

Lesson C4–2

Maintaining Turfgrass Areas

Unit C. Nursery, Landscaping, and Gardening

Problem Area 4. Landscape Maintenance

Lesson 2. Maintaining Turfgrass Areas

New Mexico Content Standard:

Pathway Strand: Plant Systems

Standard: I: Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and natural environment.

Benchmark: I-A: Analyze and evaluate nutritional requirements and environmental conditions to develop and implement a fertilization plan.

Performance Standard: 1. Describe nutrient sources. 2. Determine plant nutrient requirements for optimum growth. 4. Determine the environmental factors that influence and optimize plant growth. 6. Describe nutrient application methods and appropriate practices.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Explain good fertilization practices for turf.
2. Describe good mowing practices.
3. Describe other maintenance practices for turfgrass.
4. Explain practices for controlling weeds in turf.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Biondo, Ronald J. and Charles B. Schroeder. *Introduction to Landscaping: Design, Construction, and Maintenance*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2003.

Ingels, Jack E. *Landscaping: Principles and Practices*, Fifth Edition. Albany, New York: Delmar Publishers, 1997.

Other Resources. The following resources will be useful to students and teachers:

Emmons, Robert D. *Turfgrass Science and Management*, Third Edition. Albany, New York: Delmar Publishers, 2000.

Schroeder, Charles B. and Howard W. Sprague. *Turf Management Handbook*, Fifth Edition. Danville, Illinois: Interstate Publishers, Inc., 1996.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters

Terms. The following terms are presented in this lesson (shown in bold italics):

Fertilizer composition
Fertilizer rate
Herbicides
Pre-emergent herbicides
Slow-release fertilizers
Spreader setting
Thatch
Tines

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Begin by asking those students who cut their own lawns to raise their hands. Next, ask them to describe the reasoning they use in setting their mower height. If they are like most people, they will have no good reason for setting the mower at a particular height. Ask the class what times of year they apply fertilizer to their lawns. Most will answer the spring and fall. Inquire why fertilizer is applied at these times of the year to lawns. Use this discussion to introduce the concept that good turf is not just throwing out some grass

seed and watching it grow. Instead, good management practices are needed at the appropriate times to maintain turfgrass areas.

Summary of Content and Teaching Strategies

Objective I: Explain good fertilization practices for turf.

Anticipated Problem: How and when should fertilizer be applied to turf?

- I. Fertilization during late spring will provide the turfgrass with the nutrients needed to survive the hot summer growing season. Early fall fertilization will stimulate production of new tillers and rhizomes for the following year. This practice will also help maintain a vigorous, green turf until late fall or early winter. It can also improve early spring green-up of the grass. Effective fertilizer application involves an understanding of fertilizer composition, fertilizer rates, and spreader settings.
 - A. **Fertilizer composition** refers to the percentages of nitrogen (N), phosphate (P), and potash (K) that are included in a container of fertilizer. A one hundred pound bag of fertilizer labeled with an analysis of 16-4-8 means that 16 percent (16 pounds) consists of nitrogen, 4 percent (4 pounds) consists of phosphoric acid, and 8 percent (8 pounds) consists of potash. Maintenance fertilizers should be high in nitrogen, but also have moderate amounts of phosphate and potash. Slow-release fertilizers are often used immediately after the initial fertilization. **Slow-release fertilizers** provide a sustained flow of nutrients to the grass. They insure against over-stimulation.
 - B. **Fertilizer rate** is a measurement of the amount of fertilizer applied to a given area. It should be adjusted to the natural fertility of the soil, the length of the growing season, and the amount of foot traffic. Turfgrass planted on infertile soils and those in areas with long growing seasons require more fertilizer.

A good rate of nitrogen fertilizer that should be applied in an application is about one pound per 1,000 square feet. Landscapers must determine how much fertilizer should be applied to provide the right amount of nitrogen for a given area. A method for calculating how much fertilizer to use is as follows:

$$\frac{\text{lbs. nitrogen to use per 1,000 sq. ft.}}{\% \text{ of nitrogen in the fertilizer}} \times 100 = \text{lbs. of fertilizer to apply per 1,000 sq. ft.}$$

If a landscaper needed to calculate how much 32-4-8 fertilizer would be needed on a 16,000 square foot lawn in order to apply one pound of nitrogen per 1,000 square feet, the above equation would be used as follows:

$$\frac{1}{32} = .031 \times 100 = 3.1 \text{ lbs of fertilizer per 1,000 square feet. } 3.1 \times 16 = 49.6 \text{ lbs.}$$

- C. **Spreader setting** refers to how the spreading equipment is calibrated in order to distribute fertilizer over the turf. All fertilizers must spread uniformly over the turfgrass area since fertilizers do not move laterally in the soil. Uniform spreading is dependent on properly setting the spreader. Failure to do so will result in missed spots or areas that are over-stimulated. There are two major types of fertilizer spreaders.
1. The drop or gravity spreader will provide an accurate application of fertilizer. However the application is time consuming since these spreaders only cover a strip that is 2 to 3 feet wide.
 2. Rotary spreaders cover a 6 to 12 foot area and provide uniform application. They allow for quick application over a large area. However, care must be taken not to apply fertilizers in areas where they are not desired, such as gardens.

Display TM: C4–2A and use it to reinforce the concept of fertilizer composition. Discuss the roles of N, P, and K in supplying nutrients. Review the sample equation provided above to reinforce fertilizer rates. The Introduction to Landscaping Activity Manual includes a good exercise on calculating fertilizer rates. You can use it or develop your own worksheet in order to reinforce the math skills associated with calculating fertilizer rates. Show the two main types of spreaders, and demonstrate how to set them. Also, depending on the time of year, ask students to identify turf areas that have received too much or too little fertilizer.

Objective 2: Describe good mowing practices.

Anticipated Problem: What are good mowing practices?

- II. Mowing is important in the maintenance of turfgrass areas. Proper mowing involves adjusting the height of the cut and deciding whether to remove grass clippings from the turf area. Attention to these details will assist in maintaining healthy and attractive turf areas.
- A. Height of cut—different species of grasses should be cut at different heights. Cool season grasses should be cut at a height of $2\frac{1}{2}$ to 3 inches. Mowers for warm season grasses should be set to cut at a height of one to two inches. Mowing frequency should be such that no more than one third of the grass blade should be removed at any one cutting. Depending on weather conditions, this may involve mowing every few days or once every couple of weeks. Mowing should continue in the fall for as long as turf areas continue to grow.
 - B. Removal of clippings—the decision to remove grass clippings affects both the health and appearance of the turf areas. Failure to remove excessive clippings is not only unattractive, it can also be an invitation to turf diseases. Turf diseases prefer the high humidity conditions found under heavy layers of clippings. Clippings should be removed promptly, before fungus diseases have an opportunity to develop. Clippings allowed to remain, sift down and add to soil fertility. They decompose rapidly, return about 25 percent of the nitrogen to the lawn, and do not contribute to the build up of thatch.

The concepts of this objective can best be presented and reinforced through application. Demonstrate how to adjust mower height on individual pieces of equipment. Have students identify turf areas that were cut

too high or “scalped.” Also point out areas where clippings should have been removed. Emphasize the fact that excessive clippings not removed are more than unsightly. They also have negative impacts on the health of the turf areas.

Objective 3: Describe other maintenance practices for turfgrass.

Anticipated Problem: What are some other practices that can be used in maintaining turfgrass?

III. In addition to fertilizing and mowing, there are some additional practices that can be undertaken to maintain turfgrass areas. These practices include the following:

- A. Watering—As a rule, turf should be watered to a depth of about six inches. Generally, about one inch of water will soak the soil to a depth of six to eight inches. Turfgrass should be watered early enough in the day to insure that the grass leaves are dry by nightfall. Grass that goes into the night with wet leaves provide the ideal scenario for the development of leaf diseases. Water should be added only when needed. Lightly sprinkling turf in hot weather will benefit weeds more than turfgrasses.
- B. Thatch control—**thatch** describes the accumulation of excess grass stems and roots in the turf. For years, turf experts believed that thatch was caused by un-bagged grass clippings. In fact, grass clippings do not contribute to thatch buildup. Excess grass growth, possibly caused by over-fertilization can create conditions for thatch to accumulate. Controlling thatch involves the physical removal of the excess plant growth and the adoption of practices to prevent additional buildup. Some methods for removing thatch involve the following:
 1. Power rakes or thatching machines can physically remove thatch from the lawn. When using a power rake, the thatch must still be picked up from the lawn surface.
 2. Core aerifying machines remove small plugs of soil from the turf. Air that penetrates into the thatch layer from these holes will allow soil microbes to destroy the thatch. This technique prevents thatch accumulation.
 3. Chemical thatch removers are available on the market today. However, their value and effectiveness are limited.
- C. Aerifying turfgrass soil—aerifying turf can provide temporary improvement of compacted soil conditions and reduce thatch accumulation. An aerifying machine drives hollow tubes called **tines** into the soil and removes a $\frac{1}{2}$ inch diameter plug of soil. The more holes, the better aerification. Therefore, it is best to use a machine with closely spaced tines, or make several passes over the turf area. Aerification is best timed when it proceeds the application of lime or fertilizer. The creation of the holes in the soil allows the deep penetration of the fertilizers and/or lime.
- D. Rolling turf—rollers are used after seeding and sodding to establish good contact between the seed or sod to the soil. The objective of good turf management is to roll sparingly, if at all. Repeated rolling in the spring when the soil is wet and soggy, causes undesirable compaction of heavy-textured soils. Since grass roots will penetrate only into soil

layers that are well aerated, spring rolling may restrict the new roots to the uppermost layers of the soil.

- E. Removal of leaves—under deciduous trees in autumn, fallen leaves should be removed periodically to prevent them from covering the turf and cutting off light. It is also essential for newly seeded or renovated areas in order to allow the development of grass seedlings.

Use TM: C4–2B to illustrate general turf maintenance practices that can be carried out in addition to mowing and fertilizing. Discuss with the class whether turf irrigation is required in your area. Possibly demonstrate the operation of power rakes and aerifying machines. If this is not feasible, have students research the machines and models offered by major turf maintenance equipment manufacturers.

Objective 4: Explain practices for controlling weeds in turf.

Anticipated Problem: What are some common practices of controlling weeds in turf?

- IV. Good weed control strategy depends on exploiting opportunities in the following areas: natural competition, using weed-free seed mixtures, and herbicide applications at appropriate times. These three factors should be used in combination. Employing only one factor is not an effective method for weed control. The following practices encourage the implementation of these factors:
- A. Mowing practices should be timed to prevent weeds from producing seed. Timely mowing, combined with using herbicides at the appropriate periods, constitutes good weed control. Grass that is mowed too short is one reason for weedy turf. Grass allowed to grow taller is better able to compete with weeds for available water and nutrients.
 - B. **Herbicides** are chemicals that kill or prevent weed growth. They are powerful compounds that should be used with care. The manufacturer's label should always be read in detail before herbicides are used. Other considerations when using herbicides include:
 1. Turfgrass should be treated when soil moisture is adequate and weeds are actively growing. The weeds are most vulnerable under these conditions. An exception to this is the use of **pre-emergent herbicides**, which prevent the germination of weed seeds. Such herbicides are commonly used to control crabgrass.
 2. The individual spraying the herbicide should take appropriate precautions so that the herbicide does not drift onto other vegetation such as flowers, trees, shrubs, and vegetables.
 3. Herbicide application should be carried out well before any re-seeding of grass, so the herbicide dissipates before planting. This is due to the fact that seedling grasses are far more susceptible to herbicides than mature turf plants.

Use classroom discussion to reinforce the principle that a good weed control strategy involves a combination of factors. Use TM: C4–2C to illustrate the fate of chemicals applied to turfgrass. Have students examine the manufacturer's labels of various herbicides. Ask them to determine the kinds of weeds controlled, application rates, and any special precautions associated with each herbicide.

Review/Summary. Focus the review and summary around the lesson's student learning objectives. Ask students to verbally explain the concepts associated with each objective. Use their responses as a basis for determining whether particular areas need to be covered again. The questions at the ends of the chapters in the recommended resources can also be used in the review/summary. The exercises contained in the lab manuals that accompany the recommended resources will also be helpful.

Application. The exercises contained in the *Introduction to Landscaping Activity Manual* may be used for application.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is also attached.

Answers to Sample Test:

Part One: Matching

1 = d, 2 = b, 3 = a, 4 = c, 5 = e

Part Two: Completion

1. Fertilizer rate
2. slow-release
3. Herbicides
4. nitrogen, phosphoric acid, potash

Part Three: Short Answer

1. Use information presented under Objective 2 to grade answers.
2. $1/26 = .04 \times 100 = 4$ lbs. of fertilizer per 1,000 square feet.
 $4 \text{ lbs.} \times 20 = 80$ lbs. of fertilizer to be used on the 20,000 square foot lawn.

Sample Test

Name _____

Test

Lesson C4–2: Maintaining Turfgrass Areas

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- a. pre-emergent herbicides
- b. tines
- c. fertilizer composition

- d. thatch
- e. spreader setting

- _____ 1. The accumulation of excess grass stems and roots in the turf.
- _____ 2. Hollow tubes on an aerifying machine that are driven into the soil.
- _____ 3. Prevent the germination of weed seeds.
- _____ 4. The percentages of N, P, and K, in a container of fertilizer.
- _____ 5. How spreading equipment is calibrated in order to distribute fertilizer.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. _____ is the measurement of the amount of fertilizer applied to a given area.
2. Fertilizers that provide a sustained flow of nutrients are referred to as ____ - _____.

3. _____ are chemicals that kill or prevent weed growth.

4. A fertilizer that is labeled as 16-4-8 consists of 16 percent _____, 4 percent of _____, and 8 percent _____.

Part Three: Short Answer

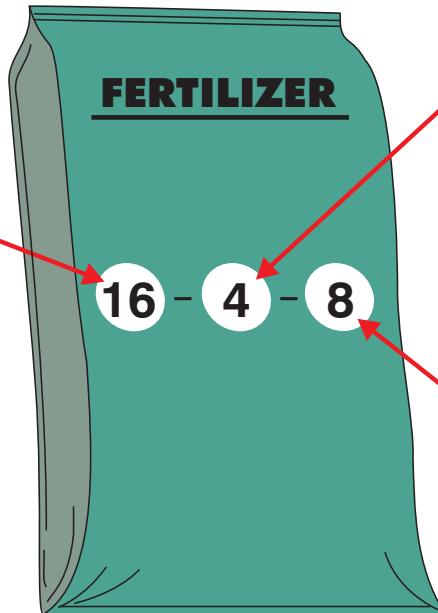
Instructions. Provide information to answer the following questions.

1. List and explain the two major aspects that determine good mowing practices.

2. A landscaper has a supply of 26-6-10 fertilizer. He or she needs to apply it at a rate of 1 pound per 1,000 square feet to a 20,000 square foot lawn. How many pounds of fertilizer will he or she use?

FERTILIZER COMPOSITION

16% nitrogen (N)—
If it is a 100 pound
bag, it contains 16
pounds of nitrogen.



4% phosphoric acid
(as P_2O_5)—If it is a
100 pound bag, it
contains 4 pounds
of phosphoric acid.

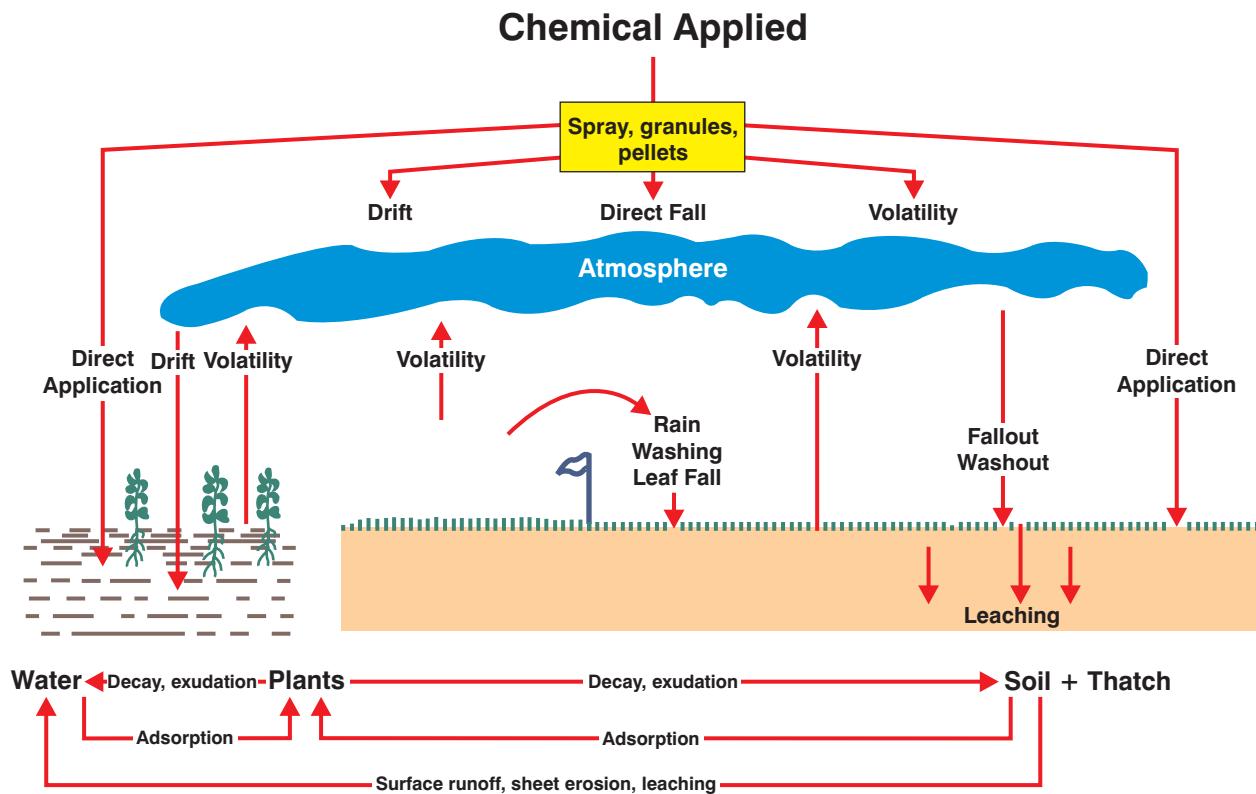
8% potash (as K_2O)—
If it is a 100 pound
bag, it contains 8
pounds of potash.

(Courtesy, Interstate Publishers, Inc.)

GENERAL TURF MAINTENANCE PRACTICES

- 1. Watering**
- 2. Thatch control**
- 3. Aerifying turfgrass soil**
- 4. Rolling Turf**
- 5. Removal of leaves**

TM: C4–2C



(Courtesy, Interstate Publishers, Inc.)