

Morgan Perry

AgEd 410

May 7, 2013

AGED 410 Webquest

CFL's Addressed: CLF6401, CLF6403, CLF6402, CLF6501, CFL6355, CFL6357

Guiding Question: Assess what type of soil you have and what problem is affecting your plants. After assessing both case studies, devise a soil amendment and plant treatment plan and tell the owner how to prevent the problem in the future.

Learning Outcomes:

- List and discuss four advantages of soil improvement and conservation techniques.
- Review the four functions of soil.
- Describe the soil texture considered ideal for gardening.
- List and discuss four advantages of soil improvement and conservation techniques.
- List symptoms of plant nutrient deficiencies when the following minerals are inadequate: N,P,K,Fe,S,Mg,B, and Zn.

What the Heck Do I Have Here?!

What the Heck Do I Have Here?! Soil and Plant Diagnosis and Treatment



Introduction:

Today, you must be meticulous in your observations, imaginative in your analysis and creative in your final report. You are, no matter what, concerned first and foremost for your plants' well-being and will do whatever it takes to ensure a healthy plant, starting with your soil.

The management of soils for gardening and ornamental horticulture is more intensive than that for most fields of agriculture. Nothing is as important as the soil when producing an ornamental crop, or when maintaining healthy plants in the landscape because the condition of the soil has a direct and immediate effect on the well-being of plants. Correctly managing horticultural soils and assessing plant health is the first step that must be taken to have success in horticulture. Remember that good soil provides four basic things for plants. Soil provides important plant nutrients, water and air to plant roots and also serves as anchorage for plants. A good soil must be able to provide all of these things and, if it cannot, amendments to the soil must be made.

Task:

You will be put in one of four groups and asked to evaluate a self-selected NUMBERED case study (soil). After assessing what type of soil you have, you will then evaluate a self-selected LETTERED case study (plant) and assess what problem is affecting your plants. After assessing BOTH case studies, you must devise a **soil amendment and plant treatment plan** (related to BOTH case studies chosen!) and tell the owner **how to address and prevent the problem** in the future. Also in your report, you must **include plant species most susceptible** to these problems and **other issues that arise from the soil type selected**. Present to class,

PowerPoint, poster board, video or another teacher approved presentation. You have 4 days to complete the presentation. 5th day, everyone presents.

Grading:

Total 100pts

• Case Study Guide-	10pts
• Soil Diagnosis-	10pts
• Plant Diagnosis-	10pts
• Soil Amendment-	20pts
• Plant Treatment-	20pts
• Organization and creativity-	10pts
• Presentation-	20pts

Case Studies:

1. Soil Case Studies

- a. Case Study One: You live on the eastern side of the San Joaquin Valley (Stanislaus or Merced County), and would like to find out the general soil type and drainage for the soil in your backyard. You know that the soils in your area tend to have little or no layering to restrict downward water flow. To determine your soil type and drainage, you dug a hole about six inches wide and one foot deep. You then filled the hole with water and let it drain completely and finally you fill the hole with water again. After 30 minutes, the water has finished draining. What general soil type (texture) do you think you have?
- b. Case Study Two: One of the main soil types in San Luis Obispo County is the Ayar soil. Deep, wide cracks remain open in the soil from June to November for 150 to 180 days and remain closed the rest of the time. The Ayar soil has slow permeability. The available water capacity is high to very high, the surface runoff is rapid, and the hazard of erosion is high. The shrink-swell potential is also high. To determine your soil type, you took a handful of moist (but not wet) soil from your garden, and gave it a firm squeeze. When you opened your hand, the soil held its shape, even after you poked it to try and break it apart. What kind (texture) of soil do you think you have?
- c. Case Study Three: You are on a backpacking trip in the foothills around Portland, Oregon. For once, it's actually sunny, and you're hungry, so you stop to relax and

enjoy a picnic. While relaxing after your glorious picnic, you decide to conduct a little experiment to try and find out what type of soil you're sitting on. You know that the soil is derived from basalt and siltstone over residuum weathered from siltstone and fine-grained sandstone. You wet some soil in your hand and gave it a firm squeeze. When you opened your hand, the soil held its shape, but crumbled after you poked it. What kind (texture) of soil do you think you have?

2. Plant Case Studies

- a. Case Study A: Congratulations! You work at Farm Supply here in San Luis Obispo, California! Now that it is almost summer-time, you know that tomato sales currently comprise a significant

portion of Farm Supply's income. While you are out pruning one morning, you notice that your plants seem to be showing signs of wilting, leaf burn and necrosis, even though you know that you have been giving them plenty of water. It is critical that you not only diagnose the problem, but come up with a way to remedy



the situation ASAP! In addition to the immediate concern at the nursery, you must address complaints of customers who have already purchased some of the damaged tomato plants (the problem continues once they get the plant home).

- b. Case Study B: You have the day off from work!

You decide to spend your day out in your garden since the weather here in San Luis Obispo, California is so beautiful today. While you are out watering your rose bushes, you see that your plants' leaves are yellowing and falling off and that they seem to be smaller, or stunted, when compared to your neighbors. It is critical that you not only diagnose the problem, but come up with a way to remedy the situation quickly since you were planning on putting these roses in the Mid-State Fair next month!



- c. Case Study C: You are out hiking on one of the many stunning Montana Del Oro trails when you notice that some of the plants alongside the trail are looking a little strange. The leaves looked crinkled and cupped. You need to take a breather anyways, so you decide to do a little more investigating as to why the plants might be sick. You dig up one of the sick plants, as well as a healthy plant of the same type. You see that the roots of the sick plant look stunted and significantly smaller than that of the healthy, normal plant. So whatever is causing the plants to get sick isn't just affecting the leaves, but the roots too! Your friend is a park ranger and you know that she would want to know what is causing the plants to get sick, but you also know that plant health isn't her strong suit. She definitely needs your help to diagnose these plants...



List of Soil Types and Plant Problems to choose from (they will be in this list):

- | | | |
|--------------|----------------------|------------------------|
| ➔ Sandy Soil | ➔ Loam Soil | ➔ Potassium Deficiency |
| ➔ Silty Soil | ➔ High Salinity | ➔ Nitrogen Deficiency |
| ➔ Clay Soil | ➔ Acid (low pH) Soil | ➔ Base (high pH) Soil |

Process: How to Get Started

1. In order to successfully treat and help your plants grow to the best of their potential, you must first identify what type (textures) of soil you have and what type of plant you have.
 - a. Some things to look for when identifying your soils:
 - i. What degree of drainage does your soil have?
 - ii. How “sticky” is your soil?
 - iii. Are there any physical clues given to you (erosion issues, county, etc)?
 - b. Some things to look for when identifying your plant problem:
 - i. Is the plant is a tree, bush, moss, vine or herb?
 - ii. Are there any other physical clues given to you about the plant problem, such as smell, color, and general location?
 - c. Identify important information in your case studies and write them down under symptoms.

- d. Read through the list of soil types (textures) and plants problems it could be.
- e. Go to WESTERN GARDEN BOOK (2012) and read through the information on plants and soils.
- f. Find the soil and plant that best matches your set of symptoms.
- g. Complete the Case Study Guide with all the information you have found.
- h. Choose a method of presentation
 - i. PowerPoint
 - ii. Poster Board
 - iii. Video
 - iv. Teacher Approved
- i. Complete presentation by _____

Resources:

- Editors of Sunset Books and Sunset Magazine. (2012). LANDSCAPING ILLUSTRATED. Menlo Park, CA: Lane Publishing Co.
- Hausenbuiller, R. L. (1972). SOIL SCIENCE: PRINCIPLES AND PRACTICES. Dubuque, IA: Wm. C. Brown Company.
- http://www.agric.wa.gov.au/objtwr/imported_assets/content/lwe/water/irr/fn_soil_texturing.pdf
- <http://aggie-horticulture.tamu.edu/vegetable/cucurbit-problem-solver/leaf-disorders/salt-injury/>
- <http://www.sdstate.edu/ps/extension/soil-fert/corn-deficiency-photos.cfm>
- <http://newgardeningcoaches.gardening-coaches.com/resources/plant-symptoms-and-causes/>
- <http://www.ext.colostate.edu/pubs/garden/07235.html>
- <http://www.gardeners.com/Building-Healthy-Soil/5060,default,pg.html>

What The Heck Do I Have Here?!

Case Study # _____, Case Study Letter _____ Guide

Names of the Members in Group: _____

Symptoms identified from Case Studies:

Possible soil type (texture) and plants:

Soil Type (Texture) I Most Likely Have: _____

Plant Problem I Most Likely Have: _____

Reason you chose this Soil Type (texture) and Plant Type:

Case Study # _____ has _____.

Case Study Letter _____ has _____.

Soil Amendment Plan (if no change needs to be made, explain why):

Plant Treatment Plan:

Possible FFA/SAE Projects:

1. Create your own potting mix
2. Create your own gardening soil additive
3. Study the effect of different types of fertilizer on soil quality
4. Collect samples of a variety of soil amendments, learning the name and uses of each, and whether they are of organic or inorganic origin
5. Mix a batch of medium to be used in the greenhouse for containerizing new transplants
6. Start a soil testing company for your local community
7. Determining the best way to grow ornamentals, trees, grass, fruit trees, vegetables or vines in your local community
8. Investigate the importance of plant genetics and disease
9. Explore the chemical properties of soil, plants and chemicals used in production operations in your area.



Possible Soil and Plant Amendments Answers:

1. Case Study One: **PEDOMINATELY SANDY SOIL**
 - a. Sandy soil amendment:
 - i. Till the area as deep as possible, preferably more than once.
 - ii. Till in organic compost over the sandy garden site. The compost increases the humus content of the sandy soil, which improves the soil texture.
 - iii. Cultivate peat moss into the sandy soil. Peat moss aids in moisture retention.
 - iv. Spread fertilizer over the garden site and till the fertilizer into the soil. The fertilizer adds the required nutrients for plant growth.
2. Case Study Two: **PREDOMINATELY (SILTY) CLAY SOIL**
 - a. Clay soil amendment
 - i. Till the planting area, extending out a little past the planting area. This will ensure that the roots have extra growing room if they need it.
 - ii. Till a layer of organic material over the area.
 - iii. The most common substances to add to clay soil are builder's sand, composted manure, compost or other coarse organic material. Together, builder's sand and organic matter will create a more desirable soil for planting. Builder's sand allows for better water drainage and increased air pockets, as it acts to help force the particles in the clay apart. Organic matter will help the plants get the proper nutrients and also help build

increased humus with additional microbes that are the building blocks of good soil.

3. Case Study Three: PREDOMINATELY LOAM SOIL

a. No amendment needed because:

- i. Loam soils generally contain more nutrients, moisture and humus than sandy soils, have better drainage and infiltration of water and air than silty soils, and are easier to till than clay soils. The different types of loam soils each have slightly different characteristics, with some draining liquids more efficiently than others.
- ii. Loam is considered ideal for gardening and agricultural uses because it retains nutrients well and retains water while still allowing excess water to drain away. However, a soil that meets the textural definition of loam can lose its characteristic desirable qualities when it is compacted, depleted of organic matter, or has clay dispersed throughout its fine-earth fraction.

4. Case Study A: SALINITY PROBLEMS

a. High salinity soil amendment:

- i. Gypsum is used to counter high levels of sodium (Na⁺) in high salt soils. Gypsum helps displace the sodium, and thereby allows clay particles to clump together, forming larger, more beneficial soil aggregates. This improves soil structure and tilth. Calcium sulfate is another name for gypsum.
- ii. Spread gypsum over the soil according to the directions on the package. Package directions should explain the size of the area that a cup of gypsum will cover so you can approximate the correct amount of gypsum to use.
- iii. Scrape the surface of the soil with the blade of the hoe to work the gypsum into the soil.

5. Case Study B: NITROGEN DEFICIENCY

a. Low nitrogen soil amendment:

- i. Commercial fertilizer:
 1. Spread commercial fertilizer over the soil according to the directions on the package.
 2. Water the soil to dilute the fertilizer and to prevent it from burning the plants and their roots.
- ii. Cover Crop:
 1. Prepare the soil for planting by tilling it to break up the top 3 to 6 inches of the soil with a hoe. Rake the soil smooth.
 2. Scatter the seeds of a cover crop plant such as cowpea (*Vigna unguiculata*), soybean (*Glycine max*), pearl millet (*Pennisetum glaucum*) or buckwheat over the soil. These plants react with bacteria in the soil to add nitrogen that will be available to future crops.

3. Rake the soil lightly to cover the seeds so they won't blow away in the wind or wash away when you water them.
4. Water the planted bed with a fine mist. Keep the soil moist until the seeds germinate, and water the plants twice a week throughout the growing season until the crop dies and turns brown. You won't need to water a cover crop that you plant in the fall. A fall-planted cover crop will die the following spring, and a spring-planted cover crop will die in the fall.
5. Till the dead plants into the earth. The organic matter will continue to decompose over time, releasing nitrogen into the soil.

6. Case Study C: ACID SOIL

- a. Aluminium toxicity is the most widespread problem in acid soils. Aluminium damages roots in several ways: In root tips and Aluminium interferes with the uptake of Calcium, an essential nutrient. Aluminium can also restrict cell wall expansion causing roots to become stunted.
- b. Manganese toxicity can become a problem at pH 5.6 and below. Manganese, like aluminium becomes increasingly more soluble as pH drops. Mn is an essential plant nutrient, so plants transport manganese into leaves. Classic symptoms of manganese toxicity are crinkling or cupping of leaves.
- c. High acidity soil amendment:
 - i. Lime (calcium carbonate) can be incorporated to raise pH in acid soils, and will also add calcium as a nutrient.