

Course	Agricultural Science II
Unit	Soil Science
Lesson	Site Characteristics
Estimated Time	50 minutes

Student Outcome

Describe the various site characteristics.

Learning Objectives

1. Explain how landform affects land use.
2. List the major landforms.
3. Explain how percent slope is determined.
4. Explain the relationship between percent slope and water erosion.
5. Explain how you identify parent material.
6. Describe the effect of stoniness on land use.
7. List the factors which affect water erosion.

Grade Level Expectations

SC/ES/1/B/09-11/a SC/ES/2/A/09-11/a SC/ES/2/A/09-11/b
 SC/ES/3/A/09-11/c

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
 - PPt 1 – Reading Slope With an Abney Hand Level or Clinometer
 - PPt 2 – Judging Soil Slope
 - PPt 3 – Slope Diagram Showing Feet Fall Per 100-Foot Distance
2. Minor, Paul E. *Soil Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1995.
3. *Soil Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Soil Judging Scorecard (found on DESE’s website)
- Abney level or clinometer

Supplemental Information

1. Internet Sites
 - Missouri Soil Judging Scorecard. Missouri Department of Elementary and Secondary Education. Accessed May 20, 2008, from <http://www.dese.mo.gov/divcareered/AG/CDE/SoilsScorecard.pdf>.
 - Soil Erosion, Crop Productivity, and Cultural Practices. Iowa State University Extension. Accessed May 20, 2008, from <http://www.extension.iastate.edu/Publications/PM1870.pdf>.

2. Print

- ❑ Ashman, Mark R., and Geeta Puri. *Essential Soil Science: A Clear and Concise Introduction to Soil Science*. Malden, MA: Blackwell Publishing, 2002.
 - ❑ Brady, Nyle C., and Ray R. Weil. *The Nature and Properties of Soils*. 14th ed. Upper Saddle River, NJ: Prentice Hall, Inc., 2007.
 - ❑ Coyne, Mark S., and James A. Thompson. *Fundamental Soil Science*. Clifton Park, NY: Delmar CENGAGE Learning, 2005.
 - ❑ Donahue, Roy L., and Roy Hunter Follett. *Our Soils and Their Management*. Danville, IL: Interstate Publishers, Inc. 1990.
 - ❑ Plaster, J. Edward. *Soil Science and Management*. 2nd ed. Albany, NY: Delmar Publishers, Inc., 1992.
 - ❑ White, Robert E. *Principles and Practice of Soil Science: The Soil as a Natural Resource*. 4th ed. Malden, MA: Blackwell Publishing, 2005.
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Interest Approach

Discuss site evaluation as it relates to soil judging. Introduce the Soil Judging Scorecard (found on DESE's website) and explain the section on Site Characteristics.

Communicate the Learning Objectives

1. Explain how landform affects land use.
2. List the major landforms.
3. Explain how percent slope is determined.
4. Explain the relationship between percent slope and water erosion.
5. Explain how you identify parent material.
6. Describe the effect of stoniness on land use.
7. List the factors which affect water erosion.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Discuss why site evaluation is just as important in soil judging as a description of each horizon. Take a field trip and evaluate a landform.</i></p>	<p>Explain how landform affects land use.</p> <ol style="list-style-type: none">1. Site characteristics<ol style="list-style-type: none">a. Runoffb. Erodibilityc. Internal drainage2. Management decisions<ol style="list-style-type: none">a. Choice of cropsb. Tillage systemsc. Mechanical practicesd. Drainage systemse. Irrigation
<p>Objective 2</p> <p><i>Discuss landforms in your area and procedures for evaluation.</i></p>	<p>List the major landforms.</p> <ol style="list-style-type: none">1. Uplands2. Foot slopes3. Alluvial fans4. Flood plains5. Stream terraces6. Sinkholes
<p>Objective 3</p> <p><i>Discuss the importance of slope and how it affects the use and management of the soil. Demonstrate the use of an Abney level or clinometer to measure slope. Since your students will not have instruments to judge slope,</i></p>	<p>Explain how percent slope is determined.</p> <ol style="list-style-type: none">1. Place two stakes a certain distance apart (run) on the slope.2. Calculate the difference in the two elevations (rise).3. Divide the rise by the run.4. Change fraction to percentage.

Instructor Directions	Content Outline
<p><i>estimate the slope gradient within a percent or two. Show PPt 1, PPt 2, and PPt 3.</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> PPt 1 – Reading Slope With an Abney Hand Level or Clinometer <input type="checkbox"/> PPt 2 – Judging Soil Slope <input type="checkbox"/> PPt 1 – Slope Diagram Showing Feet Fall Per 100-Foot Distance 	
<p>Objective 4</p> <p><i>Discuss with students how a slope’s length, shape, and gradient determine erodibility. Also discuss how the aspect of a slope influences moisture and plant growth as it relates to erosion.</i></p>	<p>Explain the relationship between percent slope and water erosion.</p> <ol style="list-style-type: none"> 1. The greater the percent slope (gradient), the higher the erosion rate. 2. The steeper the slope, the greater the runoff. 3. As length increases, so does volume and speed of runoff water.
<p>Objective 5</p> <p><i>Discuss parent material and how they are developed.</i></p>	<p>Explain how you identify parent material.</p> <ol style="list-style-type: none"> 1. Parent material is determined by comparing upper horizons with C and R horizons. <ol style="list-style-type: none"> a. C horizons usually represent original parent material. b. Landforms of a soil indicate the kind of parent material. c. Geology of an area provides clues to parent material. d. Abrupt changes may indicate two parent materials. 2. Six types of common parent materials have their own characteristics. <ol style="list-style-type: none"> a. Residuum: unconsolidated, weathered mineral material b. Alluvium: sand, silt, and clay sediments deposited by flooding c. Loess: clays and silts deposited by wind d. Eolian sand: sand dunes deposited by wind action

Instructor Directions	Content Outline
	<ul style="list-style-type: none"> e. Glacial till: clay, silt, sand, and gravel transported by glaciation f. Colluvium: loose soil and rocks transported down steep slopes
<p>Objective 6</p> <p><i>Explain that stoniness is defined in terms of its impact on agricultural management. Discuss classes of stoniness. Ask the students how each class of stoniness might affect land use.</i></p>	<p>Describe the effect of stoniness on land use.</p> <ul style="list-style-type: none"> 1. Stoniness interferes with tillage 2. Can make cultivated crops impractical – could still work for hay crops or improved pasture 3. Can prevent any agricultural improvements – use as native pasture or range 4. Rockiness also limits cultivation
<p>Objective 7</p> <p><i>Discuss the hazards of soil erosion by water. Talk about damages erosion does to productivity and water quality. Refer to Table 11.2 in the student reference.</i></p>	<p>List the factors which affect water erosion.</p> <ul style="list-style-type: none"> 1. Slope <ul style="list-style-type: none"> a. Steepness of slope b. Length of slope 2. Runoff <ul style="list-style-type: none"> a. Soil texture b. Permeability and infiltration c. Soil depth d. Vegetative cover e. Climate
<p>Application</p>	<p>Other activities:</p> <ul style="list-style-type: none"> 1. Tour local farms and observe the six general landforms that are common in the state. 2. Invite your Natural Resources Conservation Service (NRCS) representative to speak to your class. 3. Show a slide set of soil erosion to illustrate types and effects of erosion.
<p>Closure/Summary</p>	<p>Land forms have characteristic shapes and are produced by natural geologic processes. The six general landforms that commonly occur in the state are uplands, foot slopes, alluvial fans, flood plains, stream terraces, and sinkholes. There are five major characteristics used in a site evaluation: landform, slope, aspect, parent material, and stoniness. Both slope steepness and slope shape are important considerations in a site evaluation.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ul style="list-style-type: none"> 1. c 2. b

Instructor Directions	Content Outline
	<ul style="list-style-type: none"> 3. d 4. i 5. f 6. g 7. h 8. e 9. j 10. a 11. $\text{Rise} \div \text{Run} = \% \text{ Slope}$ 12. 10% 13. <ul style="list-style-type: none"> a. Uplands b. Flood plain 14. <ul style="list-style-type: none"> a. Convex b. Concave c. Linear 15. <ul style="list-style-type: none"> a. Slope shape b. Slope length c. Slope gradient