Soils/Geology Learning Objectives & Resources

1. Recognize soil as an important resource.
   - *Soil Quality Concepts* – USDA Natural Resources Conservation Service (NRCS) http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/co/home/?cid=nrcs144p2_063020
   - *Soil Quality Introduction* (Soil Quality Information Sheet) - USDA NRCS http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052207.pdf
   - *Helping people Understand Soils – Ten Key Messages* http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052550.pdf
   - *Sustaining Our Soils and Society – American Geological Institute, Chapter 1* http://www.americangeosciences.org/sites/default/files/soils.pdf

2. Describe basic soil properties and formation factors.
   - *Bedrock Geology of Michigan* – Michigan Dept. of Natural Resources *http://www.michigan.gov/documents/CGI_1987_Bedrock_Geology_8X11_128879_7.pdf*
   - *Geology of Michigan in Brief Soil Quality Information Sheets* – USDA NRCS http://soils.usda.gov/sqi/publications/publications.html Scroll down until you see the gray shaded box with the following title: "Note 8: Soil Quality Information Sheets". There are fifteen information sheets total, starting with Soil Quality Introduction and ending with Salinization.
   - *Texture Flow Diagram & Textural Triangle USDA, NRCS* http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054311
   - *Characteristics of the Major Textural Classes* http://www.crowcanyon.org/ResearchReports/FieldManual/34_Table_01.pdf
   - *Soil Formation & Classification* - USDA NRCS http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054278
   - *The Glacial Lakes around Michigan* http://www.michigan.gov/documents/deq/GIMDL-BU04pixs_216120_7.pdf
   - *Sustaining Our Soils and Society – American Geological Institute, Chapter 1(see link above)*
   - *Urban Soil Primer – USDA NRCS, Chapter 2* http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052835.pdf

3. Understand soil drainage classes and know how wetlands are defined.
   - *Supplemental Key for the ID of Soil Drainage Class* USDA NRCS ftp://ftp-fc.sc.egov.usda.gov/ME/tech/NRCS%20Drainage%20Key.pdf

4. Determine basic soil properties and limitations, such as mottling and permeability, by observing a soil pit or soil profile.
   - *A Guide for Land Judging in Michigan Part 1: Physical Features of Soil* http://macd.org/ME/Resource%20Material/Soils%20and%20Geology/A%20Guide%20for%20Land%20Judging%20in%20Michigan.pdf
   - *The Twelve Orders of Soil Taxonomy – USDA NRCS* http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_053588

5. Identify types of soil erosion and discuss methods for reducing erosion.
   - *Soil Erosion* (Soil Quality Information Sheet) – USDA NRCS http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051278.pdf
   - *Water Erosion* (Soil Quality Information Sheet) – USDA NRCS http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051599.pdf
   - *Sediment Deposition on Cropland* (Soil Quality Information Sheet) – USDA NRCS http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052488.pdf

6. Utilize soil information, including soil surveys, in land use planning.
    - *Online Soil Survey Manuscripts*
      http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=MI
      Find your county and click for specific information.
    - *Web Soil Survey*
      http://websoilsurvey.nrcs.usda.gov/app/
    - *A Guide for Land Judging in Michigan* – MSU Extension
      http://archive.lib.msu.edu/DMC/Ag.%20Ext.%202007-Chelsie/PDF/e326.pdf
    - *Land Judging in Oklahoma* http://www.landjudging.com/2009/land_judging_manual_2009.pdf
    - *Important Facts About Land Descriptions*
      http://www.rockfordmap.com/Submitted-Content/ImageGallery/Facts%20About%20Land%20Descriptions.pdf
    - *Topographic Maps*
      http://macd.org/ME/Resource%20Material/Soils%20and%20Geology/Topographic%20Maps.pdf

7. Discuss how soil is a factor in, or impacted by, non-point source pollution.
    - *Managing Soil Organic Matter* – USDA NRCS Soil Quality Institute
      http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050965.pdf
    - *Sustaining Our Soils and Society – American Geological Institute, Chapter 5*
      http://www.agiweb.org/environment/publications/soils.pdf
    - *Urban Soil Primer – USDA NRCS, Chapter 3*
      http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052835.pdf

Additional Internet Resources for Soils/Geology

USDA Natural Resources Conservation Service Soils
http://soils.usda.gov/

The Nitrogen Cycle – MSU Extension
http://msue.anr.msu.edu/news/the_nitrogen_cycle_explaining_where_your_lost_nitrogen_is_going

Kalkaska: Michigan State Soil
http://www.michigan.gov/documents/hal_mhc_mhm_kalkaska-sand_63853_7.pdf

Basic Biological Factors of Soil Carbon and Nitrogen
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051926.pdf