Certified Nursery &
Landscape Professional

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Training Manual

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New York State Nursery & Landscape Association

230 Washington Ave Ext, Suite 101, Albany, NY 12203-3539

Phone (518) 580-4063 | E-Mail: info@nysnla.com

LAWN ESTABLISHMENT & MAINTENANCE

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Lawn Establishment and Maintenance

Establishing a lawn is not an easy task, but if you follow the guide lines presented here, the results will be well worth the effort. Keeping a lawn vigorous, healthy and thus more tolerant of diseases and insects is more important than ever in light of today's increasing concern about pesticide use.

Establishing a New Lawn

A new lawn should be seeded between August 15 and September 15 in upstate New York and between August 15 and October 1 in southeastern New York. Warm soils, cool temperatures, and autumn rains produce an environment favorable for seed germination and seedling growth. Competition from weeds is lower in fall than in early spring. Lawns can be established in spring and summer when irrigation is available but may become infested with annual weeds unless preventive steps are taken. Ensuring a dense, vigorous turf from the beginning will result in an attractive lawn and lower maintenance costs for many years.

Renovate or Establish a Lawn in Late Summer

The cooler temperatures, adequate moisture and less weed competition make the middle of August through September most favorable to sprout seeds and grow grass seedlings.

Steps to Successful Lawn Establishment

1. Analyze the site
2. Have the soil tested
3. Eliminate existing vegetation
4. Drain and grade
5. Add Fertilizer or other amendments
6. Select Seed
7. Prepare the seedbed
8. Plant
9. Irrigate
10. Mow

1. Analyze the Site

A few weeks before seeding, set realistic goals based on your aesthetic standards, the amount of maintenance you are willing to provide, degree of shade, and how the lawn will be used. Giving some thought to these issues will help you make the most suitable choices and avoid common pitfalls.

Ask yourself some questions about the site.

- How well does the soil drain?
- Will the area need to be provided with surface or subsurface drainage, or will the site be droughty?
- Is the soil too acidic? Too alkaline?
- How much topsoil is on the site, and does it need to be amended?
- Will the lawn be established by seed or sod?

Answers to these questions will help you estimate costs and may change expectations.

Not all residential sites are favorable for growing an acceptable lawn. Heavily shaded or severely sloped areas are difficult and expensive to establish and maintain. Turfgrass may not be the most suitable ground cover for the entire area.

2. Have the Soil Tested

Do not neglect this important step. The only opportunity to incorporate lime, sulfur, fertilizer or organics into the root zone is when a lawn is being established. A competent laboratory can test the soil to determine the required amendments. Contact your county Cooperative Extension office for information on obtaining a soil test.

See Chapter 1 of this Training Manual for detailed information on Soils and Soil Testing.

3. Eliminate Existing Vegetation

Certain types of weeds growing on the site may interfere with establishment if not controlled prior to planting. Tilling these weeds into the soil prior to establishment may not eliminate them and new growth from roots, crowns, and seeds may occur. If grass weeds are present in large quantities on the site, make provisions to control them with herbicides. Broadleaf weeds, such as dandelion and clover, are usually controlled after the lawn is established.

4. Drain and Grade

Unless excess water drains rapidly through the soil, the turfgrass will have a poor root system and weak growth. If your soil stays wet after heavy rainfall, supplemental drainage maybe necessary to grow a satisfactory lawn. The house foundation and the curb or sidewalk level are the fixed grade points for a new home. An existing property has more places that cannot be changed. The goal in grading is to arrange the soil between these fixed points in gradual slopes to direct water away from the house and off the property.

Avoid sudden steep slopes because they are hard to establish and difficult to maintain. If much soil must be changed, move the topsoil into a pile and rearrange the subsoil to the desired grade or slope. Then spread the topsoil evenly over the subsoil. When grading, it is best to prepare the seedbed several weeks before planting to allow the loose soil to settle. A 6-inch layer of loose soil settles to about 5 inches.

5. Add Fertilizer or Other Amendments

An amendment is any substance added to soil to alter its physical or chemical properties. Most soil test labs can provide a complete analysis of the soil along with recommendations for how much organic matter, fertilizer, lime or sulfur should be added. Depending on soil conditions, select amendments based on one or more of the following:

- Effect on soil texture and related physical properties
- Effect on chemical characteristics of soil
- Local availability
- Long-term availability
- Cost

Find out more about the benefits and types of Amendments in the "Plant Installation" section in Chapter 5a - page 26.

Organic material is usually added to a lawn to improve soil texture. There are several ways to add organic matter to soil. A soil test report for turf establishment should specify the amount of organic matter needed in a soil. Once you know the recommended amount, spread the material evenly over the entire site. The soil should be tilled before spreading the amendment as this will make mixing the amendment with the soil easier. Spreading can be done with a loader bucket, grading blade, or York rake for large sites or with shovels and grading rakes for small lawns. Typically, a 1 to 2-inch layer of compost can be worked 4 to 6 inches into the soil with conventional rototilling equipment. If more than 2 inches of organic matter is required, till the 2-inch layer into the soil, then spread more of the amendment and till again. Organic layers greater than 2 inches are difficult to till evenly into soils.

The only way to determine how much fertilizer, lime or sulfur are required for turf establishment is with a soil test.

The nutrients most often needed by turfgrasses in the form of fertilizer supplements are nitrogen, phosphorus, and potassium. Because phosphorus and potassium do not move into the soil fast enough when surface applied, they usually are tilled into the soil to a depth of 4 to 6 inches before establishment. This is accomplished by spreading the amount recommended in the soil test report on the soil

surface with a fertilizer spreader, then tilling. Lime can be applied in a similar manner if the soil is too acidic. The amount needed should be specified on the soil test report.

> *Nitrogen should NOT be tilled into the soil since it can be leached out of the topsoil before turf can use it.*

Nitrogen, as well as additional phosphorus and potassium, should be applied to the surface as starter fertilizer just before or just after seeding.

6. Select Seed

Kinds of Turfgrass for Lawns

A common, serious error in lawn establishment is using the wrong kind of turfgrass seed. Taking time to learn about specific types of grasses and their uses is well worth the effort. Several grass species can be used for home lawns in New York State. Species and even varieties differ in their appearance, growth habit, adaptation, and ability to tolerate diseases and insects.

Table 4 - Attributes of Types of Turfgrass

Relative Rating for MAINTENANCE		Relative Rating for SHADE TOLERANCE	
	LEAST		LEAST
Tall Fescue		Bluegrass	
Fine Fescue		Tall Fescue	
Bluegrass		Ryegrass	
Ryegrass		Fine Fescue	
	MOST		MOST

Relative Rating RECUPERATIVE ABILITY		Relative Rating for WEAR RESISTANCE	
	LEAST		LEAST
Fine Fescue		Fine Fescue	
Ryegrass		Bluegrass	
Tall Fescue		Ryegrass	
Bluegrass		Tall Fescue	
	MOST		MOST

Seeding Blends or Mixtures

Although a lawn can be established using a single species such as Kentucky bluegrass, a mixture of species is preferable.

Different turfgrasses are not equally susceptible to disease, insects, and environmental stress, and if one species is injured or eliminated by disease or other stressors, the others may be able to fill in the void. Species also vary in speed of establishment, recuperative potential after injury, fertility requirements, and tolerance to close mowing. Refer to **Table 4** for more information on differences in species. The mixture chosen should contain at least two basic species such as Kentucky bluegrass and fine fescue or Kentucky bluegrass and perennial ryegrass. If you prefer a single-species lawn for aesthetic or other reasons, always include at least three recommended varieties of that species.

Choosing a Ready-Made Seed Mixture

Seed companies are required by law to list on the package label the individual species used in a mixture. Inspect the tag for seed purity information, which includes the minimum percentage of pure seed and the maximum allowable percentages of weed seeds inert matter, and "other crop" seed. More than 5 percent of any one "other crop" turf seed must be listed on the label. The percentage of each grass present is given along with germination percentages, weed seeds, and other facts. To judge the quality of a seed mixture, add the percentages of Kentucky bluegrasses, fine fescues, and perennial ryegrasses: If the total is 80 percent or more and the mixture does not contain objectionable grasses such as timothy and orchard grass, it is suitable to buy. Depending on your lawn, you may need to buy the components separately and make your own seed mixture. For example, if your lawn site is wet and shady, 70 percent rough bluegrass seed and 30 percent shade-tolerant Kentucky bluegrass seed could be combined for a suitable mixture. Some suggested seeding mixes and rates are presented in **Table 5.**

7. Prepare the Seedbed

Preparing the seedbed is the most labor-intensive and time consuming step in seeding a new lawn, but a well-prepared seedbed is essential for rapid, successful establishment. After incorporating any amendments or fertilizer, take the following steps:

- Rake the seedbed to finish grade just before seeding. The soil surface should be smooth, level, and free of debris.
- Roll lightly to indicate any low spots or irregularities in the seedbed.
- Add a topdressing of starter fertilizer on the prepared seedbed to enhance establishment.

Table 5 -Suggested Seeding Mixes and Application Rates

USE	SPECIES / MIX (% by weight)	MIXTURE (lb. per 1,000 sq ft)
Sunny Lawns		
Medium to High Maintenance	70% (or more) Kentucky bluegrass blend, 10-20% perennial ryegrass*, remainder fine leaf fescues	3 -4
Maintenance, Dry Sites	65% fine fescue blend, 10-20% perennial ryegrass, remainder Kentucky bluegrass blend	4 -5
Maintenance, Dry Sites	100 % tall fescue' blend (Southeastern New York)	7 -10
Shady Lawns		
Dry Sites	6D-B0% fine fescue blend, 10% perennial ryegrass, remainder a blend of shade-tolerant Kentucky bluegrass	4 - 5
Dry Sites	80% shade-tolerant Kentucky bluegrass blend, 20% perennial ryegrass	3 - 4
Wet Sites	70% rough bluegrass, 30% shade-tolerant Kentucky bluegrass blend	2 - 3
*Tall fescue and perennial ryegrass may winter kill in the northern parts of New York State, especially away from the Great Lakes		

8. Plant

When you have obtained a high-quality seed mixture, divide the mixture in half. To ensure uniform coverage sow half in one direction and the other half at right angles to the first. A mechanical drop or centrifugal-type spreader does the best job of seeding (or fertilizing or liming), but hand seeding is satisfactory if done carefully. If this is your first attempt to sow seed, mix each half of the seed with some sand or fine topsoil to give you more material with which to work. When there is no wind, scatter one-half evenly and carefully while walking back and forth in parallel lines. Scatter the other half in the same manner walking in lines at

right angles to the first half. **Figure 1** After sowing, rake the area lightly to cover the seed no more than 1/4 inch deep. Seed covered too deeply will be lost. Roll the area lightly to ensure good seed-to-soil contact.

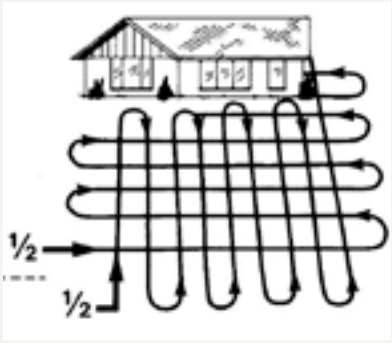


Figure 1 Seed Distribution

9. Irrigate

Turfgrass seedlings can die quickly from lack of water. Apply enough water to keep the soil surface moist. As establishment progresses, the frequency of irrigation can be reduced and the amount applied at a single irrigation increased. Continue to irrigate the turf for at least three weeks after germination and preferably until the lawn is completely established. Irrigation is most important in the spring, especially when seeding a Kentucky bluegrass lawn. Avoid overwatering and runoff.
Mulching the lawn with clean (weed-free) straw will conserve moisture and help prevent erosion. Hay is not a satisfactory substitute because it usually contains an abundance of seeds of hay-type grasses and weeds. Shakeout straw thoroughly and spread uniformly one bale of straw per 1,000 square feet will provide a light mulch covering that will not have to be removed after germination. When you have finished, you should be able to see about half of the soil surface through the straw. The mulch slows surface drying and breaks the force of rains and watering. On moderate slopes hydroseeding can be used where seed has already been applied. In these cases, the practice is called hydromulching. Occasionally, mats or covers are used as mulches for new establishments. These can be geotextile fabrics, wood fiber mats, burlap, or other types of loose-woven fabrics or mats. Mats or covers may be used in high value establishments when soil temperatures are cold or on steep banks. They provide weed free, uniform coverage, but are a labor intensive means of mulching because they are bulky, must be anchored with pins or staples and may not be biodegradable.

10. Mow

Proper mowing discourages weeds and makes the lawn more resistant to pests. Most lawn mixes can be mowed when seedlings are about 3 inches tall. Mowing encourages seedlings to tiller, rapidly increasing turfgrass density. Make sure the lawn mower blades are sharp because ragged cuts from dull blades damage plants and slow the rate of establishment.

Post-Germination Care

Sometimes starter fertilizer applications are not enough to sustain rapid growth of new establishments and additional fertilizer is required. An application of ½ lb nitrogen/1000 sq ft 4 to 8 weeks after applying the starter fertilizer helps to thicken the new turf.

Newly-established turf is very sensitive to most herbicides, and applications should be avoided unless a severe weed infestation occurs and you are absolutely sure the herbicide will not interfere with the growth of the turf. Herbicide labels usually have precautionary statements concerning the rate and length of time after seeding the product can be safely applied. Many broadleaf herbicides, for example, should not be applied until 4 to 6 weeks following establishment.

Sodding

Although sodding is expensive and labor intensive, it is the quickest way to achieve a mature lawn. It can be done at almost anytime of the year except when soils are frozen. The optimum times for sodding cool-season turfgrasses are in late summer, spring, or fall. Sodding may be the only answer for steep slopes or spots where traffic ruins young seedlings.

Nursery-grown sod is about 1 inch thick, of uniform width, and has little soil attached. Nursery-grown sod with blends of Kentucky bluegrass is available in most areas. It makes an attractive lawn in sunny situations, but a fine fescue mixture is a better choice for dry or shaded areas. Some sod farms produce mixtures designed for shady lawns.

To install sods prepare the soil as though seed were to be planted. Purchase the sod when the soil is ready. Do not accept sod that is dried or silted. For best results sod should be laid no more than thirty-six hours after it is cut. Before laying the sod, water the soil lightly to improve the ability of the sod to survive and knit. Lay the sod strips on a prepared soil, tightly together, edge to edge, with staggered joints like bricks in a wall. Fill all cracks with screened soil. Soak the newly laid sod thoroughly. When it is dry enough to walk on, roll or tamp the sod lightly to give good contact with the soil beneath. Water as required in the early morning to keep the soil moist until the sod is securely rooted, usually within two weeks. Avoid overwatering.

Routine Lawn Maintenance

Every lawn needs to be mowed regularly and fertilized occasionally. Watering is necessary under certain circumstances. A Kentucky bluegrass lawn, for example, will require more water than a fine fescue lawn because fine fescues are a low-water-use species.

Mowing

Mowing is the most fundamental turf grass management practice. It provides a uniform and usable surface for aesthetic purposes or recreational activities. Mowing has a profound effect on turfgrass: the removal of photosynthetically active tissue temporarily stops root growth, reduces carbohydrate production and storage, and lessens water absorption by the roots. Proper mowing discourages weeds and makes the lawn more resistant to pests.

- Lawns must be mowed to the correct height. Height affects the size of the root system. A shorter lawn has a shallower root system and is thus more susceptible to drought injury, less tolerant of root feeding insects and root-pruning diseases, and more prone to germination of weed seeds.
- Keep mower blades sharp and properly adjusted to avoid injuring turfgrass plants. Mow Kentucky bluegrass and fine fescue lawns to a height of 2 to 3 inches and tall fescue lawns to a height of 3 inches. Increasing mowing height develops deeper rooting and limits sunlight for weed seed germination.
- Proper mowing also means mowing at regular intervals. The rule of thumb is never to remove more than one-third of the leaf tissue with each mowing. Scalping the lawn can shock it, making it more susceptible to stress.
- Always leave the clippings where they fall because they return nutrients to the soil. This can reduce nitrogen and potassium requirements by up to 30 percent.
- Properly mowed lawns should not have increased thatch or clumps of clippings.

Fertilizing

Turfgrass requires moderate amounts of nitrogen and potassium to produce a healthy, vigorous lawn that requires minimal pesticides. Returning grass clippings after mowing can reduce these requirements by 30 percent. Kentucky bluegrass lawns require 2 to 3 pounds of actual nitrogen (N) and can require 1 to 3 pounds of potash (K20) per 1,000 square feet per year split into two or three applications. Fine fescue and tall fescue lawns require 1to 2 pounds of nitrogen and can require 1 to 3 pounds of potash per 1,000 square feet each year. Potash requirements should be confirmed with a soil test prior to selecting fertilizer.

Returning grass clippings after mowing can reduce these fertilizer requirements by 30 percent.

Lawns should be fertilized two or three times annually; either in the late spring and late fall or in late spring, early fall, and late fall. Fertilization in late fall is not recommended in areas with sandy soils, including Long Island. Nitrogen is released more uniformly in slow release fertilizers such as sulfur-coated urea or natural organics. The lawn will be greener for a longer period and will have less top growth. Some natural organic products will also suppress diseases.

What Is in a Bag of Fertilizer?

Fertilizer companies are required by law to list on a fertilizer bag the amounts of elements contained in the fertilizer. This is referred to as a guaranteed analysis. The fertilizer grade is also listed. It designates the percentage of nitrogen, available phosphate, and water-soluble potash in the product. A 10-6-4 grade fertilizer contains 10 percent nitrogen, 6 percent available phosphate, and 4 percent water-soluble potash.

Thus a 40-pound bag of 10-6-4 contains:

4 pounds of nitrogen (10 percent of 40),

2.4 pounds of available phosphate (6 percent of 40),

and 1.6 pounds of watersoluble potash (4 percent of 40).

Fertilizer recommendations are often made using a fertilizer ratio, which refers to the relationship between the percentages of nitrogen, phosphate, and potash (N - K - P). A 16-8-8 grade fertilizer contains twice as much nitrogen as phosphate or potash. Thus it has a 2-1-1 ratio. Grades of 10-5-5 and 20-10-10 also have 2-1-1 ratios. A grade of 20-5-10 has a 4-1-2 ratio. The easiest way to determine the ratio is to divide each number in the grade by the smallest number in the grade or by the highest whole number divisible into all three numbers of the grade.

Unless establishing a new lawn, the use of phosphorus must be verified by a soil test.

A turf-grade fertilizer is a complete fertilizer (containing nitrogen, phosphate, and potash) that has an approximate 2-1-1 or 3-1-2 ratio and has a least 35 percent of its total nitrogen as water-insoluble nitrogen (WIN). Water-insoluble nitrogen is not immediately available to the plant. Instead, the nitrogen is released over relatively long periods of time. Fertilizers with at least 35 percent WIN can be applied at higher rates than a quick-releasing fertilizers (water-soluble nitrogen) with little risk of burning the turf.

If a fertilizer contains slow-release nitrogen, a percent water-insoluble nitrogens (WIN) should be listed on the label in the guaranteed analysis. This WIN is the slow release nitrogen present in the bag, and it is expressed as a percentage, by weight, of the bag's contents. It is also important, however, to know what percentage of the total nitrogen is slow release. This can be determined easily by dividing the percent WIN by the percent total N, then multiplying by 100. In this case, 8 percent ÷ 20 percent x 100, or 40 percent of the total nitrogen is water insoluble. Sixty percent of the nitrogen in this example is quick release and will provide quick greening. The other 40 percent is slow-release nitrogen that will become available over the next several weeks. Some manufacturers and formulators will claim slow-release nitrogen in a product, but if you run through this calculation, you may find that the amount of slow-release nitrogen is insignificant. A fertilizer should have a least 30 percent of the total nitrogen as WIN if it is expected to have some slow-release characteristics.

Properties of Fertilizers

Turfgrass requires a greater amount of nitrogen than of any other nutrient. The many sources of nitrogen are usually classified by availability: quick release (water soluble) or slow release (water insoluble). **(Table 6)**

Table 6 - Properties of Fertilizers

Quick-Release Fertilizers	
Advantages	**Disadvantages**
Rapid response	Slower response, short duration of response
Minimal dependency on temperature	High salt index, possibility of foliar burn
Less expensive than slow-release forms	Possible losses from leaching and volatilization
Quick -release forms of nitrogen should be applied more often and at lower rates than other forms. They can also lower soil pH.	
Slow-Release Fertilizers	
Advantages	**Disadvantages**
More constant supply of nitrogen	More expensive than quick-release forms
Less potential for leaching and burning	Effectiveness can depend on temperature and moisture
Slow-release sources include natural organics, synthetic organics, and coated materials. The release of nitrogen from these sources, especially natural organics, is affected by temperature and moisture.	

Some Notes on Fertilizing

Soil testing is the only way to determine how much phosphorus, potassium, and lime or sulfur your lawn may need for optimal growth. This information helps eliminate unnecessary applications. Refer to the appendix for specific instructions on how to take soil samples.

The amount of nitrogen fertilizer that most lawns require depends on the predominant species of turfgrass, soil type, desired turf grass quality, type of nitrogen used, and climatic factors. Refer to **Table 7** for general guidelines on how often to fertilize.

Avoid fertilizing in early to mid-spring because a heavy application (especially of nitrogen) can cause certain disease problems and shallow root growth, which can lead to serious trouble for your lawn during the summer. Do not fertilize in the summer because turfgrass is often under stress from drought and heat and may be damaged by fertilizer.

Suggested timing of fertilizer application based on the number of yearly applications

Table 7 - Suggested timing & frequency of fertilizer application			
Number of Yearly Applications	**LATE SPRING**	**LATE SUMMER / EARLY FALL**	**LATE FALL / DORMANT**
ONE		**X**	
TWO	**X**	**X**	
THREE	**X**	**X**	**X**
The maximum rate of application of nitrogen is l lb. per 1,000 square feet per single application. Therefore, if you plan to apply 3 lb. of nitrogen per 1,000 per square feet per year, three 1 lb. applications must be made.			
Suffolk County Prohibits application of lawn fertilizers Between Oct 31 and April 1. Nassau County has a blackout for Nov 15 - April 1.			

NOTES:

- Late spring refers to the period just after the 'spring flush' but while temperatures are still very mild (64°-70°F day).
- Late summer/early fall Is after the summer heat spell, usually late August or early September when temperatures start to moderate and nights are cool.
- Late fall/dormant refers to the period just after last mowing until winter snow cover.

How to Apply Fertilizer

Fertilizer must be applied evenly at prescribed rates to ensure even growth, color and to prevent burning. A mechanical spreader is best for this work. Organic fertilizer can be used in almost any season without danger of burning grass. Inorganic fertilizers can be used during the growing season, but take these precautions against burning: distribute fertilizer evenly, spread fertilizer only when grass is completely dry, and immediately wash the fertilizer off the grass blades to the ground.

Dry fertilizers can be applied with a gravity drop spreader or a centrifugal spreader. Use a drop spreader when applying fertilizer products containing herbicide to minimize the chance of herbicide injury to trees, shrubs, and vegetable gardens. A drop spreader is also good for applying ground limestone.

Centrifugal spreaders generally cover a larger area with each pass and decrease the time it takes to fertilize your lawn. Uniform application is more difficult, however, because fertilizer particles are more susceptible to wind. Centrifugal spreaders can also be used to apply granular lime and sulfur materials.

When using either spreader, make at least two passes over your lawn. Apply half of the fertilizer in one direction and the other half at a right angle to the first pass. This will help eliminate the streaks that develop from an uneven application.

Modification of Soil pH

In some regions of New York, soils have an acceptable pH and may never need lime or sulfur. In other regions the pH may be higher than 7.5 (too alkaline) or lower than 6.0 (to acidic). When pH is above 7,0, nutrients such as iron, zinc, manganese, and copper become less available. A pH below 6.0 results in reduced availability of phosphorus and depletion of calcium and magnesium. At the higher and lower pH ranges, microorganism activity slows or even stops, reducing the breakdown of organic matter and the release of nitrogen, sulfur, and other nutrients. The only way to be certain of a soil's pH is to have it tested. Your local Cooperative Extension agent can assist you with this test.

To Raise Soil pH

Once you know the soil pH, refer to **Table 8** for established lawn recommendations. Liming can be done in spring or fall but not during summer or within two weeks after applying fertilizer. Avoid using hydrated lime because it is caustic and difficult to handle. See **Table 10** for a description of several liming materials and suggested methods of application.

When a large amount of lime (more than 50 pounds per 1,000 square feet) is to be applied to established turfgrass, a split application is recommended. Apply half in the spring and the other half in the fall. Add water to remove lime from the shoots and move it into the soil.

Table 8 - pH modification for established turfgrass soil - To RAISE Soil pH

Pounds of ground limestone / 1,000 sq. ft. to raise pH to 6.5 - surface applications

Present pH	Sand	Loam	Clay
4.5	42.0	84.3	116.0
5.0	35.3	70.3	96,7
5.5	14,0	28.0	38.7
6.0	5.7	11.0	15.0

*Do not apply more than 501b. of limestone/1,000 sq. ft. per application.

To Lower Soil pH

When the pH is greater than 7.5, acidifying materials should be applied. Elemental sulfur is the preferred material to lower soil pH. For ease of application, use a pelleted form, which can be applied with a centrifugal spreader. Do not apply more than 5 pounds of elemental sulfur per 1,000 square feet per application to established lawns, see **Table 9**. Be sure to water in sulfur to avoid burning . Apply sulfur only during spring and fall. Do not use ferrous sulfate and aluminum sulfate for soil acidification. Ferrous sulfate can burn grass blades, and aluminum sulfate is not as effective as elemental sulfur.

Table 9 - pH modification for established turfgrass soil - To LOWER Soil pH

Pounds of elemental sulfur / 1,000 sq. ft. to lower pH to 6.5

Present pH	Sand	Loam	Clay
> 8.0	6	11	16
7.5 - 8.0	4	7	9
7.0 - 7.4	2	3	5

*Do not apply more than 501b. of elemental sulfur /1,000 sq. ft. per application. Do not apply sulfur during the summer.

Table 10 - LIMING MATERIALS and their Characteristics

Material	Composition	Rate of Reaction	Method of Application	Comments
Ground Limestone	Granular Ground Limestone	Slow and Gradual	Drop Spreader	Water in if lawn appearance is a concern; only a slight chance of leaf burn. Its effects can last up to two years.
Pelleted Limestone	Pelleted, finely ground limestone	Very Fast	Centrifugal spreader	Apply 60-70% of the ground limestone rate; effect is not long lasting. Yearly limestone applications may be necessary.

Watering

Most cool-season lawn grasses can survive conditions of extreme drought by going into summer dormancy. Unfortunately, dormancy may result in extensive injury from insects and diseases, and it encourages weed invasion. It is preferable to avoid drought conditions through proper maintenance.

When the lawn first begins to wilt in the spring, water it thoroughly with about 1 inch of water. This deep watering encourages deeper rooting, whereas frequent light waterings in the spring promote shallow roots, making the lawn more susceptible to root-pruning insects and diseases. During the summer, it is natural for much of the root system to deteriorate.

> *The best time to water a lawn is early morning when evaporation losses are low and leaves dry quickly. Evening watering does not allow time for the leaves to dry and creates an environment conducive to disease development.*

Thatch

There are many misconceptions about the causes and problems of thatch. Thatch is a layer of undecomposed and partially decomposed organic residue situated above the soil surface and capable of supporting turfgrass growth. As thatch accumulates, it becomes a tightly intermingled mat of dead and living stems, leaves, and roots.

> *A moderate amount of thatch (less than 1/2 inch) generally causes no problems and is even desirable because it increases wear tolerance, decreases soil compaction, and insulates the soil from extreme temperature.*

Excessive thatch (1" or more), however, leads to scalping, decreased fertilizer activity, water repellency, roots that are limited to the thatch layer, increased disease and insect problems, and decreased tolerance of high and low temperatures.

Thatch accumulates when there is an imbalance between plant growth and decomposition. Heavy nitrogen fertilization and irrigation promote thatch development, which is why the nicest lawns are often the first to have thatch-related problems. To determine if your lawn has excessive thatch, take several wedge-shaped slices, including the surface soil layer, at several locations. Inspect the samples to determine the thickness of the thatch. A layer of thatch in excess of 1/2" may require attention. Control requires an integrated approach that includes prevention, biological control, and mechanical removal.

Prevention

Water and fertilize often enough to maintain good growth but not enough to encourage succulent, excessive growth. Excessive irrigation inhibits breakdown of thatch by microorganisms. Keep soil pH above 5.5. Mow tall grass at proper intervals. Grass clippings are a valuable source of nitrogen and do not contribute to thatch development if the lawn is mowed regularly. Certain species or cultivars of grasses thatch more quickly than others. Some Kentucky bluegrass cultivars are notorious producers of thatch because of their vigorous growth habit. Fine fescues grow slowly, but their leaves and other plant parts resist decomposition and are thus prone to development of thatch.

Early fall is the best time to power rake a lawn in New York.

Biological Control

Altering the soil environment to promote the activity of fungi, bacteria, and other microorganisms will enhance decomposition of thatch. Microbial activity is influenced by moisture, temperature, aeration, pH and supply of inorganic nutrients. Cultivation by core aerification, using a machine that punches a hollow tine into the soil to remove a small soil core, can greatly improve the micro environment. Mixing the soil cores with thatch increases microbial activity by providing more favorable moisture and temperature conditions. Core aerification is most effective as preventive measures and should not be used to remove large amounts of thatch. Homeowners who have high-maintenance lawns should consider annual core cultivation.

Mechanical Removal

Vertical mowing or power raking is the most common method used to remove thatch. Following severe vertical mowing, a lawn should have at least three to four weeks of good growing weather to recover. Early fall is the best time to power rake a lawn in New York. It is necessary to power rake a lawn in the spring, consider applying a preemergence herbicide afterward to control annual grasses such as crabgrass, especially in downstate New York. Preemergence herbicides prevent seedling establishment. Creating a chemical barrier in the soil. When weeds germinate in this zone, the herbicide is absorbed and kills the plant. Power raking after applying a preemergence herbicide will break the herbicide barrier and decrease efficacy. A light application of fertilizer following power raking will help the grass recover from injury.

Lawns with a serious thatch problems may require a severe power raking each fall until thatch is less than ½" deep. After this, an integrated program of preventive methods may be used. Lawns with more than 1 1/2" of thatch will need to be re-established from seed or sod.

Lawn Pests

Weeds

Prevention is the best weed control. Damaged or weak lawns are most prone to weed encroachment. A balanced fertilizer program and proper mowing help grasses outcompete weeds. When you start a new lawn, try to prevent weeds from getting a foothold. If you remove weeds

from an established lawn, stimulate the grass growth or weeds will reappear In the bare spaces.

To minimize weed problems

- Select the most appropriate turfgrass for your site
- Plant a new lawn in the fall
- Optimize cultural practices (e.g., moving, fertilization, irrigation)
- Mow your lawn at least 2 inches high to reduce weed competition, the higher you cut your grass, the more the sunlight is reduced to the soil limiting weed seed germination.
- Control insect pests and diseases that damage turf

Identifying Features of Weeds

Weeds differ greatly in their appearance, growth patterns, and reaction to herbicides. Annual weeds grow from seed, flower, produce new seeds, and die in a single growing season. Perennial weeds grow for two or more seasons, wintering as an entire plant or by roots, underground stems, bulbs, corns, or tubers, which start growth the next season. A perennial can flower and produce seed year after year. Grassy weeds have long narrow leaves with parallel veins and may complete their life cycle in one season. Annual grassy weeds such as crabgrass, goosegrass, and annual bluegrass reseed themselves every year. Tall fescue, bentgrass, and quackgrass grow vegetatively for many years. Non-grassy weeds, or dicots, have wider net-veined leaves and are also called broad-leaved weeds. Common annual broadleaved weeds include prostate spurge and common chickweed. Perennial broad-leaved weeds include dandelion, plantain, white clover, hawkweed, and ground ivy. Yellow nutsedge and wild onion are narrow leaved but are not grasses. Some weeds are a good indication of underlying soil problems. Yellow nutsedge often grows in water-logged soils. Prostrate knotweed is common in dry, compacted soil. Consult your Cooperative Extension agent for help in identifying weeds. Correct identification is the first step in determining what control method to use.

Preventing Weeds in New Lawns

The soil itself is the greatest source of weed seeds in a new lawn. Most soils contain many more weed seeds than are carried in the grass seed.

For detail information and Help Identifying Weeds - visit CALS Turfgrass and Landscape Plant ID site.

http://turfweeds.cals.cornell.edu/plants

For Pesticide Free Weed Management reccomendations - visit CALS Turfgrass and Landscape Plant ID site.

http://turfweeds.cals.cornell.edu/environments

For More Detailed information on Weeds, Pests and Diseases of Turf - **See Chapter 4 Problems of Ornamentals**

Planting appropriate grasses at the right season and fertilizing adequately at seeding time are the most important practices in minimizing weed problems. In southeastern New York and on Long Island, planting in the fall is almost the only way to prevent crabgrass from taking over the lawn. (Spring seedings can succeed if the recommended herbicide is used.) If you plant in early fall, the grass plants will spread laterally, and the turf will be dense and mature before most troublesome lawn weeds start to grow the following spring.

Proper fertilization of the seedbed will help newly seeded areas quickly gain a competitive advantage over weeds. Apply fertilizer according to soil test recommendations. In lieu of a soil test, use a high phosphorus or starter fertilizer according to label directions. Mowing when grass is 3 inches tall will control many weeds and promote thickening of the lawn.

Do not try to prevent weed establishment by sowing an extra large amount of grass seed. Although growth will be dense, the individual grass plants will be crowded and weak. Diseases may kill large patches of grass, leaving the lawn susceptible to weed invasion. For better results, sow only the amount of seed recommended, and fertilize it well at seeding time so that each grass plant becomes established quickly.

Weed Control in Established Lawns

The occurrence of most common weeds can be greatly reduced by improved lawn care. If your lawn drains reasonably well, you can probably reduce the number of weeds drastically by proper fertilization and mowing.

When weeds persist despite good maintenance, you must decide whether to accept them or to control them by hand pulling or with herbicides. A weed-free lawn is neither feasible nor desirable when large areas of turf must be managed. For small lawns or those with only a few weeds, hand pulling as weeds appear can give good temporary results. Weeds are much easier to pull immediately after a heavy rain or watering.

Chemical Controls

The only alternative to hand pulling weeds is the use of herbicides. Herbicides are most practical for large infested areas where a selective chemical kills the seeds but does not harm the grass. Herbicides for the home lawn are sold as pre and post-emergence in granular or liquid

formulations. Preemergence herbicides are applied to the soil before the target species emerges and are not effective once the weeds appear. Post-emergence herbicides are usually applied to foliage after weeds germinate.

Crabgrass is the most common annual weed found in lawns. The best control is a granular preemergence herbicide applied in the spring before crabgrass germinates. Because this herbicide is active in soil it should be applied when the grass is dry so the granules will drop through foliage to the ground.

Most broad-leaved weeds such as plantain and dandelion are best controlled with a postemergence herbicide applied in early fall when the weeds are actively growing but less foliage of desirable plants is exposed. If a granular formulation is used it should be applied in the morning when there is dew on the lawn. This will help the herbicide adhere to leaves and increase absorption into the plant.

Do not use the same sprayer used for herbicides such as 2,4-D on any plants other than grass. Use another sprayer to control insects, diseases, or weeds in the garden.

Many herbicides are available in combinations with fertilizers. These products do two operations at once and facilitate application of pesticides. Because these combination products are pesticides, you are required to hold a Pesticide Applicator license and take proper care in application and storage.

Make sure to read and understand the label before applying any pesticide.

Check for the safest, most effective time to apply.

Do not use at rates higher than those recommended.

Diseases

Disease is only one factor that causes unhealthy and dead grass in a home lawn. No amount of disease control effort can overcome poor growing conditions or improper maintenance, and diseases are more likely to occur when lawns have been improperly aerated or fertilized, overwatered, have poor drainage, or have been mowed too low.

Turfgrass injuries from causes such as drought are frequently confused with symptoms of disease. Drought often occurs where thin layers of soil lie over buried debris such as rocks, lumber, plaster, and concrete. The soil dries rapidly in hot summer weather. Dead spots or patches that suddenly appear in a lawn may be caused by fertilizer burn; dog urine; spilled gasoline, oil, or grease; exhaust from power mowers; or improper use of pesticides.

For More Detailed information on Weeds, Pests and Diseases of Turf - **See Chapter 4 Problems of Ornamentals**

Example of Turf Disease

Incorrect mowing can cause a disease-like condition as well as influence the actual development of disease. Cutting grass too closely ("scalping") or using a mower with dull blades may result in a condition that looks like a disease. Infrequent mowing, which produces excessive clippings in a mat, may encourage disease to develop in the hot, humid environment under the mat. Grass weakened by frequent low mowing often appears off-color and is more susceptible to disease.

Lawn diseases are caused primarily by fungi that live in the soil or thatch layer and follow a typical life cycle. Only a few of these fungi are potentially harmful, and even those that cause disease can coexist with grass without damaging it as long as environmental conditions and cultural practices do not create opportunities for attack. Disease-causing pathogens can also become active when applications of fungicides, insecticides or herbicides inadvertently kill beneficial microorganisms that compete with the pathogens.

A disease must be diagnosed correctly before it can be managed. Diagnosing turfgrass diseases can be difficult because pathogens seldom act alone in causing disease, and symptoms rarely remain constant over a variety of environmental extremes. In addition, attack by pathogens is often a secondary affliction: something else weakens the grass so that the pathogen is able to attack it.

The best form of disease control is prevention. This includes planting resistant or tolerant turfgrass varieties and altering cultural practices to favor the growth of the plant and discourage the activities of pathogens.

Disease Control

Although disease spores may be present at any time in your lawn, an epidemic will not occur unless all of the following factors are present:

- A host plant (turfgrass species that is susceptible to attack by a specific fungus)
- A pathogen (organism capable of causing disease)
- Favorable environment, including the natural and man-made conditions and practices that encourage development of disease (temperature, moisture, watering, fertilizing, mowing, soil compaction)
- A means by which spores are transported from plant to plant, such as lawn mowers, foot traffic, wind, and water

Cultural practices that encourage a vigorous, hardy turf help minimize both the occurrence of turf diseases and the necessity for control measures. Although fungicides may control one disease, their use often aggravates others.

For More Detailed information on Weeds, Pests and Diseases of Turf - **See Chapter 4 Problems of Ornamentals**

Insects

In general, two types of insects feed on lawn grasses: root-feeding white grubs of several species and surface feeders, including chinch bugs, sod webworms, and cutworms.

Roots Feeders

Most insect damage to lawns in New York is caused by five species of beetles whose white grub larvae feed on turfgrasses. The more prevalent grubs are the European chafer and Japanese beetle. The Asiatic garden beetle, Oriental beetle, and others are common on Long Island. These scarab larvae chew off grass roots.

Turf that has been seriously damaged by grubs can be pulled up easily because of the lack of roots. In September and October and again in April to early June, grubs can be found easily and quickly under the loose sod. Grubs are white, worm-like insect larvae with brown heads and three pairs of legs near the head end. They are C-shaped and range from 1/2 to 1 inch long but are smallest in late summer when still young. Grub injury is usually worst in sunny areas.

Symptoms appear as wilted turf after the ground dries in late spring or early fall.

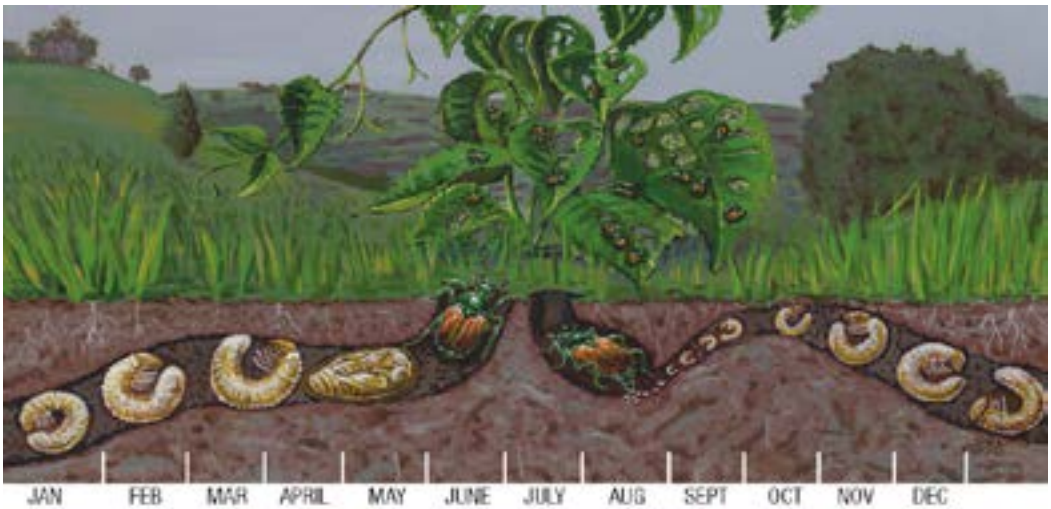
Check for grubs in your lawn by cutting three sides of a square-foot area with a shovel and peeling back the sod layer. The grubs will be apparent on the underside of the sod mat. Count the grubs in several areas of the lawn. Inspect lawns in mid-to late August in upstate New York and in late July or early August downstate and on Long Island.

Before taking any control measures against scarab grubs, ensure that the damage is caused by grubs. Symptoms vary from weak turf to large, dead patches. A gradual thinning and weakening of the stand may be one of the earliest symptoms as grubs feed on roots near the soil surface. When the grub population is large, grass may wilt suddenly as a result of severe root pruning even if soil moisture is adequate. As damage continues, the surface may become spongy. Root pruning in the soil-thatch interface may be so complete that the sod can be lifted in large sections.

Turf Pest Examples

Remember that no grubs are present during midsummer because the insects are in the adult stage. One indication of a potential grub problem is the obvious heavy flight of adult beetles.

A commonly used threshold for treatment is more than eight live grubs per square foot, but a properly watered and fertilized lawn may tolerate up to ten grubs per square foot with no visible damage, whereas the same infestation could devastate a weak, poorly maintained lawn.



The Japanese beetle life cycle. (Illustrated by APHIS employee Joni Floyd.)

Late summer and early fall are the best times of year to treat for grubs with a one year life cycle. Effective treatment in the fall will make spring treatment unnecessary because these grubs produce only one generation per year. Treat when grubs are young and feeding actively close to the soil surface. **This occurs from mid-August to late September upstate and from early August to mid-September in southeastern New York. See Figure X**

Biological control alternatives to synthetic soil insecticides are available. Milky spore disease is a naturally occurring bacterial parasite that infects Japanese beetle grubs. It is not effective on other white grub species and has been, at best only marginally effective in New York.

Parasitic nematodes (microscopic wormlike organisms) have been introduced as a biocontrol for white grubs. Although results have been inconsistent, nematodes, available through garden specialty catalogs, are a viable choice for insect control of lawns. Homeowners who rely solely on biological controls for White grubs may need to renovate their lawns following heavy grub infestations.

Surface Feeders

Avoiding drought stress will lessen insect damage. In recent years, plant breeders have developed insect resistant grass varieties by introducing a fungus (endophyte) into the grass plant that produces chemicals called endophytes which are toxic to insects. Because the toxin does not move to underground plant parts, the grasses are resistant only to surface feeders such as sod webworm, billbug, and chinch bug. Certain varieties of perennial ryegrass, fine fescue, and tall fescue contain endophytes.

Bluegrass Billbug

Bluegrass billbug adults (weevils) are dark gray to black, about 1/3 inch long, and have a prominent snout. They leave overwintering sites on warm, sunny days in May and June and

can be seen walking over pavement as they seek feeding and egg-laying sites. This is a warning of possible lawn destruction later. Eggs are deposited in the stems lust above the crown, and young larvae feed in the stems. As they grow, the white, legless, brown-headed larvae leave the stems to feed externally in the crown of turfgrass plants. The presence of frass, which resembles fine sawdust, around the crowns is characteristic of their activity.

Insecticides are listed in Home Lawns: Varieties and Pest Control Guide.

https://hdl.handle.net/1813/3298

Chinch Bugs, Sod Webworms, and Cutworms

Chinch bugs, sod webworms, and cutworms feed on the leaves and stems of grass, not on the roots as grubs do. They do not occur in soil but on its surface.

Chinch bugs cause yellowing and subsequent browning of grass, usually in gradually enlarging patches. Damage is most likely to be seen during a hot, dry summer (June to August). If spring is cold and wet, chinch bugs are usually not a problem because a fungus disease kills most of the overwintering adults. Adult chinch bugs are very small about 1/5 inch long, and black. Young nymphs are red or brown and black, about 1/8 inch long.

You can find the tiny Cinch bugs using one of two methods:

Select a sunny spot along the border of the yellow or suspected area of your lawn. Cut out both ends of a large tin can and push one end of the can about 2 inches into the sod. Fill the can with water nearly to the top. If chinch bugs are present, they will float to the surface of the water in about five minutes.

Place a piece of white cloth over the suspected area and thoroughly flood the sod beneath it. If chinch bugs are present they will crawl up on the cloth in about five minutes.

Moths of sod webworms can be seen on cloudy days and at dusk on hot summer days. As you walk across the lawn, the moths fly ahead of you in a zigzag pattern before landing. They drop their eggs indiscriminately over the turf during their flights at night. As eggs hatch, young worms feed on grass blades, but as they grow larger they feed on blades, stems and even the crowns of grasses. Worms feed only at night and rest in silk-lined tunnels during the day. Green grass may be found in or near the tunnels. Small yellow spots of damaged grass coalesce with other spots; large areas of grass may eventually turn brown and die.

Cutworms also feed at night and cause similar yellow spots, which may coalesce to form large patches of dead grass.

Special Lawn Problems

Renovating a Poor Lawn

Renovation improves a lawn by seeding into the existing sod. It is a selective tillage process that falls short of completely re-establishing the turf. Lawn renovating becomes necessary when the area has been so damaged that it cannot recover with standard maintenance practices such as irrigation and fertilization. This degree of damage is caused by an environmental or biological factor such as poor drainage, thatch, compaction, excessive shade, unadapted grass species, diseases, and insects. If the cause is not dealt with effectively, renovation may not be successful.

The renovation method used depends on the amount of desirable permanent turfgrass species present as well as the amount and kinds of undesirable grass, grasslike weeds, or broad-leaved weeds present. If your lawn contains at least 50 percent desirable turfgrass in a fairly uniform stand, a thorough renovation may save it. The thickness of thatch should also be considered. Renovation will probably not be successful on lawns that have accumulated more than 11/2 inches of thatch.

Lawns in the Shade

Shaded lawns are troublesome because of reduced light and competition with trees for water and nutrients. Even the most shade-tolerant grasses never make as good a sod in the shade as do grasses growing in the sun.

Sometimes shade alone is the chief difficulty such as on sites near buildings or under deep-rooted, high-branched trees. In many cases good soil preparation plus a shade-tolerant turfgrass mixture makes an acceptable lawn. Fine fescues are the best grasses to use if soil is dry; rough bluegrasses, if soil is moist. Several shade-tolerant Kentucky bluegrasses are also available.

See **Tables 4 & 5** in this chapter.

Turfgrass is much harder to grow under dense, shallow-rooted trees because trees cut off the light and rob the soil of water and fertilizer. Of the common trees, Norway maple is the worst offender. In such situations, even your best efforts to establish a lawn may fail. If this is the case, try using perennial ryegrass at the rate of 8 pounds per 1,000 square feet instead of the other grasses. Mow it high, water

whenever the soil is dry, and fertilize each spring and fall. Whenever dead patches appear, loosen the soil and sow more seed.

If you are unable to grow a lawn, look for a lawn substitute or ground covers suitable for your area. If these also fail, consider wood or stone mulch.

Steep Slopes

Avoid steep slopes if possible. They tend to be dry, and lawns are difficult to establish and maintain. If you do decide to use turfgrass on a steep slope, be sure to round off the crest of the slope to avoid scalping,

Whenever possible, sod a steep slope. This prevents a heavy rainfall from washing away all the topsoil and generally ensures that the slope will become established. On very steep slopes, each piece of sod may need to be fastened with a peg and twine. Follow the sodding procedure described previously.

Hydroseeding is a practical method on sites with gradual slopes and where a hydroseeder can gain reasonable access to the site. Some slopes are just too steep to assure good adherence of a hydraulically applied product,"

To plant a slope with seed, follow all the important points described for seeding. Pay special attention to seedbed preparation and fertilization and be sure to plant in early fall. A straw mulch, jute or erosion control fabric covering is essential during the first few weeks of establishment. Give turf on steep slopes the same care as other lawn areas, and remember to fertilize, mow, and water properly.

If slope is too steep for safe mowing, consider allowing a fescue to grow and form seed heads, which can be attractive as they blow in the breeze.

Ground covers such as crown vetch may be used as substitutes for turf on steep slopes.

Turfgrasses and Substitutes to Avoid

For lawn use in New York State, avoid the following plants: Mondo, Dichodra, pearlwort, St. Augustinegrass, bahiagrass, and Bermudagrass.

In the spring, zoysiagrass is heavily marketed to home owners in New York. Zoysias are warm-season grasses that are tolerant of low fertility, drought, close cutting, and summer weed invasion. Accompanying disadvantages are that zoysias go dormant and turn straw brown in autumn and remain so until mid-to-late spring. They are not resistant to traffic or weed invasion when dormant,

must be started from plugs or sprigs of sod, and do not tolerate shady conditions. It takes several years of patience to produce a solid sod of zoysia, which has not been consistently winter hardy in New York State. In addition, a severe outbreak of chinch bug can totally destroy a zoysia lawn in one season. For these reasons, zoysiagrass is not recommended for the home lawn in New York.

Moss

Moss is an indication that growing conditions are not ideal for turfgrass. Favorable conditions for moss include low fertility, poor drainage, unadapted grass species, shade, and humidity. Mosses may also be found in thin turf and full sunlight. Closely mowed turf composed of nonaggressive species is especially prone to moss encroachment.

Depending on your own lawn, controlling moss may entail doing one or more of the following:

- Increase nitrogen fertility
- Raise mowing height
- Adjust irrigation practices to avoid excessive water
- Improve drainage with tiles, dry wells, French drains, or by elevating depressions
- Use a turfgrass species better adapted to the site: fine fescue or rough bluegrass (Poa trivialis) in shades areas

There is no guaranteed chemical control for moss. The best treatment involves applying iron sulfate or ferrous ammonium sulfate at 1 pound per 1,000 square feet. Water the material after the moss turns black, about one hour after application. It is best to make this application in cool, humid weather. Repeat applications may be necessary. The moss should be raked out after it is dead to avoid formation of an impervious layer over the soil surface. Follow with an application of lawn fertilizer to encourage growth of desirable grasses back into the areas. If sizeable bare spots remain after removing the moss, it may be necessary to reestablish the spots by seeding or sodding.

Moles, Skunks, and Other Animals

Moles raise ridges in the lawn as they burrow through the soil in search of insects and earthworms to eat. If moles persist, try a trap. Skunks, crows and other animals may also damage your lawn by digging holes in search of grubs and earthworms.

Appendix: Calculations for Lawn Practices

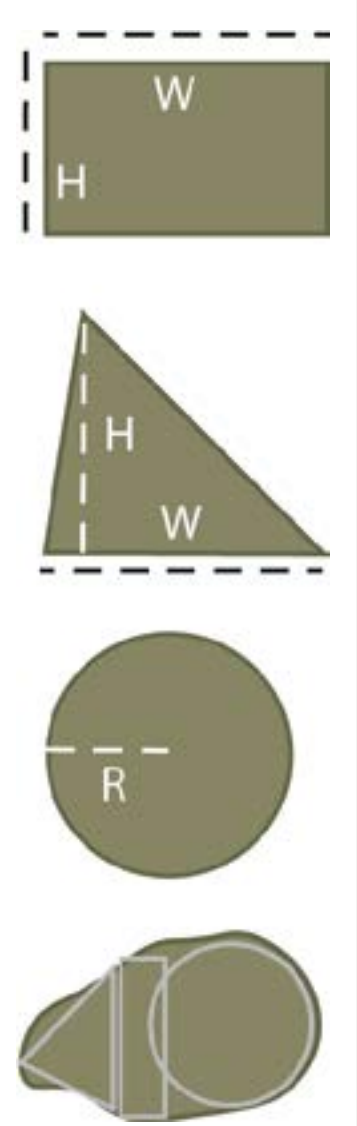
You must know the area of the lawn to make proper applications of fertilizer, lime or sulfur, and pesticides. Use mathematical formulas for the following to determine the area of the lawn.

Formulas to Calculate the Area of:

- Square or Rectangle: Length x Width [L x W]
- Triangle: Base x Height ÷ 2 [B x H ÷ 2]
- Circle: 3.14 x Radius^2 [TT x R^2}

Irregular Shape: Irregularly shapes, usually can be divided into smaller, geometric areas (square, rectangle, circle, triangle) to facilitate total area calculation. Simply calculate the area for each individual shape and add them together. Conversely, it may be necessary to compute the total square footage of structures within the area which will not be treated; buildings, patios, sidewalks, ponds, etc. and subtract it from the overall area.

Here is an online calculator to check your math.https://www.calculator.net/area-calculator.html



Calculating the Amount of Fertilizer Needed

The amount of fertilizer needed to cover your lawn is determined by the total lawn area (see above) and the fertilizer rate and analysis. Review the following example:

Your established lawn is 5,000 square feet, 1 pound of nitrogen per 1,000 square feet is to be applied, and you have selected a fertilizer with the analysis 25-5-10. Four pounds of 25-5-20 will be needed to provide 1 pound of nitrogen per 1,000 square feet.

4 lb. (25-5-10) x .25 = 1 lb. total nitrogen

4 lb. (25-5-10) x .05 = 0.2 lb. phosphate

4 lb. (25-5-10) x .10 = 0.4 lb. potash

To cover the entire lawn, you will need 20 pounds of this particular fertilizer i.e., 4 pounds/1,000 square feet x 5,000 square feet = 20 pounds of 25-5-10 for 5,000 square feet.

NOFA- Standards for Organic Land Care

This is a synopsis of the recommendations, for a complete guide in English and Spanish click here: https://nofa.organiclandcare.net/the-standards/

Principles

Lawns are good for recreation, athletics, pathways (provided foot traffic is light), and as separations between different land uses. Lawn areas can be visually appealing, but they can also be a high-maintenance component of an organic landscape. Limiting the size of lawns to what is absolutely necessary reduces maintenance costs and is better for the environment.
Where lawns are necessary or desired, the ecological footprint should be kept as small as possible by choosing grass varieties and cultural methods that reduce the need for irrigation, fertilizer, pesticides (including organic pesticides), and energy-consuming machinery to a minimum. The demands of some specialized situations (high-profile lawns and athletic fields) can be met organically, but may require the use of more inputs and more time than are required in most residential and commercial landscapes.

New Lawn Installation

Proper installation of a new lawn is essential for its long-term beauty and health, and reduces the need for excessive inputs. Soil testing is the first step. Installation of a new lawn is best undertaken in late summer or early fall, and can be accomplished in several ways. One of the key elements of a successful new lawn is properly prepared soil.
Be careful to choose a seed mixture that is adapted to, and tolerant of, the particular growing conditions of the site. There are many insect- and/or disease-resistant, sun- or shade-tolerant species and cultivars to choose from. Always use several different species and cultivars in the mix to enhance diversity and increase the chances of success. Sodding is a form of lawn establishment that provides instant coverage and looks impressive right away. Unfortunately, most sod is composed of high-maintenance grass species that have been given large amounts of synthetic inputs and water to meet the demand for cheap sod.

Lawn Renovation

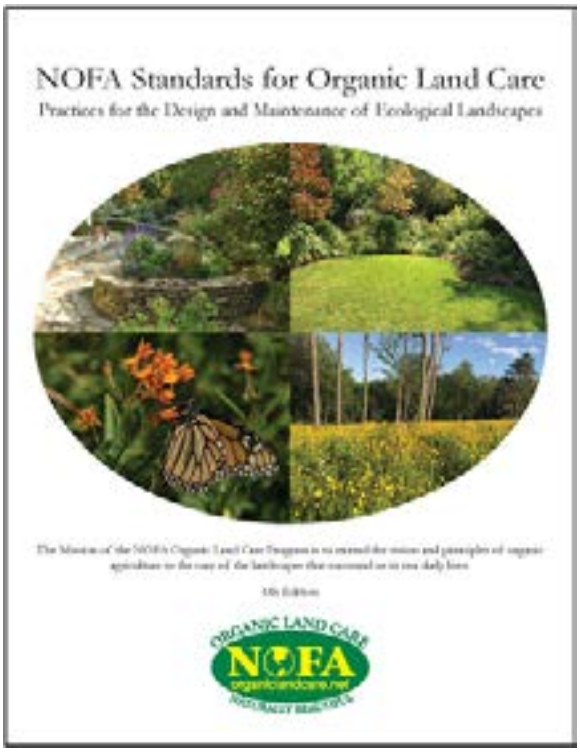
Lawn renovation is the process of rejuvenating a partially damaged lawn. Lawns may require rejuvenation to repair insect, disease, or drought damage; recover from soil compaction; or improve vigor and appearance. By adding different varieties of grass, we can improve wear tolerance, decrease disease susceptibility, and increase a lawn's adaptability to its site. All these changes can alter the dominant cultural regime from high maintenance to low maintenance. Renovation is often the first step in converting a conventionally maintained lawn to organic management. It may be three years before a functioning organic turf ecosystem is fully established. Until the process of building up soil organic matter and soil biology and encouraging the grass plants to develop healthy root systems has been completed, lawn or turf may be susceptible to more weed infestation and insect damage than the client is used to. The land care professional needs to prepare

the client for the challenges of the transition period and counsel patience if he or she starts to have second thoughts.

Lawn Maintenance

The ongoing sustainability of a properly installed lawn is dependent upon proper maintenance. Mow using a well-maintained mower with a sharp blade. No more than one-third of the grass blade should be removed at one time, and the grass should be allowed to grow to a height of 3 inches or taller. The taller the grass is allowed to grow, the larger and deeper the root systems can grow and the more effective the turf will be in crowding out competition from weeds. The grass clippings should, if at all possible, be left in place. As they decay, they release nutrients back to the soil; over the course of a growing season, the nitrogen contained in the clippings equals one fertilizer application. When there is a history of using persistent herbicides on a lawn, the grass clippings must remain in place or be composted separately and returned to the lawn. The residues of such herbicides do not break down readily in composting and are a hazard to many broad-leaved plants. When needed, nutrients can be added to a lawn in several ways: by applying organic matter (typically in the form of compost); by returning grass clippings and shredded autumn leaves to the soil; by using a blended organic fertilizer; by including plants in the lawn that fix nitrogen; or by applying individual nutrients. When applying compost, spread it evenly in a thin layer approximately ¼ inch thick. Compost can be added to a lawn in both spring and early fall.

On healthy, established turf, systematic watering is generally not needed and is not recommended.



Lawn Fertilizer and Phosphorous Law *NYS Nutrient Runoff Law*

Environmental Conservation Law, article 17, title 21 and Agriculture and Markets Law § 146-g, effective January 2012 https://www.dec.ny.gov/chemical/67239.html

When fertilizing your lawn-

Follow the requirements of the law. DO NOT:

- Use lawn fertilizer that contains **phosphorus** unless you are establishing a new lawn, or a soil test shows that your lawn does not have enough phosphorus.
- Apply any lawn fertilizer December 1 - April 1.
- Apply fertilizer on sidewalks, driveways or other impervious surfaces. If fertilizer spills onto these surfaces, you MUST sweep it up to prevent it from washing into drains or waterways. Do not hose if off.

Do Not Apply ANY lawn fertilizer within 20 feet of any water body unless:

- There is at least a 10-foot buffer of shrubs, trees or other plants between the area you are fertilizing and the water,

  OR
- Fertilizer can be applied no closer than 3 feet from the water using a device with a spreader guard, deflector shield or drop spreader.

The law applies to:

- Homeowners applying fertilizer themselves
- Landscapers and lawn care professionals
- Pesticide applicators
- Retailers, distributors and manufacturers of lawn fertilizers
- Fertilizer/pesticide combination products (sometimes called "weed and feeds") when these products contain over 0.67% phosphorus.
- Organic phosphorus fertilizer (such as bone meal).

The law DOES NOT apply to:

- Use of products with 0.67 in the middle or lower
- Agricultural fertilizer or fertilizer for trees, shrubs or gardens
- Compost

Penalties:

- For an owner, owner's agent, or occupant of a household, the penalties are: issuance of a written warning with educational materials for a first violation; a fine of up to $100 for a second violation; and fines up to $250 for subsequent violations.
- The penalties for all others are: a fine up to $500 for a first of violation; and fines up to $1000 for subsequent offenses.

Fertilizer and Nitrogen on Long Island - Nitrogen runoff impacts both surface and groundwater quality on Long Island. Suffolk and Nassau counties have their own fertilizer laws to restrict nitrogen from fertilizer from reaching waterbodies. Visit the counties' websites for details about their respective regulations .

Acknowledgments & Resources

This chapter is based on:
Home Lawns: Establishment and Maintenance
M.C. Thurm, N.W. Hummel and A.M. Patrovic
Updated and expanded by:
Daniel Schied, CNLP.
Director of Grounds at Cornell University, Ithaca

Turfgrass Species and Variety Guidelines for NYS

https://turf.cals.cornell.edu/resources/turfgrass-species-and-variety-guidelines-for-nys/

Lawn Care without Pesticides

How to keep turf healthy so that you can reduce or eliminate the need for lawn chemicals
https://hdl.handle.net/1813/43857

Thatch Explained

https://turf.cals.cornell.edu/lawn/lawn-care-the-easiest-steps-to-an-attractive-environmental-asset/advanced-care/thatch/

Suffolk County Fertilizer Law

https://healthylawns.suffolkcountyny.gov/law/

Nassau County Fertilizer Law

https://www.nassaucountyny.gov/DocumentCenter/View/3178/2009-local-laws-11?bidId=

NYS Nutrient Runoff Law

https://www.dec.ny.gov/chemical/67239.html

NOFA- Standards for Organic Land Care

https://nofa.organiclandcare.net/the-standards/

Locate your Local Cornell Cooperative Extension (CCE) office

https://cals.cornell.edu/cornell-cooperative-extension/local-offices