

Course	Agricultural Science II
Unit	Introduction to Grassland Management
Subunit	Soil Management
Lesson	Using Soil Survey Manuals
Estimated Time	Four 50-minute blocks
Student Outcome	

Interpret soil survey manuals and recommend plants for a soil type.

Learning Objectives

1. Identify parts of the soil survey manual that apply to grassland management.
2. Describe how property is located in a soil survey manual.
3. Describe how the uses of the soil type are determined.
4. Identify the possible soil classifications.
5. Identify what soil factors affect plant selection.
6. Identify what the common drainage classifications are.
7. Determine where soil survey manuals/maps can be obtained.

Grade Level Expectations

SC/ME/1/B/09-11/b

SC/EC/3/C/09-11/d

SC/ES/3/A/09-11/e

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slide
 - PPT 1 – Forage Adaptation by Soil Drainage Class
2. *Introduction to Grassland Management* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
3. *Introduction to Grassland Management Curriculum Enhancement, Unit II – Soil Management.* University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Local soil survey manuals

Supplemental Information

1. Internet Sites
 - Soil Survey Program. USDA Natural Resources Conservation Service. Accessed February 13, 2008, from <http://www.mo.nrcs.usda.gov/technical/soils.html>.
 - The Missouri Cooperative Soil Survey Website. Center for Agricultural, Resource and Environmental Systems (CARES), College of Agriculture, Food and Natural Resources, University of Missouri. Accessed February 13, 2008, from <http://soils.missouri.edu/>.

Interest Approach

Bring in copies of local soil survey manuals. Allow the students to attempt to locate their home and read the information concerning the soils found in that area. Discuss the various ways this information might be useful.

Communicate the Learning Objectives

1. Identify parts of the soil survey manual that apply to grassland management.
2. Describe how property is located in a soil survey manual.
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4. Identify the possible soil classifications.
5. Identify what soil factors affect plant selection.
6. Identify what the common drainage classifications are.
7. Determine where soil survey manuals/maps can be obtained.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Ask students what soil information <u>not</u> provided on the soil test report they would need to know if they were managing a grassland area. Use the answers as a bridge into the list provided below.</i></p>	<p>Identify parts of the soil survey manual that apply to grassland management.</p> <ol style="list-style-type: none">1. How to use the soil survey: provides an introduction to or review of the survey; includes the general soils map for land use planning2. Soil maps: aerial photographs on which phases of soil series are drawn to be used in making land use decisions3. Use and management of the soils: descriptions of land use potential and management for all areas of interest4. Descriptions of the soils: series by series soil description with information on characteristics, limitations on use, land capability, and suggested management practices5. Formation and classification of the soil: information on uniform systems of soil classification
<p>Objective 2</p> <p><i>Discuss the maps provided in the manual. Ask students why they might be included. Using the local manual, show the location of the school as an example of the procedure for locating specific plots of land. Have students refer to the instructions in the front of the soil survey manual.</i></p>	<p>Describe how property is located in a soil survey manual.</p> <ol style="list-style-type: none">1. Use the "Index to Map Sheets" to locate the property.2. Go to the page number of the map sheet indicated by the index.3. Locate the property on the map using landmarks and features and/or the US standard land survey system.

Instructor Directions	Content Outline
<p>Objective 3</p> <p><i>The soil scientist interprets all the information for a particular area and determines the uses of that soil. Ask students how this determination is made.</i></p>	<p>Describe how the uses of the soil type are determined.</p> <ol style="list-style-type: none"> 1. Permanent limitations: cannot be easily changed; includes severe slope, soil depth, flooding, and large rocks 2. Temporary limitations: can be removed or improved; includes soil nutrient content, moderate slope, and minor drainage problems
<p>Objective 4</p> <p><i>Some soils are more useful than others. For example, a plot of land on a rocky mountain is not going to be nearly as productive as a river bottom plot with a deep topsoil layer. Therefore, soils are classified according to the permanent limitations and hazards that affect the productivity of the soil. Have students describe the classification system and soil classifications.</i></p>	<p>Identify the possible soil classifications.</p> <ol style="list-style-type: none"> 1. Cultivable <ol style="list-style-type: none"> a. Class I (1): very few limitations b. Class II (2): has a few limitations that reduce plant choices or require moderate conservation practices c. Class III (3): requires special conservation practices with extra effort and costs because of severe limitations that reduce plant choices d. Class IV (4): requires very careful management and/or special conservation practices because of very severe limitations 2. Noncultivable <ol style="list-style-type: none"> a. Class V (5): suitable for pasture and wildlife; limitations are difficult to remove and prevent the use of standard farm equipment b. Class VI (6): used for grassland, range, or wildlife due to severe limitations c. Class VII (7): very severe limitations d. Class VIII (8): mountainous areas 3. E, W, S: additional labels for Classes II through VIII, standing for erosion (E), wet (W), and stoniness, shallowness, or droughtiness (S)
<p>Objective 5</p> <p><i>Many aspects of the soil affect plant growth. These are therefore important to consider when selecting plants for the grassland. Have students list factors that influence plant selection.</i></p>	<p>Identify what soil factors affect plant selection.</p> <ol style="list-style-type: none"> 1. Soil texture: relative proportions of sand, silt, and clay particles in soil; affects the amount of contact plant roots have with available water, air, and nutrients 2. Soil depth: area that plant roots have available to extend downward; limits the type of plants that can root in the soil 3. Slope: steepness of the land's surface; affects erosion and ability to use farm machinery

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	<ol style="list-style-type: none"> 4. Erosion: loss of soil by wind or water; decreases soil depth by removing topsoil 5. Surface runoff: rate at which water disappears from the soil surface by absorption or flowing over the soil; leads to erosion, leaching of soil nutrients, and washing away of seeds or nutrients 6. Permeability: movement of air and water through the soil; affects root penetration, water movement in and on the soil, and nutrient leaching 7. Drainage: speed at which the water moves from the soil's surface; affects plant growth through a lack of or an excessive amount of water
<p>Objective 6</p> <p><i>Water movement in and above the soil also affects the productivity of a grassland. Ask students how soils are distinguished by drainage classifications. Use PPt 1 to show plant adaptation by soil drainage classes.</i></p> <p><input type="checkbox"/> PPt 1 – Forage Adaptation by Soil Drainage Class</p>	<p>Identify what the common drainage classifications are.</p> <ol style="list-style-type: none"> 1. Excessively drained soils: very porous and freely permeable 2. Somewhat excessively drained soils: free movement of water and air, but less than excessively drained soils 3. Well-drained soils: sandy or intermediately textured; uniform color with mottling near deep water table 4. Moderately well-drained soils: slower internal water movement and more mottling further up the profile; artificial drainage needed for alfalfa 5. Somewhat poorly drained soils: surface wet for many weeks; mottling just below surface; artificial drainage usually needed 6. Poorly drained soils: surface wet for many months; mottling throughout profile; artificial drainage required 7. Very poorly drained soils: wet almost every month; usually gray with mottling on surface; artificial drainage difficult to install but required
<p>Objective 7</p> <p><i>County soil survey manuals are free to all Missouri residents. A fee is charged to all non-Missouri residents. Ask students where they can be obtained.</i></p>	<p>Determine where soil survey manuals / maps can be obtained.</p> <ol style="list-style-type: none"> 1. Soil and Water Conservation districts 2. Natural Resources Conservation Service offices

Instructor Directions	Content Outline
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Have the students locate their homes in the soil survey manual. Using the information in the manual, the students should write a report on what they think is the best use of the land and why. Ask them to defend the answers with soil facts from the manual. 2. Use the soil survey manuals to simulate exercises. They should allow the students to practice map reading and interpretation of the information provided in the manual. Ask for information pertinent to grassland management. Land uses and crop selection should be derived by the students. Factual information provided by the manual may also be incorporated into the activity. The extent of this activity is dependent on the objectives of the teacher.
<p>Closure/Summary</p>	<p>Soil survey manuals contain a lot of material that is useful to the grassland manager. However, the manual is only useful if the user has an understanding of the organization of the manual and a basic knowledge of soils. Soil type and drainage affect the productivity of plants and should therefore be considered when selecting plants for the grassland.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 1. b 2. a 3. b 4. g 5. f 6. d 7. e 8. c 9. a 10. Use the “Index to Map Sheets” to locate the property. Go to the page number of the map sheet indicated by the index. Locate the property on the map using landmarks and features and/or the US standard land survey system. 11. Permanent limitations cannot be easily changed, while temporary limitations can be removed or improved. Examples of permanent limitations include

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	<p>severe slope, soil depth, flooding, and large rocks. Examples of temporary limitations include soil nutrient content, moderate slope, and minor drainage problems.</p> <ol style="list-style-type: none"> 12. b 13. h 14. e 15. d 16. a 17. g 18. c 19. f 20. Decreases soil depth and removes topsoil 21. Affects root penetration, water movement, and nutrient leaching 22. Affects the amount of contact roots have with water, air, and nutrients