Article 130

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Toward a Low Input Lawn

While many homeowners are concerned with stream quality, many also have a fundamental self-interest in retaining an attractive, dense and green lawn—regardless of the inputs of time, money, fertilizer, pesticides and water needed to sustain it. After all, a well-manicured lawn has undeniable aesthetic appeal to many residents. Therefore, one of the key challenges of any public outreach program is to convince roughly half of our homeowners that it is possible to grow a sharp looking lawn with low inputs (and not greatly increase the amount of labor expended to maintain it). This article sets forth some broad principles to guide homeowners toward a low input lawn and provides a starting point for designing a more effective outreach program to achieve this goal.

The most important input to the low input lawn is knowledge. Efficient management is based on a rudimentary understanding of soil properties, local climate, and the growing requirements of selected grass species. With this understanding of regional conditions, it is relatively simple to select appropriate grass species and to give the lawn what it needs at the proper time. Without this understanding, large amounts of grass seed, fertilizer, pesticides, water, and time may be wasted. This article presents the management techniques needed for a low input lawn in eight key steps:

Step 1. Lawn conversion

Step 2. Soil building

Step 3. Grass selection

Step 4. Mowing and thatch management

Step 5. Minimal fertilization

Step 6. Weed control and tolerance

Step 7. Integrated pest management

Step 8. Sensible irrigation

These steps, summarized in Table 1, are intended to provide a framework for the homeowner interested in reducing lawn inputs. A continuum of management options is presented within each step, allowing the homeowner to make the transition to a low-input lawn by gradual stages. This article can also be used as a starting point for designing a better community outreach program to promote the low input lawn.

Community Benefits of the Low-Input Lawn

Apart from their presumed benefit in reducing nutrient and pesticide runoff, low input lawns provide other economic benefits to a community:

- Reduced summer water demand
- Preservation of landfill capacity
- Reduced cost for management of public lands

Some of these benefits have been quantified; others are a matter of common sense.

Reduced Summer Water Demand

Low input lawns that use water conservation techniques can sharply reduce demands on water resources during periods of drought. During a recent California water shortage, it was estimated that 30 to 50% of all residential water use went to landscaping (Foster 1994). Lawn watering was estimated to account for 60% of summer water use in Dallas, Texas (Jenkins, 1994). As a result, many Western municipalities now offer rate rebates to homeowners implementing water efficient landscaping (xeriscaping).

Changing watering techniques and replacing water-demanding plants with water-efficient and locally adapted ones can reduce water use by 20 to 43% (Foster, 1994). Even in humid Atlanta, Georgia, calculations showed that maintenance and water savings would pay for the cost of such retrofitting in only three years (Foster, 1994). Full conversion to xeriscaping (i.e., growing turf solely with the available rainfall supply) can easily cut water use by 50 to 60% (Foster, 1994 and Ellesfon, 1992).

One of the first principles of xeriscaping is to reduce turf coverage on the lawn. As a general rule, grass consumes eight units of water, trees consume five units of water, and shrubs and ground covers consume four units of water (Foster, 1994). A one acre lawn consumes up to a half million gallons of water a summer in some regions of the country (Jenkins, 1994). A well-shaded lawn, however, uses up much less surface water on a hot, sunny day than an unshaded lawn (Foster, 1994).

Preservation of Landfill Capacity

Yard wastes (clippings, fallen leaves, trimmings, and uprooted weeds) can make up 20 to 25% of house-

Table 1: Eight Key Steps Toward a Low Input Lawn	
Step 1: Lawn conversion	**Convert lawn areas into groundcover, trees, shrubs, or meadow plantings.** For a *low* input approach, replace the grass underneath mature trees with groundcover. For an even *lower* input approach, examine your lawn for potential conversion areas and plant groundcovers, trees, shrubs, or perennials in all areas where grass is hard to grow. For the *lowest* input approach, use turf only where it is the best plant to fulfill a particular function, such as providing a children's sports area.
Step 2: Soil building	**Provide a strong foundation for the lawn.** For a *low* input lawn, get a soil test to determine the soil's pH and fertility. You may not need to add any lime or fertilizer to your lawn. For a *lower* input lawn, test for soil compaction. Can you sink a screwdriver into the ground without pounding or is the soil compacted? If the soil is compacted, aerate with a hand corer or mechanical aerator. For the *lowest* input lawn, examine the soil's texture— neither extremely sandy soils nor extremely heavy clay soils make for good lawns. Next count earthworms—if none can be found in a square foot of soil, there's a problem. A healthy soil community has over 10 per square foot. With this basic understanding of soil acidity, fertility, compaction, texture, and earthworms, one can build soil that supports dense, healthy turf.
Step 3: Grass selection	**Choose the type of grass that will be easiest to grow.** For a *low* input lawn, select hardy grass species adapted your the region's climate. For a *lower* input lawn, select named grass varieties to meet your specific needs. For the *lowest* input lawn, try the new low-input slow-growing or dwarf grass mixes.
Step 4: Mowing and thatch management	**Mow to the right height at the right time and recycle clippings.** For a *low* input lawn, leave clippings on the lawn to provide nutrients and moisture. For a *lower* input lawn, set mowing height as high as possible. For the *lowest* input lawn, adjust mowing height and frequency during the growing season and monitor thatch levels.
Step 5: Minimal fertilization	**Give the lawn what it needs but don't overfeed.** For a *low* input lawn, recycle clippings and (in the right season) apply commercial fertilizer at half the recommended rate; avoid weed and feed formulations and don't fertilize if rain is imminent. For a *lower* input lawn, fertilize as above but use encapsulated nitrogen or an organic product instead—and fertilize only if soil tests show it's needed. For the *lowest* input lawn, substitute home generated compost for commercial organic or encapsulated products.
Step 6: Weed control and tolerance	**Establish a realistic tolerance level for weeds and use least toxic control methods to maintain it.** For a *low* input lawn use least toxic weed control methods such as: cultivation, solarization, flaming, mowing, or herbicidal soap. For a *lower* input lawn, grow strong healthy grass and it will crowd out weeds. For the *lowest* input lawn, broaden your definition of "lawn" to include weeds that perform desirable functions.
Step 7: Integrated pest management	**Establish a realistic tolerance level for pests and use least toxic control methods to maintain it.** For a *low* input lawn, use least toxic control methods such as removing or trapping pests, introducing biological control agents, or apply least toxic chemical controls such as insecticidal soaps. For a *lower* input lawn, grow strong, healthy grass that can resist attack. For the *lowest* input lawn, use cultural controls to prevent infestation, protect natural predators, and add beneficial soil microbes.
Step 8: Sensible irrigation	**Practice water conserving landscaping techniques.** For a *low* input lawn, water infrequently, in the early morning, but soak the lawn well. For a *lower* input lawn, water only when the lawn definitely needs it, and calibrate sprinklers. For the *lowest* input lawn, accept that the grass may not be green year round.

hold garbage (Kolb, 1991). A one acre lawn generates almost six tons of grass clippings a year, or nearly a thousand bags worth (Jenkins, 1994). It is estimated that yard waste fills up 10 to 50% of the nation's landfills (Jenkins, 1994). Although grass clippings decompose rapidly on the lawn, they often persist for a long time in landfills. In 1981 the city of Plano, Texas, instituted a program that encouraged residents to leave clippings on home lawns to provide nutrients and moisture. Knoop and Whitney (1989) reported the results: the city saved $60,000 in disposal costs in the first year, even though the number of households served increased 12% over the same period. Residents participating in the program saved $22,000 in plastic bag purchases. In 1989, it was estimated that Fort Worth, Texas could save about $200,000 in annual disposal costs if all homeowners stopped bagging grass clippings. By 1991, 34 states had enacted restrictions on yard waste dumping or were debating such laws (EPA, 1991). In Seattle, an education program encouraged urban citizens to compost yard and food wastes. About 5,300 tons of yard waste were removed from disposal annually, for a net savings of $378,000 (EPA 1991).

Reduced Cost for Management of Public Lands

Integrated pest management (a pest control approach that minimizes pesticide use) is an excellent investment on public lands. Raup and Smith (1986) reported that integrated pest management (IPM) reduced community pest management costs by 22%, even though more pests were controlled under the new program. The use of expensive chemicals to control weeds can also be substantially reduced. Simply changing mowing height can, by itself, reduce weed levels by over 50% (Alliance for the Chesapeake Bay, 1994). Finally, converting lawns to plantings that require less intensive maintenance can also generate savings. In Maryland, a program to landscape highway interchanges allowed the state to reduce mowing by 10% for a $300,000 savings (Rodbell, 1993).

Steps Toward the Low Input Lawn

Step 1: Lawn Conversion

Convert lawn areas into groundcover, trees, shrubs, or meadow plantings. For a *low* input approach, replace the grass underneath mature trees with groundcover. For an even *lower* input approach, examine your lawn for potential conversion areas and plant groundcovers, trees, shrubs, or perennials in all areas where grass is hard to grow. For the *lowest* input approach, use turf only where it is the best plant to fulfill a particular function, such as providing a children's sports area.

How Much Lawn Should Be Converted?

Most lawns have areas that are not suited to grass growth. These include frost pockets, exposed areas, dense shade, steep slopes, and wet, boggy areas. While it is possible to grow grass in any of these areas, higher inputs of fertilizer and/or water are needed to compensate for inhospitable conditions. In addition, these areas may be difficult to safely mow. Even in moderate terrain, lawns add up to large maintenance investments. The average homeowner spends 40 hours a year simply mowing, so a large lawn may take about as much time as the traditional family summer vacation (Schultz, 1989). Less lawn results in less work. The shape of an area should also be considered, since small, edge areas such as narrow strips or tight corners can be difficult to mow, water, and fertilize evenly. For lawns with the same surface area, water use rises as the perimeter increases (Ellefson, 1992). Converting lawn edges to less intensive plantings is a particularly effective strategy for reducing inputs.

Once a lawn area has been targeted for conversion, alternative plantings must be selected. Existing flowerbeds or groupings of trees and shrubs can simply be expanded, or groundcovers can be used to replace grass. Another option is to establish plantings that mimic native plant communities such as forests, meadows, and wetlands. In addition, some areas of the lawn can be converted into mulched beds.

Step 2: Soil Building

Provide a strong foundation for the lawn. For a *low* input lawn, get a soil test to determine the soil's pH and fertility. You may not need to add any lime or fertilizer to your lawn. For a *lower* input lawn, test for soil compaction. Can you sink a screwdriver into the ground without pounding, or is the soil compacted? If the soil is compacted, aerate with a hand corer or mechanical aerator. For the *lowest* input lawn, examine the soil's texture: neither extremely sandy soils nor extremely heavy clay soils make for good lawns. Next, count earthworms: if none can be found in a square foot of soil, there's a problem. A healthy soil community has over 10 per square foot. With this basic understanding of soil acidity, fertility, compaction, texture, and earthworms, one can build soil that supports dense, healthy, turf.

The first step in building good soil is to take a soil test to determine pH and fertility. Soil should be tested every three years, with either an inexpensive test kit purchased at a garden center or a soil sample tested by the local Cooperative Extension Service (found in the Blue Pages). A soil test is essential to determine whether any fertilizer or lime is actually needed. The next step in soil building is to test for compaction.

Compaction keeps air, water and nutrients from entering the soil. Compacted soils have less microbial activity. Soil temperatures also increase, so grass in compacted soil may be one to 13 degrees hotter (Schultz, 1989). Grass grown in compacted soils also has shallower roots, more thatch, and is generally weaker. To

check for compaction, try to sink a screwdriver into the ground without pounding. If the screwdriver doesn't easily penetrate the soil, aerate with a hand corer or rent a mechanical aerator. Sometimes aeration is all that is needed to turn a problem lawn into a thriving lawn.

To complete the soil analysis, it is necessary to determine soil texture and count earthworms. Two simple methods are used to determine texture. In the first, a soil sample is mixed with water and the proportion of settled soil components (clay, sand, etc.) are measured. In the second, a handful of moist soil is collected and squeezed through the fist. Gershuny (1993) gives instructions for both tests. Neither extremely sandy soils nor extremely heavy clay soils make for good lawns, so it may be necessary to add organic matter.

Earthworms are only part of the critical soil life community, but they are a good indicator species. If none are found in a square foot of soil, this may indicate a problem with soil texture. A healthy soil community has over 10 worms per square foot (Gershuny, 1993). With this basic understanding of soil acidity, fertility, compaction, texture, and earthworms, one can build soil that supports dense and healthy turf.

Step 3: Grass Selection

Choose the type of grass that will be easiest to grow. For a *low* input lawn, select hardy grass species adapted to the region's climate. For a *lower* input lawn, select named grass varieties to meet your specific needs. For the *lowest* input lawn, try the new low-input slow-growing or dwarf grass mixes.

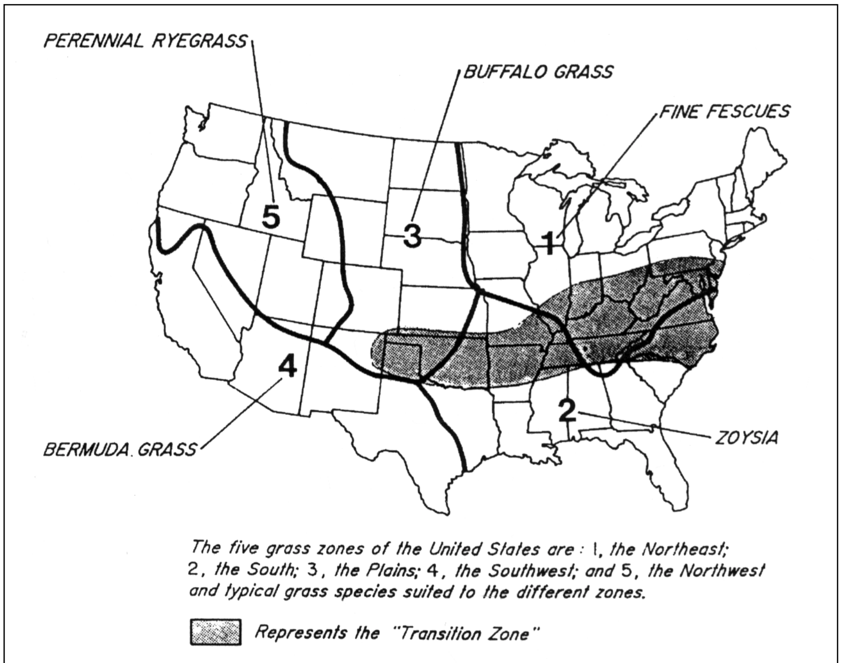

Figure 1: Grass Zones of the U.S. and Examples of Suitable Grasses (Bucks, 1995 and Schultz, 1989)

Which Grass?

All grasses are not created equal. Most of us realize that bananas trees cannot be grown in the upper Midwest because they are not adapted to the winter climate or the short growing season. And yet, many homeowners try to grow bluegrass, which is best suited to the cool, rainy climate of England. Since bluegrass is a shallow-rooted and fast growing grass, it is prone to dry out very quickly in a hot or dry summer. It makes better sense to choose a more deeply-rooted grass (such as tall fescue) or one that is adapted to drier conditions (such as buffalograss). Grass selection also needs to reflect winter conditions. Warm season grasses such as zoysia go dormant (turn brown) in cold weather. They come out of dormancy when the weather is above 50 degrees, and grow best when the temperature is between 80 and 95 degrees. Cool season grasses such as fine fescues will stay green through the winter but go dormant in the summer. They grow best in 60 to 75 degree temperatures. The United States has been divided into six major grass growing zones, as shown in Figure 1. These zones help guide the selection of the grass species best adapted to the local climate (see Table 2).

Once a grass species has been selected, it is important to select the particular variety that suits the unique site conditions and maintenance requirements of the lawn. A wide range of cultivars (cultivated varieties) is now available. Cultivars have been developed for particular characteristics such as shade tolerance or improved disease resistance. Recent developments include slow-growing or even dwarf cultivars and grasses that require less fertilizer and water. Others have been developed with endophytes, fungi that enable the grass to resist surface-feeding insects including aphids, cutworms, chinch bugs and sod webworms. Cultivars are given names such as AURORA hard fescue or PRAIRIE buffalograss. A named cultivar also means that the seed or sod is certified to be true to type.

Step 4: Mowing and Thatch Management

Mow to the right height at the right time, and recycle clippings. For a *low* input lawn, leave clippings on the lawn to provide nutrients and moisture. For a *lower* input lawn, set mowing height as high as possible. For the *lowest* input lawn, adjust mowing height and frequency during the growing season and monitor thatch levels.

Grasscycling: Letting Clippings Lie

Grass is unusual in that it does not grow from the tip but from the crown, near the soil line (see Figure 2). Mowing cuts off the oldest part of the plant, and thus the plant can tolerate repeated cropping. Traditional lawncare practices call for raking and removing clippings, which were thought to promote thatch and disease. In fact, leaving clippings on the lawn is benefi-

Table 2: General Comparison of Grasses

Type	Drought Tolerance	Disease Resistance	Insect Resistance	Heat Tolerance	Cold Tolerance	Growth Rate
Cool Season Grasses						
Kentucky bluegrass	medium	medium	medium	fair	excellent	medium
Perennial ryegrass	medium	fair	fair	fair	good	fast
Fine fescue	good	good	good	poor	excellent	slow
Tall fescue	good	good	excellent	medium	fair	fast*
Warm Season Grasses						
Zoysia-grass	excellent	good	good	excellent	medium	slow
Bermuda grass	excellent	fair	good	excellent	poor	fast
Centipede grass	poor	good	good	good	very poor	slow
St. Augustine grass	fair	medium	medium	good	very poor	fast
Prairie Grass						
Buffalo-grass	excellent	fair	good	good	good	slow

* except for dwarf varieties which are medium to slow-growing

cial, so long as the lawn is frequently mowed. Clippings provide nutrients and moisture. Researchers at the University of Connecticut Agricultural Station used radioactive nitrogen to track the fate of applied nutrients when clippings are recycled. They found that within a week, most of the nitrogen from the clippings was incorporated into new grass growth. After three years, nearly 80% of the applied nitrogen had been returned to the lawn through the clippings (Schultz, 1989). The Rodale Institute Research Center found that an acre of clippings provides an average of 235 pounds of nitrogen and 77 pounds of phosphorus each year (Meyer, 1995). Clippings also return moisture to the grass, which helps protect against drought, and calcium, which helps keep the soil from getting too acid.

How Low to Mow?

Mowing height is critically important. Traditional lawncare looks to the close-cropped putting green as the ideal turf. Unfortunately, close mowing can weaken the grass and expose the grass crowns to sunburn. It also exposes the soil to sunlight, which may encourage weed seeds to germinate. Keeping grass taller will actually shade out weeds, reducing them by more than

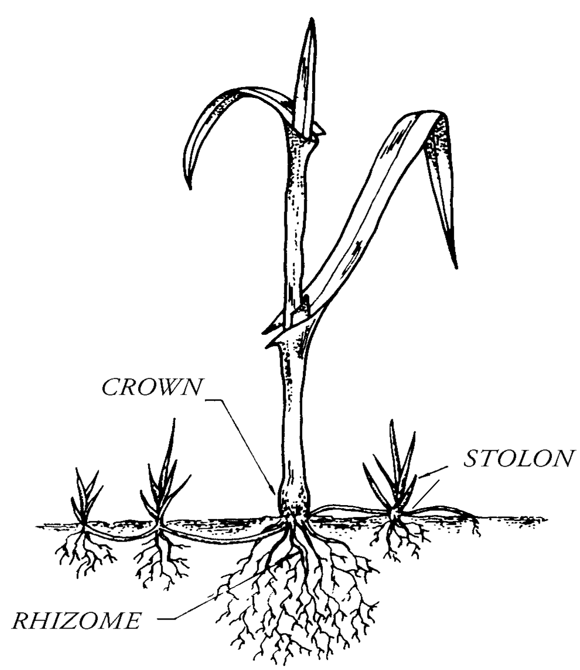

Figure 2: Lower Anatomy of the Grass Plant (Schultz, 1989)

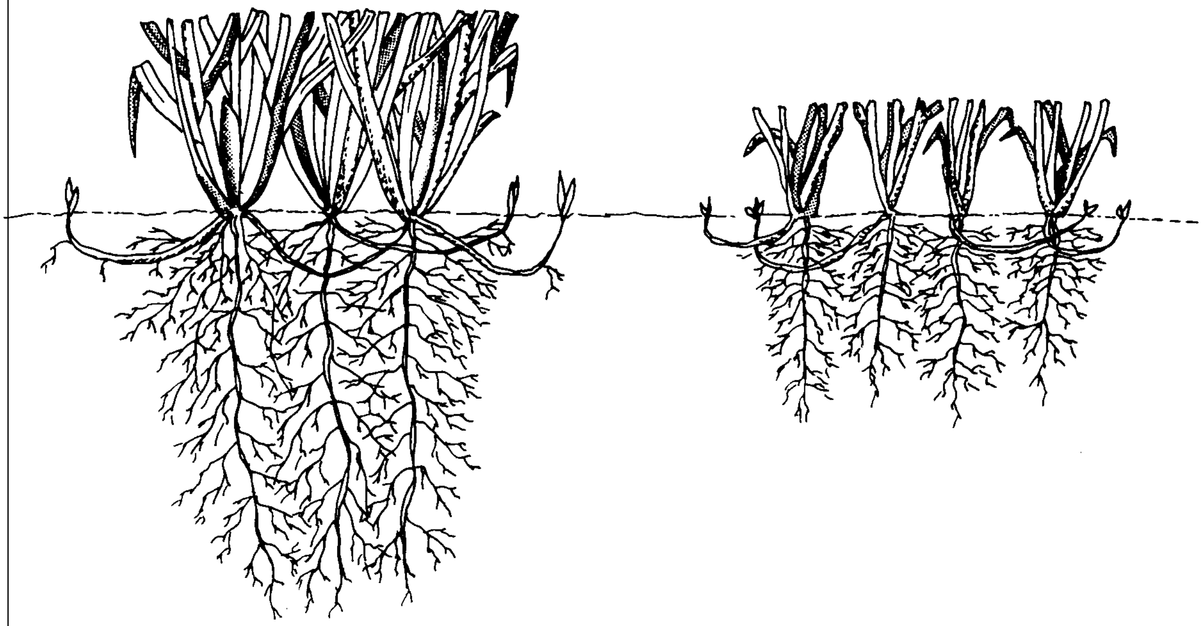

Figure 3: Mowing Height Affects Turf Density and Root Length (Ferrara, 1992)

50% (Alliance for the Chesapeake Bay, 1994). Mowing taller also encourages thicker turf and deep roots (Figure 3). Many grasses spread through stolons (shoots that run along the ground and produce a new plant at the tip) or rhizomes (underground horizontal stems that produce new plants).

Since the blade tips contain chemicals that inhibit side shoots, mowing can stimulate the growth of stolons or rhizomes. However, turf trials at Purdue University found the spread of grass varies with mowing height. After 22 weeks, a freshly-seeded lawn that was mowed to 3/4 inch height covered 42% of its plot. In contrast, a lawn mowed to three inches covered 80% of its plot (Schultz, 1989). Mowing high encourages deep roots because with more leaf surface, the grass plants are able to manufacture more food. Researchers at the Michigan Agricultural Station found closely cropped grass (one-inch mowing height) had less root growth and shoot regrowth, as well as fewer lateral stems (Schultz, 1989). Table 3 gives general mowing heights for different grass species.

Mowing Frequency and Thatch Management

Mowing frequency is also important. Mow too much or too often, and the grass can be damaged. To keep the grass healthy, it is recommended that no more than one-third of the leaf be cut at a time. While following the "one-third" rule may mean mowing more frequently, it does not necessarily mean spending more time behind the mower. This is due to the fact that grass grows at different rates throughout the year. When the grass is growing rapidly, it may be necessary to mow twice a week. At other times, mowing twice a month may be sufficient.

Lastly, homeowners should learn how to recognize and measure thatch; too much thatch (over half an inch) is a sign of unhealthy grass, poor maintenance, and/or compacted soil. Thatch is a brown, straw-colored layer between the green grass and the soil. A small thatch layer is actually helpful, it functions like mulch in a flower-bed to conserve moisture and block weeds. When thatch is deep it may keep water, air and nutrients from reaching the grass roots. Shallow watering, overfertilization and close mowing all can increase the thatch layer. Practicing low input lawncare and aerating the soil can prevent excessive thatch build-up. If thatch build-up has occured and sprinkle compost over the lawn (a practice called top dressing) and aerate to encourage thatch decomposition.

Step 5: Minimal Fertilization

Give the lawn what it needs but don't overfeed. For a *low* input lawn, recycle clippings and (in the right season) apply commercial fertilizer at half the recommended rate; avoid weed and feed formulations and don't fertilize if rain is imminent. For a *lower* input lawn, fertilize as above but use encapsulated nitrogen or an organic product instead—and fertilize only if soil tests

show it's needed. For the *lowest* input lawn, substitute home generated compost for commercial organic or encapsulated products.

How Much to Apply?

The Lawn Care Field Guide lists regional resources that provide recommended fertilization rates for specific grass species. The actual amount required by a particular lawn may, however, be much less than the standard recommended rate. According to the Northern Virginia Soil and Water Conservation District a good rule of thumb is to use half of what you think you need or half of the manufacturer's recommended application, and never more than 44 lbs./acre in a single application. This advice recognizes that grasscycling can easily provide about half the required nutrients to the lawn. It also recognizes that it is better to underapply (since additional fertilizer can always be applied in the future) than to overapply and risk damage to the grass and runoff or leaching of excess nutrients. The surest way to apply the right amount is to get a soil test, and then fertilize only when the test indicates nitrogen is needed.

When to Apply?

Table 4 indicates the appropriate season for fertilization by region and grass type. Cool season grasses are best fertilized in the fall, when their roots are actively growing and topgrowth has ceased. Warm season grasses are best fertilized in several small doses during the summer. (Summer grasses maintain root growth during warm weather.) Fertilizing in the wrong season wastes money as much of that fertilizer goes unused (and increases the risk of stream pollution). Moreover, fertilization in the wrong season can either stimulate the growth of weeds or grass growth at the wrong time. For example, spring fertilization of cool season grasses usually gives broadleaf weeds a headstart in competing with grass, while summer fertilization may weaken the grass and increases water needs.

What to Apply?

It is best to use an encapsulated formulation or an organic fertilizer rather than inorganic forms to minimize nutrient leaching. Encapsulated fertilizers are coated to release nutrients more gradually. In leaching column tests, Alva (1992) found that losses of all three major nutrients (nitrogen, phosphorus, and potassium) were strongly reduced with controlled-release fertilizer blends. Lawn formulations with encapsulated nitrogen are often labeled "WIN" for water insoluble nitrogen.

Organic fertilizers are also a good choice, as they break down more slowly than traditional chemical fertilizers. In addition, composted organic fertilizers contain active microorganisms and humus. Humus not only helps build soil texture, but its complex organic compounds can buffer soil. The Connecticut Agricultural Experiment Station in New Haven has been comparing vegetable plots treated with compost against plots treated with inorganic fertilizer. Results from the first 12 years show that compost-only treatment had similar yields and increased organic matter and water retention (Long, 1994). Italy's Soil Microbiology Center found that composting could sharply increase desirable soil microorganisms (Long, 1995a).

Disease symptoms may also be lessened with organic fertilizers. For example, researchers at Michigan State University found that bluegrass lawns treated with organic fertilizers suffered less disease than lawns treated with chemical fertilizers (Long, 1995b).

Step 6: Weed Control and Tolerance

Establish a realistic tolerance level for weeds and use least toxic control methods to maintain it. For a *low* input lawn use least toxic weed control methods such as cultivation, solarization, flaming, mowing, or herbicidal soap. For a *lower* input lawn, grow strong healthy grass and it will crowd out weeds. For the *lowest* input lawn, broaden your definition of "lawn" to include weeds that perform desirable functions.

What Is a Weed?

"Weeds" go in and out of fashion. For example, clover was for many years an ingredient of premium

Table 3: General Mowing Heights (in Inches)

Species	Cool weather and/or shade	Hot weather	Last mow
Kentucky bluegrass	2.5	3.0	2.0
Perennial ryegrass	1.5	2.5	1.0
Fine fescue	1.5	2.5	1.0
Buffalo-grass	1.5	2.5	1.0
Tall fescue	2.5	4.0	2.0
Zoysia-grass	0.5	1.0	0.5
Bermuda grass	0.5	1.0	0.5
Centipede grass	1.0	2.0	1.0
St. Augustine grass	2.0	3.0	1.5

Table 4: General Regional Maintenance Calender						
Region	**January–March**	**April–May**	**June**	**July–August**	**September**	**October–December**
Humid Midwest and Northeast	Remove dead material and winter debris	Start new lawns, reseed or resod	Northern grasses may start to go dormant	Do not water in July; it promotes grub growth and the spread of disease	If needed, fertilize after active top-growth has stopped; apply lime. Start new lawns, reseed or resod.	Clean up and rake up
Humid South	Resod, resprig, or replug; if needed apply lime	Start new lawns	If needed, partial fertilizer dose	If needed, partial fertilizer dose	If needed, fertilize winter grasses	Mow the first fall of leaves into the lawn
Plains	Remove dead material and winter debris	Mow often, but set blades high	Northern grasses may start to go dormant	Do not water in July; it promotes grub growth and the spread of disease	If needed, fertilize	Lower mower height to 2 inches for the last cut of the year
Southwest	Plant new lawns	If needed, partial fertilizer dose for summer species	This is the last month lawns should be planted	If needed, partial fertilizer dose for summer species	Mow high to shade out crabgrass	If needed, fertilize winter grasses
Northwest	Remove dead material and winter debris	Remove excess thatch	Monitor weed and grub levels	The grass will slow down, so mow less often	Start new lawns, reseed or resod	If needed, fertilize

lawn seed mixtures. However, once a herbicide was available to kill clover, it was no longer desirable. Indeed, many of the weeds that are decried in lawn care guides were once the mainstays of the kitchen garden. Everyone has to decide for themselves which weeds they can live with, and which must be controlled. The traditional lawncare approach of preventive pre-emergent weed control, however, is certainly wasteful and expensive, and may well contribute to the herbicide levels found in urban streams.

How Many Weeds Make Too Many?

Personal preference will dictate how many weeds should be tolerated. A lawn that is 10% weeds may appear to be weed-free, and even a lawn with 20% weeds can provide an attractive, consistently green appearance. To get an objective measure of how weedy a lawn is, a simple transect count can be performed. This is done by stretching a hose or string diagonally across the lawn. While walking along the line, look at the plants in front of your toes. For each step, record weed or grass. Repeat the process on the other diagonal (forming an X) and then add up how many grasses versus weeds were found. The test can be repeated at regular intervals to monitor the effectiveness of weed control efforts. Whatever the selected tolerance level, it should be realistic. For example, zero weed tolerance is probably unattainable in the long run.

What Good Are Weeds?

Weeds can tell a lot about soil conditions. For example, sedges indicate poorly drained soil. Wild mustards are a sign of compacted soil or soil with a hard crust. Field peppergrass appears in alkaline soils. Daisies show poor fertility, while lamb's quarter could indicate the opposite. If clover is common in your lawn (and you didn't plant it), it indicates that nitrogen levels may be low. Since the clover fixes nitrogen, it can do well in areas where the grass may go hungry. Dandelions are especially common in lawns with acid surface soil.

Composting weeds that have been removed by hand can take advantage of desirable weed qualities. Most weeds help feed the compost pile, but plants like dandelions provide a special service. Called dynamic accumulators, they reach deep into the soil for essential elements. Traditional lawncare often recommends a feeding of iron to green up the lawn (not surprising since excess phosphorus can lead to iron deficiency). Instead, common weeds such as dandelion, chickweed, plantain, purslane, and lamb's quarter can be used for iron accumulation.

Many weeds also attract beneficial insects if allowed to flower. These insects need pollen or nectar in addition to the protein they get from consuming pests. For example, ladybugs feed on dandelion pollen and clover. In early spring, when not much is blooming, dandelions can be a very important food source for overwintering ladybugs. Predatory wasps take advantage of chickweed, while mustard attracts a variety of beneficial insects. Thus, weeds in the lawn can actually help plants in surrounding vegetable and flower beds.

Of course, insects aren't the only ones that find weeds appetizing. Some of the most common weeds are uncommonly nutritious for people. Before imported greens were available year-round, these plants served an important dietary function.

Least-Toxic Weed Control

There are four techniques to least toxic weed control: cultivation, solarization, mowing, and herbicidal soap. Cultivation means physically weeding, and then seeding. While it seems like a lot of work, there are many devices available to make weeding easier. In any case, no matter how weeds are removed, the resulting bare spots should always be leveled and re-seeded to prevent weeds from reoccurring. Solarization involves covering a weedy patch with black plastic for a few days to shade out the weeds while leaving the grass intact. If an area is completely infested, clear plastic can be used to "cook" the weeds (and their seeds in the ground) for several weeks. Grass can then be re-established in the resultant cleared patch. In addition to setting mowing heights to shade out growing weeds, mowing the tops of tall weeds will weaken the plants and cut down on seed formation. Herbicidal soaps can be used to spot-treat weeds, but keep in mind they are toxic to all plants they touch. Herbicidal soaps usually break down in 48 hours.

While all four least-toxic control techniques are preferable to blanket herbicide applications, weed prevention is an even better option. The best defense against weeds is vigorous, healthy grass. If the homeowner follows the eight steps outlines in this article, weeds will not normally be a problem.

Finally, a lawn can be more than a green carpet. It can include attractive flowers and living fertilizer factories. It can supplement the vegetable harvest and encourage beneficial insects to take up residence. Such a lawn is both more interesting and more functional than the traditional grass monoculture lawn. Some call it a "wild lawn" or a "flowery meade." While it is indeed wilder than a traditional lawn, it is still low-growing and more formal in appearance than a meadow. In the wild lawn, many so-called weeds become part of the design.

Step 7: Integrated Pest Management

Establish a realistic tolerance level for pests and use least toxic control methods to maintain it. For a *low* input lawn, use the least toxic control methods such as removing or trapping pests, introducing biological control agents, or apply less toxic chemical controls such as insecticidal soaps. For a *lower* input lawn, grow strong, healthy grass that can resist attack. For the *lowest* input lawn, use physical controls to prevent infestation, protect natural predators, and add beneficial soil microbes.

What Is Integrated Pest Management?

The best defense against pests is healthy, vigorous grass. Table 2 compares major grass types for insect-resistance. Cultivars specially developed for insect or disease resistance are also available. When more control is needed, Integrated Pest Management (IPM) can control pests with far fewer pesticides than traditional lawncare. The IPM approach consists of four steps that are taken before any pesticide is used:

1. **Accurate pest identification and monitoring.** To select the right control, it is necessary to know the "good" bugs from the "bad" ones, and learn their life-cycles. For example, if Japanese beetles appear in your lawn and you pay attention to their numbers, you can get an idea of the size of the grub population to come. Forewarned is forearmed.

2. **Evaluation of risk.** Unlike the "see and spray" approach, IPM establishes action thresholds. For example, if Japanese beetle grubs might be a problem in spring or fall, dig a one foot square plot (two to three inches deep) and simply count the grubs. If more than six to eight grubs per square foot are present, control may be needed.

3. **Physical/cultural controls.** For example, adult Japanese beetles can easily be handpicked and destroyed.

4. **Biological controls.** Encourage predators and parasites to take up residence. For example, cardinals eat Japanese beetles. If birds are attracted with a nesting site, water, and winter food, they will be ready for duty when the beetles come. Beneficial nematodes can be introduced to attack the grubs.

How Can Pest Damage Be Prevented?

Most lawn diseases are caused by fungi, and they are most likely to occur under particular conditions of temperature and humidity. Thus, an important part of prevention is learning which diseases tend to occur during which seasons. Selecting resistant grasses, water management, fertility management, mowing / thatch management, and aeration are all important in disease prevention. For example, dull mower blades tend to tear the grass, and the resultant ragged cut allows disease organisms easy entry. Having a mixture of lawn grasses also increases disease resistance.

One method of both preventing and treating lawn diseases is to increase the numbers of beneficial soil microbes. These microbes, which out-compete the disease organisms, are found in aged compost piles and composted tree bark. They are also available in some commercial organic fertilizer products. Least toxic chemical treatments include plant-derived products like neem oil or garlic oil as well as fungicidal soaps. For a thorough discussion of integrated pest management for lawn diseases and pests, consult a reference such as Olkowski, Daar, and Olkowski (1991).

Step 8: Sensible Irrigation

Practice water conserving landscaping techniques. For a *low* input lawn, water infrequently, in the early morning, but soak the lawn well. For a *lower* input lawn, water only when the lawn definitely needs it, and calibrate sprinklers. For the *lowest* input lawn, accept that the grass may not be green year round.

Efficient lawn irrigation is not well understood by most homeowners. Often, the lawn is given a light watering whenever the weather is dry. This approach may do more harm than good, since the water never penetrates below the top few inches of soil. Such shallow frequent watering leads to shallow rooted, fragile grass. It is much better to water less, often but more deeply. Also, watering in the early morning avoids wasting water through evaporation.

At the other extreme, some homeowners install an automatic system and water whether the lawn needs it or not. This overwatering leads to excessive top growth, weakens the grass, requires frequent mowing, and sets the stage for disease to flourish. Overwatering also can leach away nitrogen even without overfertilization (article 38). Instead, the goal should be to water only when the lawn really needs it. If footprints can be seen after walking across the lawn, it may be a signal to water. Sprinklers should be carefully calibrated in inches of water per hour to determine the time required to wet the soil to a depth of six inches. In times of drought, it is necessary to make up the difference using a general rule of thumb of one inch of water every seven to 10 days (or water until it reaches a desired soil depth of six to 18 inches). Be sure not to apply water faster than the ground can absorb it, or runoff may be created. Lastly, *water harvesting* techniques such as sloping walkways toward turf areas or extending downspouts into the ground can be used to promote runon and make more efficient use of rainfall.

Finally, it should be kept in mind that it is not natural for lawns to stay green year-round in most parts of the country. Since grass grows from the crown instead of the tip, the plant lets the leaves go dormant in order to survive a drought. Though brown, crunchy, and to all appearances dead, the lawn will revive when cooler temperatures and wetter weather return. Drought should be regarded as a natural seasonal event, like trees losing leaves in the fall. Homeowners that resist the urge to water save on water bills and get a welcome break from mowing chores.

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