



Soils

Golf courses are community green spaces that provide recreational and environmental benefits to local areas. Golf courses are large parcels of land with healthy turf, trees and other vegetation. Collectively, they provide wildlife habitat, improve air quality, reduce noise and dust, filter surface water, recharge ground water supplies, and in many cases, are used to reclaim and restore environmentally damaged sites. Healthy soil is a study topic in environmental science classes and offers teachers and students learning activities on every golf course.

Student Learning Objectives

1. **Identify the three components of soil and the ideal mixture of the components for soil that supports growth of grass and plants.**

(Sand, silt and clay are the three components. The goal is to minimize the amount of clay for better water drainage. On the golf course, the best soil for fairways and borders is sandy loam which is a mixture of 70% sand, 20% silt and 10% clay. Soil on the greens is more like 90% sand, 7% silt and 3% clay.)

2. **Explain the importance of soil nutrients in supporting healthy turf and water filtration.**

(Soil nutrients are essential for plant growth (like vitamins and minerals to humans). These nutrients need to be in balance for plants. Water filtration allows the plants to absorb water for life; excess water in the soil robs the plants of nutrients and eventually kills the plants.)

3. **Describe the best range of pH numbers for healthy plants and what can be done to keep soil at this level.**

(The ideal pH range for healthy plants is 6 to 7. Golf course superintendents test the soil to determine the kinds of nutrients necessary to correct imbalances. Depending on the age of the students, you can discuss ways that you correct imbalances on the golf course through targeted fertilizers and adequate organic mixture in the soil.)

Student Worksheet Questions

Review the worksheet questions with students at beginning of lab and at the end. It may also be printed out for students to complete as part of the field trip.

1. List three environmental benefits of golf courses.
2. What are the three components of soil?
3. Why do soil nutrients matter?
4. What is the ideal pH number for healthy soil?

Note: The teacher may want to have additional material covered and will add to these questions. Take time to talk with the teacher in advance of the field trip.

Field Trip Requirements

- Samples of sand, silt and clay.
- Soil sieve.
- Collect enough leaf litter to fill 1/3 of each container.
- Three or four empty water bottles with the bottoms cut off to use for water filtration lesson.
- Soil probe to pull soil samples.
- Soil testing kits for testing pH. See the First Green website for ordering information. (<http://thefirstgreen.org/-superintendent-resource-kit>)

Field Trip Activity Outline

1. The golf course superintendent or golf course representative should begin the soils lesson by asking the students if they take care of lawns at home and whether they know what kind of soil it takes to grow healthy grass and plants. Use the questions at the beginning of the lesson plan. If the learning lab is located where the students can see the golf course, point out some of the natural features such as lakes, ponds, wetlands, trees, rivers, streams, topography, geological features, wildlife corridors and native areas. For older students, also point out golf course design elements (drainage swales, native plants and buffer zones) along with maintenance practices (use of low maintenance areas, mowing heights and clipping recycling), and discuss the environmental impact of each element or practice and how a healthy soil is the underlying requirement.

2. A soil sieve is useful in demonstrating the components of soil. Put some soil in the top of the sieve and allow students to take turns shaking the sieve. Stop and open the layers of the sieve one or more times to show students how the soil moves through the sieve. Students like to feel the sand, silt and clay as one way to understand the differences in texture. If your golf course has significant amounts of clay, younger students like to take the clay to shape it into objects and also feel a ball made of dried clay. You can shape a ball of clay and let it dry out completely to use as a learning sample.
3. To view water movement through soil, use empty, clear plastic bottles. Individual size water bottles work well. In preparation for the class, the superintendent should cut off two inches off the bottoms of the bottles and plug the neck opening with cotton or paper towels. Fill the bottles 2/3 full of the different soils. Put one sample in each bottle and the fourth can be a combination of different layers. Have a bottle of water at the learning lab and ask the students to pour water over the soil and watch the water move through the soil. The learning lab host should then discuss the factors which influence water movement through soil. Factors such as gravity, soil type, compaction, layering, and perched water table can be discussed appropriate to the age level of the students.
4. Additional learning labs on soil: students learn by seeing soil samples using the soil probe. Grass roots, layers of sand and other soil features are readily identified. Middle school students enjoy using the soil probe to pull their own individual soil samples if there is time to allow them to do so. Soil testing kits usually include the materials necessary for explaining soil nutrients. Students are easily involved in testing the soil for pH as part of the discussion on soil nutrients. Use the soil testing kit as directed. Take a soil sample and conduct the test, allowing students to be involved in each step of the testing such as inserting the drops and shaking the test tubes. Talk with the students about the ideal pH for soil and what you have to do on your golf course to maintain this level. Ask students why homeowners and golf courses aerate turfgrass. What are the benefits? Explain what this is if the students do not know.

Wrap Up

Tell the students that you are going to review what they have learned. Ask them the questions that you posed at the beginning of the lesson plan and make sure they know the answers. If you are using the worksheet, have the students complete the worksheet and read out the answers.

The teacher may want to have additional material covered and will add to these questions. Take time to talk with the teacher in advance of the field trip. Depending on the age level of the students, the teacher may request more detail on one of these topics such as soil nutrients.

1. List three environmental benefits of golf courses.
2. What are the three components of soil?
3. Why do soil nutrients matter?
4. What is the ideal pH number for healthy soil?

Worksheet for Soils Learning Lab

Date _____ Golf Course _____

Student Name _____

Please answer the questions below while participating in the learning lab:

a. List three environmental benefits of golf courses.

- 1.
- 2.
- 3.

b. What are the three components of soil?

- 1.
- 2.
- 3.

c. Why do soil nutrients matter?

d. What is the ideal pH number for healthy soil?