use on many vegetables, fruits and ornamentals, and is active against a wide range of insects. Labeling carries the signal word warning, which indicates that it is of a lower order of toxicity to man and warm blooded animals than many phosphate insecticides. It breaks down quite rapidly in the soil. It is available as 12.5 percent, 50 percent, and 70 percent wettable powders. If used, beekeepers nearby should be forewarned so that hive openings may be screened appropriately for a few hours to alleviate the hazard of beehive contamination.
Dylox (trichlorfon), a phosphorus-type insecticide, is registered for use on many vegetables, field crops, seed crops and ornamentals. It has a low order of toxicity to beneficial insects including honeybees and is very soluble in water. Its labeling carries a signal word of warning and it breaks down rapidly in the soil.

Bacillus thuringiensis (BT) is a microbial insecticide that is non-toxic and non-pathogenic to man and warm blooded animals, fish, and honeybees, but it is capable of inducing fatal disease in certain insects, mostly caterpillars. On the basis of evidence to date, this bacillus is harmless to parasitic and predatory insects and other forms of life. It is useful against such insects as gypsy moth, cankerworm, fall webworm, elm spanworm, and linden looper. Also, it gives some control of tent caterpillar. Occasionally, it gives erratic performance. Two applications are required. It must be applied near or during the second instar stage of the gypsy moth caterpillar development which is usually about May 20, in most of Massachusetts. A second application is required about June 1.

Malathion and Methoxychlor are also in use, but these materials are not considered especially effective either separately or mixed for control of gypsy moth.

Chemicals may also be applied systemically by injecting them into tree trunks, but these chemicals may be dangerous to handle and their use is limited to certified applicators. Bidrin is the material commonly available in capsule form for trunk injection, but in this method many wounds must be made in tree trunks. The wounds are often small but they are still many times larger in size than is required for entry by organisms which cause decay. Untreated, a relatively healthy tree may recover from defoliation but, if wounded and infected, it may harbor decay for the rest of its life.

Disparlure is registered and used for trapping. Impregnated plastic strips are used for confusing the mating process, but are significantly effective for this purpose only in very light infestations (a few egg masses per acre).

Diflubenzuron (Dimilin) is an insect growth regulator which interferes with the formation of chitin — the insect's outer covering. This is a very effective control material, but it is registered only for forest use away from human habitation.

Gypcheck, a formulation of virus, is toxic only to the gypsy moth. It is registered for use only under the direct supervision of the U.S. Forest Service. It is produced only by the federal government and is not commercially available. If this material becomes available for wide-scale use we will have the ability to choose an earlier year for treatment in the population cycle. Thereby, the virus disease should be effective as a control measure, sooner than the date associated with the natural build-up of the toxic virus.
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Try Ground Covers for Low-Maintenance Urban Landscaping

If the adage, 'A five-dollar plant in a ten-dollar hole is heeded, groundcovers serve well with only occasional care.'

By Ruth Foster

Because nature abhors a vacuum, something always grows on bare ground. Left alone, it will be weeds, wildflowers and native plants. But when human aesthetic or practical needs interfere, the ground is covered with useful, productive or beautiful plants.

But instead of mowing grass to golf course standards forevermore, consider the advantages of ground covers.

Ground covers are energy efficient and require little maintenance. Their foliage is beautiful, they remain interesting in winter with their flowers and berries, and they control soil erosion. Ground covers even eliminate the need for raking fallen autumn leaves by hiding them and returning their nutrients to the soil.

But if ground covers are so useful, why doesn’t everyone use them more? Initial cost is, for some, a serious drawback. And while anyone can throw in some inexpensive grass seed, planting ground covers is more complicated. Many local officials are not familiar with the wide choice of ground cover materials, and most work gens don’t know what maintenance is necessary for ground cover survival, what is wasteful or harmful.

However, when the total lifetime cost of a planting is considered, ground covers repay their initial investment many times over in reduced maintenance.

Ground covers do not look as neat as newly mown lawns, nor are they as familiar and reassuring. Some of the conventional ground covers — ivy, myrtle and pachysandra — can be maintained as neat green mats with only occasional clipping. Euonymus, for instance, is an excellent choice for sunny acres, but it needs to have its upright growing shoots removed for a neat uniform height. Yews have a naturally graceful, loose growth habit, but they are often kept as clipped shrubs for formality.

Conventional thinking about ground covers usually embraces only decorative evergreen plants and fast-growing varieties for soil stabilization. But whatever grows on the ground should be carefully chosen for its required use, its total lifetime maintenance cost, and nowadays, its energy requirements. What covers the ground should be not put there by the whim of nature or because it’s always been done.

Ground covers are best chosen to suit the use and environment restrictions of an area. Each site has a particular microenvironment of physical, horticultural and human characteristics that limit plant growth. For instance, the soil may be sterile, or the site may be cold, windy, shady or dry. There may be high foot traffic. Usually, the most limiting factors are human, such as low initial installation budgets.

Many plants are suitable for use as ground covers. The most common ones are a small group of evergreens, primarily ivy, pachysandra, mondo grass, myrtle, juniper and yew. But literally hundreds of plants — including grass — are suitable for every conceivable use and areas. They range from creeping plants no more than a few inches high (myrtle, sedum, ajuga) to vigorous bushes that grow several feet (juniper, yew, spirea cotoneaster).

The three kinds of landscape-use areas — naturalized, high use and decorative — each support a different level of maintenance. Each also has a different cost-benefit ratio and different energy requirements.

Naturalized areas require the lowest maintenance. They are usually low-use recreation land, highway embankments, mine tailings and conservation land. Nature usually takes care of the vegetation. But when construction interrupts the natural ecosystem, vigorous ground covers should be planted to restore the landscape ambiance and prevent soil erosion. Tough, often native plants and unmown grass are useful in such areas.

High-Use areas such as parks and playing fields usually sport turf. Grass is actually the toughest ground cover known for withstanding heavy foot traffic. The more care grass gets, the better it looks — and the more it costs. Arriving at an acceptable compromise between good looks and reduced maintenance is an individual decision. In extremely high-use areas, nothing will survive the traffic. Then only wood chips, crushed stone or paving will do.

Decorative areas beautify and brighten population centers, but most are expensive to install and maintain. Plants are chosen for beauty, color and effect. The more densely populated an area, the more desire there seems to be for decorative displays. Consider urban malls with their changing floral extravaganzas, shrubs and trees. Even though keeping them alive is difficult and time consuming, cities and businesses choose to spend the money rather than sacrifice the beauty.

It is in such decorative areas, where a reasonable level of maintenance may be anticipated, that the widest choice of plants and design is afforded. Even lawns, which people often don’t think of as part of a high-maintenance, expensive display, fit the bill. While barely tended grass may be easy to deal with, keeping it perfect and green is not a simple chore. In cost per year per square foot, grass is one of the most expensive ground covers there is.

To a large extent, height determines maintenance requirements. Lower-growing ground covers are more often used for decorative plantings; taller ones are more common in low-maintenance situations. To keep grass two inches high requires weekly mowing. But certain other low

Ruth Foster is a landscape consultant in Belmont, Massachusetts, and is a former contributing editor to American City & County on Urban forestry.
### Useful groundcovers

<table>
<thead>
<tr>
<th>All sunny areas</th>
<th>Warm, sunny areas</th>
<th>Very cold, sunny areas</th>
<th>Warm, shady areas</th>
<th>All shady areas</th>
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</thead>
<tbody>
<tr>
<td>Euonymus*</td>
<td>Ice plant*</td>
<td>Crown Vetch</td>
<td>Ivym*</td>
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<tr>
<td>Creeping type</td>
<td>African Daisy-Ga-</td>
<td>Juniper*</td>
<td>Pachysandra*</td>
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<tr>
<td>Dwarf Burning Bush</td>
<td>zania</td>
<td>Daylily (also shade)</td>
<td>Myrtle*</td>
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<tr>
<td>Sargent</td>
<td>California Broom</td>
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<td>Yew*</td>
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<td>Andorra</td>
<td>Hybrids</td>
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<td>Dwarf Japanese</td>
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<td>Blue Rug-Wiltoni</td>
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<td>Spreading</td>
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<td>Pfitzer</td>
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<td>English'Nigra'</td>
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<td>Blue Hetz</td>
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<td>Densiformis</td>
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<td>'Lowboy' Firethorn</td>
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<td>'Green Wave'</td>
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<td>Sedum</td>
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<td>Japanese Holly*</td>
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<td>Thyme</td>
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<td>Leucothoe*</td>
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<tr>
<td>Crown Vetch</td>
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<td>Lily of the Valley</td>
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<td>Low Barberry</td>
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<td>Hosta</td>
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<td>Japanese 'Crimson Pigmy'</td>
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<td>Daylily</td>
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<tr>
<td>'William Penn Threespire</td>
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<td>Yellowroot</td>
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<td>'Hancock' Coralberry</td>
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<td>Hayscented Fern</td>
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<td>Spirea</td>
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<td>Snowmound</td>
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<td>Anthony Waterer</td>
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<td>Warminster Broom Cotoneaster</td>
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<td>Rock Early</td>
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<td>Mugho Pine</td>
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</table>

#### Ground covers

- Low mowing in early spring
- Hand weeding once or twice a year
- Use of ground covers along with herbicides for weed control

#### Maintenance Tips

- Use plants that grow taller than most weeds and grasses
- Proper choice and spacing
- Consider plant's tolerance for heat and cold
- Soil quality and organic content
- Fertilizer application
- Mulching for root cooling

#### Environmental Considerations

- City warming effect on plant survival
- Heat island effect on plant survival

#### Aesthetic Considerations

- A five-dollar plant in a ten-dollar hole
- Shade-loving varieties benefit from soil improvement
Grass, the most popular ground cover, is also one of the most costly to maintain. Widely relied on in naturalized and high-use areas, it stands up well even where heavy foot traffic is a problem.

The single most important factor in successful establishment of a healthy ground cover is regular watering of the plants during the first summer. 'Regular' means each week or two when it doesn't rain. Carefully water shade-loving varieties during summer droughts. During the second year, supplemental watering during dry periods is worthwhile. Fertilize only if faster growth rates or high-quality foliage and flowers are desired. Get an expert to help out with occasional insect or disease problems. If a planting needs constant spraying, consider replacing it with something more vigorous. And don't rake up leaves under plants; just pick out windblown papers.

The better the care at planting time, the better a ground cover will perform. They can be planted and will grow without much care, but their survival rate will be much lower. The plants are expensive, so the small extra effort to secure a satisfactory take is usually cost effective.

The high initial cost of ground covers is due to the fact that almost all of them are rooted plants. They may be purchased as newly struck cuttings, which are cheapest and come in large flats. Most creeping, vine-type ground covers (ivy, myrtle, Pachysandra and euonymus) are sold this way. They are easily established if the soil is improved with peat moss ahead of time, and if they are carefully watered and mulched. Larger sizes, with better root systems, come in small pots.

Shrub-type ground covers are most often sold in containers. They are mass produced and come from the best improved clones. The trick in successful planting of container stock is to prune or slice lightly the outer pot-bound roots, and to make sure that the planting medium around the root ball is compatible with the potting soil. Pot-grown roots will not move outward into hard soil. The interface between the cut roots and the new soil has to be half peat moss, vermiculite or potting medium. After planting, water and mulch.

Larger or field-grown shrubs come balled and burlapped. Before planting, remove the plastic wrappings and treated burlap completely. Untreated burlap may be left on
if it is untied and tucked down under the soil. Again, puddle planting holes carefully to fill in all air pockets. Mulch them and water regularly. The larger the plant, the longer it will need supplemental watering.

Deciduous shrubs are less expensive when they are purchased bare rooted. The soil should be prepared as for other shrubs for a good root run. During planting, protect the roots from air and sun in a slurry of mud. Puddle the holes well to settle the soil and eliminate air pockets. Then mulch.

On flat land a free-standing berm can create a natural shape. Ground covers are the best choice of plant material to stabilize a berm’s sides. Because water runs off, berms are usually drier than the surrounding ground, so plants tolerant of dry soil must be used. Grass should only be planted if the area is acceptable unmown.

For a no-maintenance area, consider uncut grass. It will grow in poor or dry soil, particularly the tough grasses such as fescue and ryegrass. Even weed grasses like redtop, orchard and crab grass will serve well.

Unmown grass makes an excellent, though very rough-looking, cover. To retain a semblance of neatness, try mowing a strip around the edges of paths and driveways. Or use a row of shrubs to separate the unkept grass.

Meadows are the first step in plant succession from field to forest. They will revert to brush and then forest in 10 to 50 years, depending on soil and climate. To keep them open, cut them every year or two. The best time is usually August, after the ground nesting birds have left. And wildflowers will enhance any unmown field. In Texas, a program of seeding bluebonnets, pinks, primroses, buttercups and other wildflowers have made the highways a delight of constant color. Even dandelions, goldenrod, aster, black-eyed susan, yarrow and butterfly weed will spruce up a highway roadside.

Pesticide News

Dear Specialist:

Two new developments have occurred relative to the certification program that are quite important.

1. *Initial* training for commercial applicators is *no longer required.* In the past to become initially certified an applicator needed both to pass his exams and to attend a workshop. Because of bookkeeping complexity, the Dept of Food and Agriculture is not continuing this requirement. Workshops will, however, continue to count towards recertification.

2. *Insurance* as a condition of licensing or becoming commercially certified is *being suspended* for at least 3 months. This comes because of extreme hardship on small applicators who have not been able to secure the needed insurance. The 3 months grace period will be used to write new insurance rules that, hopefully, will be less of a burden on the small applicator. Any applicator who has passed his exams can obtain his license or commercial certification card immediately without insurance. Insurance is, however, still recommended and will be required again in 3 months but in some reduced form. The effective date for the new insurance requirements may start as early as July, 1980 or hopefully not 'til Jan., 1981. That will be determined by the Pesticide Board.

*Please share these comments with your constituent.*

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Pesticide Coordinator
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