AN INDEPENDENT NEWSLETTER FOR TURF MANAGERS

Turf Grass TRENDS

[Vol 3]
Volume 4, Issue 12

December 1994

Selecting composts to improve your turf

by Dr. Peter Landschoot and Mr. Andrew McNitt

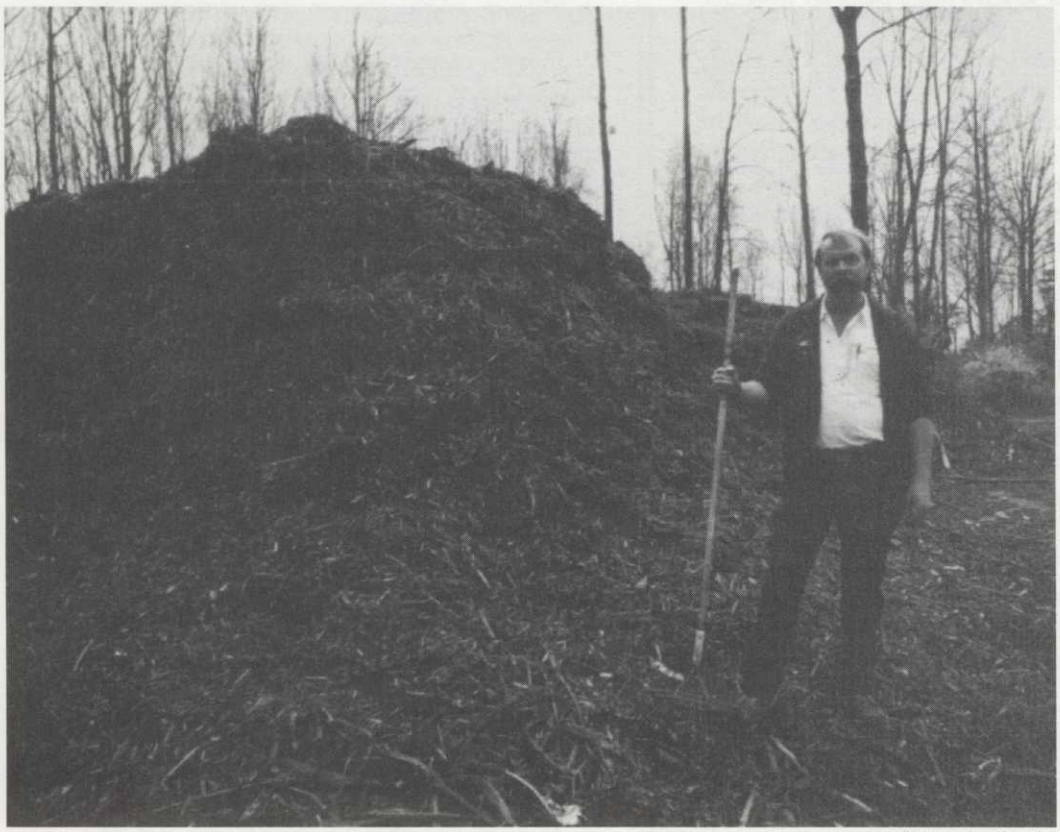

Photo by Les Crandell

Town of Vienna, Virginia, street maintenance worker David Sherwood tends the municipal compost pile.

For landscapers and grounds managers looking for ways to improve marginal or poor soils, compost may be the best deal around. In many cases, compost production sites are located near areas of intensive turf use, providing a readily-available and inexpensive source of organic matter. In many cases, compost is cheaper than topsoil.

Composts are used as soil amendments during turfgrass establishment, as surface applications (topdressing) on established turf, and as low-analysis fertilizers. In clay soils, a good quality compost will increase permeability to air and water, enhance aggregation of soil particles, reduce surface crusting and compaction, and provide plant nutrients. In sandy soils, the organic matter in compost will increase water holding capacity and nutrient retention, supply nutrients and increase microbial activity. The effects of good quality composts on turf include

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faster establishment, improved density and color, increased rooting, and less need for fertilizer and irrigation.

Before jumping on the compost bandwagon it is important to realize that not all composts are alike. Composts are made from many different materials, including municipal solid waste, leaves and grass clippings (yard trimmings), sewage sludge (biosolids), animal manures, paper mill by-products, and food waste, just to name a few. Depending on the source, composts may vary substantially with respect to their influence on soil properties and turf quality.

What to look for

Because of the tremendous variation in compostable materials, it is important to have some basis for determining a specific compost's suitability for use on turf. Ideally, the product in question has been field-tested at a university or has been used successfully by other turf professionals.

A compost with a proven track record can take some of the guess work out of the selection process provided that the product is consistent from batch to batch.

Whether you are using a field-tested product or a compost that has never been used on turf, it is wise to obtain a sample of the compost prior to use and examine it for undesirable objects and peculiar or offensive odors. If the producer does not have an analysis of chemical and physical properties, submit a representative sample to a laboratory that will conduct appropriate tests and provide recommendations that you can understand. Some basic guidelines for evaluating the suitability of a compost for use on turf follows.

Appearance

Although the appearance of composts will differ slightly among products, the color of the end product should resemble a dark topsoil and should be friable (loose and crumbly). It should be free of large stones, large pieces of wood, trash (especially glass), and other objectionable objects. For use in surface applications on high-cut turf (about 2 inches) a compost should pass through a 3/8 inch screen and preferably a 1/4 inch screen. Composts with slightly larger particles can be used as soil amendments if thoroughly tilled into the soil prior to seeding or sodding.

Odor

A good quality compost should have an 'earthy' aroma (similar to that of a woods or forest) and should not emit peculiar or offensive odors (such as a strong ammonia or sulfur smell). Peculiar or offensive odors may be an indication that the compost is not mature (not fully composted). Immature composts may have adverse effects on turf and should not be used.

Field tips

Application methods

Use these guidelines as a general guide. Higher or lower values for a given property don't necessarily mean the compost is unacceptable for turf use. Some composts meet these basic criteria, but other properties may make them unsuitable for use on turf.

Soil incorporation

In most cases, composts are applied to the soil surface at a rate between a one inch layer (approximately 3.1 cubic yards per 1000 ft^2) and a two inch layer (about 6.2 cubic yards per 1000 ft^2) then incorporated into the soil to a depth of 4 to 6 inches. In order to get maximum performance from your application, make sure the compost is thoroughly mixed with the soil and is not forming a layer at the soil surface. Depending on the material, this may require several passes with rotary tilling equipment. The lower rate (1 inch layer) is better suited for marginally-good soils and the higher rate (2 inch layer) for sandy soils, clay soils, or subsoils low in organic matter. We have found that if more than two inches are used, it may be difficult to mix the material 4 to 6 inches into the soil. On clay or compacted soils, it is helpful to rototill the soil first, then apply the compost and incorporate.

Although higher nutrient-containing composts, such as biosolids compost or composted animal manures, can usually supply enough nutrients for good establishment, some composts (such as those made from yard trimmings or municipal solid wastes) may require additional phosphorus and potassium as well as starter fertilizer for vigorous seedling growth. Although many composts can raise the pH of slightly acid soils, for soils with a very low pH (below 5.5) additional lime may be required. If you plan to use a compost with a high soluble salt concentration, make sure to

irrigate the site thoroughly several times in order to leach the salts before seeding.

Use on established turf

Composts are frequently used as surface applications (topdressings) on established turf. This practice is one means of gradually incorporating organic matter into the soil without causing extensive disruption of the surface. The two most limiting factors with this practice are finding suitable application equipment and working the material into the soil.

Since compost is light and bulky, a spreader with a large hopper is preferred. Modified manure spreaders with conveyor belts and brushes mounted on the back are ideal for spreading compost over large areas. Conventional tractor-mounted fertilizer spreaders have been used successfully, but may require many refills.

When applying compost as a topdressing, it is important to apply a thin layer (about 1/4 inch) and work it into the soil. Successive applications of thick layers without soil incorporation will result in a build-up of organic matter that may promote rapid surface drying and form a layer that restricts water infiltration and rooting into the soil. The best way of incorporating compost into the soil is through aeration. We have observed successful applications on athletic fields where the compost is applied first, followed by several passes with an aerator equipped with hollow-tines and a steel drag mat attached. The drag mat will break-up the cores and mix the compost with the soil, dragging some of the mix back into the holes. This operation is best performed during cool/moist seasons when grass is actively growing. Aeration and dragging can be stressful to the turf during hot, dry weather.

Weed seeds

If a compost product has been properly composted and stored, weed seed contamination will not be a problem. The composting process should destroy nearly all viable seeds. Occasionally, temperature control in some composting operations is not monitored adequately and some weed seeds survive. Another source of contamination is from weed plants growing on compost piles that have been stored outdoors for long periods. If these weeds are not controlled they can deposit seeds in the compost.

Although a few weed seeds do not necessarily preclude the use of a compost as a soil amendment for turf, a large amount of difficult-to-control weeds may force a contractor to redo the establishment. Even though weed seed contamination of compost is rare, if you are using a compost for the first time, you may want to inspect the production site to make sure that weeds are not growing in and around the compost piles.

Moisture content

The moisture content of a compost is important where an even application and uniform mixing with soil is desired. Composts with moisture contents between 30 and 50% are usually ideal for handling, surface applications, and soil incorporation.

Wet composts (greater than 60% moisture content) tend to form clumps and do not spread evenly when applied as topdressings. Rototilling wet material into soil may result in poor mixing and a less-than-desirable establishment. Wet composts are also heavy and difficult to handle.

A dry compost (less than 20% moisture content) is easy to handle and spreads easily, but may produce excessive dust. On windy days, the dust may leave a film on windows or siding. Dust may be inhaled or get into the eyes of the applicator. Dry composts that are high in organic matter content tend to 'float' on the soil surface while attempting to incorporate them. In this case, the equipment operator may have to spend more time and effort working the material into the soil.

Organic matter

When using composts as organic matter supplements, keep in mind that not all of the product is organic. In fact, some composts contain less that 50% by weight of organic matter. Organic matter content can be determined by a lab test, but the most common procedure employed by laboratories will consider everything that is combustible as organic matter (including wood chips, bark, leaves, and possibly even garbage). Hence, a lab test may not tell you everything about the *quality* of the organic matter. Although it is impossible to determine

how much organic matter is present simply by looking at the product, a visual examination may tell you if the compost contains mostly humus-like material or if it is mostly undecomposed material, such as wood.

An estimate of organic matter can be expressed in several different ways on soil test reports. The most common designation is percent organic matter by weight. Some test labs report a value called 'ash' content. Ash is the mineral matter that remains after the compost sample has been subjected to extremely high temperatures in a furnace. Assuming that everything that was burned-off in the furnace is organic matter, the amount of ash can be subtracted from 100 to provide an estimate of percent organic matter. For example, an ash content of 20% means that there is an estimated 80% organic matter in the sample.

Carbon to nitrogen ratio

The amount of carbon (C) relative to the amount of nitrogen (N) in a compost product is an important indicator of nitrogen availability. The C:N ratio of a compost should fall below 30:1. If above 30:1, soil microorganisms can immobilize nitrogen making it unavailable to the turf. Fortunately, most commercial composts have C:N ratios of 20:1 or below.

Nutrients

When compared with fertilizers, composts generally contain low amounts of plant nutrients. Whereas a small amount of quick-release nitrogen (ammonium) is present in some composts, most nitrogen is in the organic form and is slowly available to turf. Studies with composted biosolids show that only about 10% of the total nitrogen is available to plants during the first growing season. Little is known about the nitrogen release characteristics of other composts.

Other nutrients, such as phosphorus, potassium, calcium, and magnesium can be present in significant quantities in composts. Some composts, however, may contain very low concentrations of one or more of these nutrients. Thus, fertilizer supplements may be required.

Typically, large amounts of compost must be applied to suppoly all or most of the turf's nutrient requirements. This is difficult to achieve with surface applications since only a small amount of material can be applied. However, a 1 or 2 inch layer of compost tilled 4 to 6 inches into a soil can supply all of the nutrients necessary for turf growth and development for an entire year and possibly longer. The amount of nutrients supplied by a compost depends on its source (animal manure composts are typically higher in plant nutrients than yard waste composts) and the availability of the nutrients. More research is needed on the availability of nutrients from different composts.

pH of most composts

The pH of most composts is between 6.0 and 8.0, a range favorable for turf root growth. A few composts, however, fall outside of this range. The pH of a compost may be detrimental to turf when very high (greater than 8.5) or very low (less than 5.5). Extremes in pH may result in reduced availability of some plant nutrients and/or toxicity problems. In a turf establishment study at Penn State we noticed seedling inhibition following incorporation of a 2 inch layer of poultry manure compost (pH of 9.1) into a clay loam soil. It is likely that the high pH and presence of ammonium in the compost caused ammonia toxicity and subsequent death of the seedlings. Fortunately, most soils are buffered against rapid and drastic changes in pH and even composts with extremes in pH may not alter the overall soil pH a great deal. To be on the safe side, however, try using materials with a pH as near to neutral (7.0) as possible.

Guidelines for choosing a compost

Appearance and odor

Color	Brown to black
Size (surface applications)	1/4 to 3/8 inch
Size (incorporated)	1/4 to 1/2 inch
Odor	Earthy or mouldy

Physical properties

Moisture content	30 to 50 %
Organic matter	More than 25 %
Ash	Less than 75 %

Metals

Composts made from sewage sludges often have higher metal concentrations than those made from other sources. State and federal agencies have established

maximum allowable levels of metals in biosolids composts that are to be used for land application. Even though turfgrass is not a food-chain crop and is more tolerant of metals than many other plants, composts usually have to meet the same standards set for other crops. In Pennsylvania, the Department of Environmental Resources monitors the level of metals in biosolids compost. There are several biosolids composts that have been used successfully in Pennsylvania that fall well below the State's maximum allowable metal concentrations for land application.

Chemical properties

Carbon:nitrogen ratio	Below 30:1
Nitrogen	0.4 to 3.0 %
Phosphorus	0.2 to 1.5 %
Potassium	0.4 to 1.5 %
pH	5.8 to 8.0

Biological properties

Weed seeds	None to very few

Use these guidelines as a general guide. Higher or lower values for a given property don't necessarily mean the compost is unacceptable for turf use. Some composts meet these basic criteria, but other properties may make them unsuitable for use on turf.

Soluble salts

For various reasons, high soluble salt concentrations may be present in some composts. Excessive soluble salts can cause injury to turf by reducing water absorption, by toxicity, or by a combination of the two. A common question concerning soluble salts is: at what salt concentration will turf injury occur? The most truthful answer is that it depends on the type of salt, the salt tolerance of the turf, and how the compost will be applied.

Most soil laboratories can analyze composts for salt content. However, the salt concentration by itself may be somewhat misleading since the *type* of salt may be the more important factor in determining plant injury. For example, salts containing sodium are more toxic to turfgrasses than potassium salts.

Turfgrass species and varieties vary in their tolerance to soluble salts. Salt sensitive grasses such as Kentucky bluegrass may be injured at salt concentrations having a conductance of about 3 msiemens/cm in the germination and seedling stage (turfgrasses are particularly vulnerable in the early stages of growth). A moderately-tolerant grass, such as tall fescue, may be injured at much higher levels (between 6-10 ms/cm).

The method of compost application may also influence the degree of salt injury. When composts are incorporated into soils, the salt concentrations are greatly diluted. Irrigation further diminishes salt concentrations by leaching them out of the root zone. In a recent establishment study at Penn State, we incorporated a mushroom compost with a soluble salt content of 8.10 ms/cm into a clay loam soil and irrigated daily until Kentucky bluegrass seeds germinated (approximately 20 days). Despite this high salt concentration, no noticeable seedling inhibition occurred, presumably due to the dilution effect of soil incorporation and leaching. It should be noted that the salts were primarily composed of potassium and calcium and that the results might have been different if higher levels of sodium were present.

Surface applications of high-salt composts may cause injury to established grasses. Always irrigate to leach salts from the compost/soil mix immediately following application to avoid the possibility of salt injury.

Summary

The preceding guidelines serve as a general guide. Some composts may meet these criteria but could have other properties that make them unsuitable for turf use. Others may have properties that do not fall within these guidelines, yet are acceptable for use in some situations. When choosing a compost as a soil amendment or for surface application it is important that you are familiar with the product and how it will affect the turf. If you plan to use compost in your business, try to find a product that is consistent from batch to batch and preferably one that has been thoroughly researched and/or used successfully by other turf professionals.

If you are unfamiliar with the product, be sure to examine it for color, objectionable objects, particle size, and odors. It may be worth your while to visit the site where the compost is stored to make sure it is not contaminated with weeds or weed seeds. Other important considerations are moisture content, organic matter content, C:N ratio, nutrients, pH, metals, and soluble salts. ■

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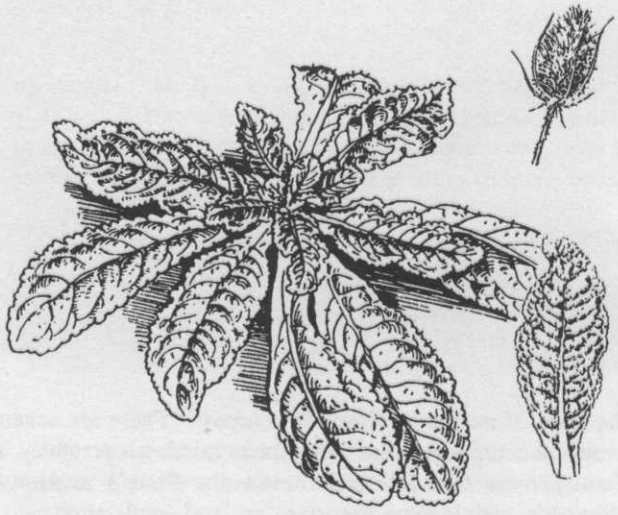
Editor's Note: As a service to our readers, Turf Grass Trends *is including this cumulative subject index for 1992.*



Teasel

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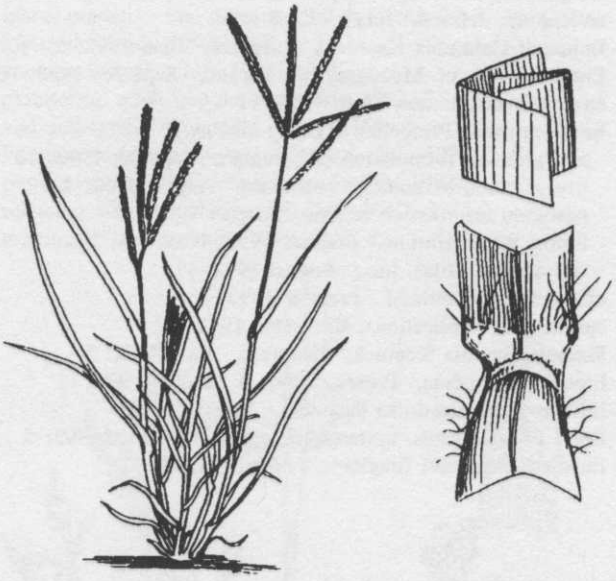

Goosegrass, silver crabgrass

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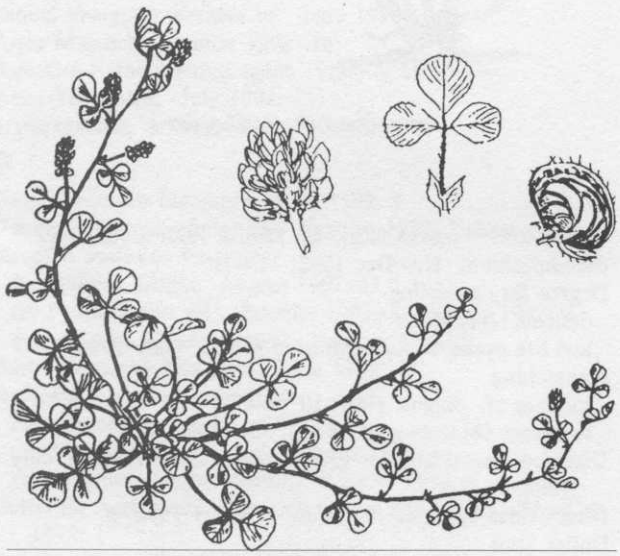

Black medic

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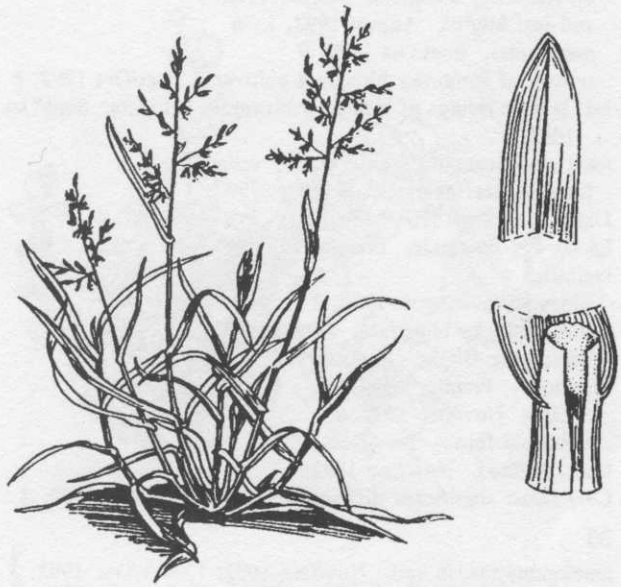

Annual bluegrass

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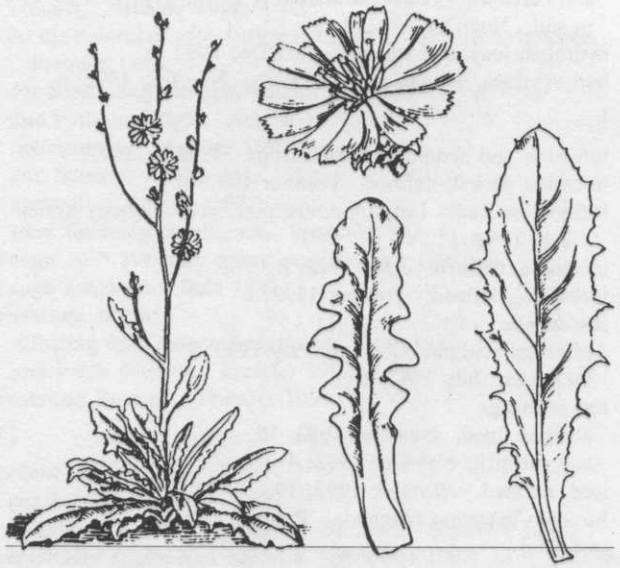

Chicory

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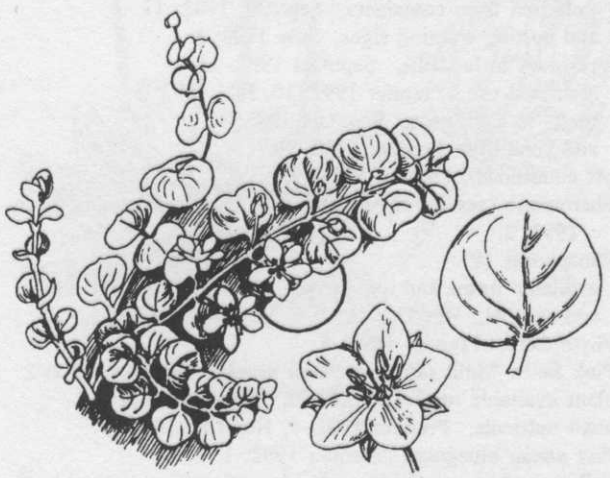

Moneywort

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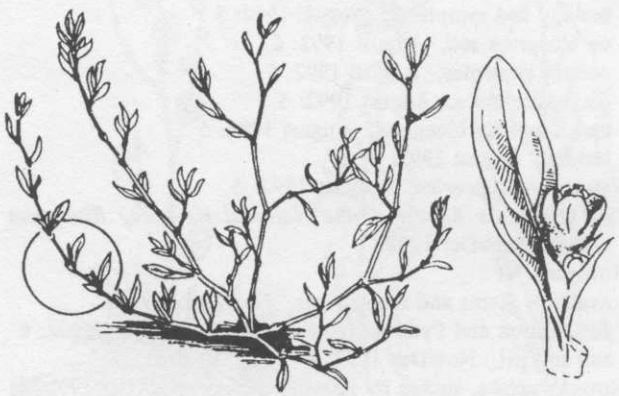

Knotweed

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Broad-leaved plaintain

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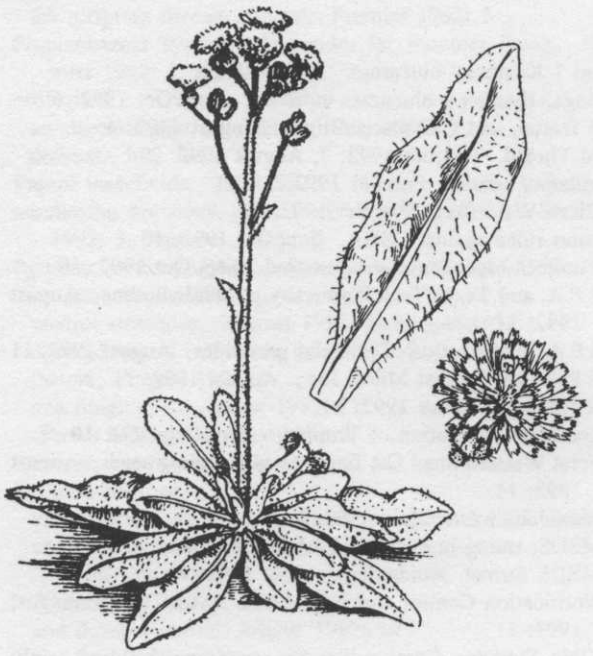

Hawkweed, paintbrush

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July '92		April '94	
August '92		May '94	
Sept./Oct. '92		June '94	
Nov./Dec. '92		July '94	
November '93		August '94	
December '93		September '94	
January '94		October '94	

Turf Grass TRENDS

Turf Grass Trends is published monthly.
1775 T St. NW, Washington, DC 20009-7124
Tel: (202) 483-TURF
Fax: (202) 483-5797
CompuServe: 76517,2451
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