FFA Urban Soil CDE

FFA Land Judging Contest 2015

Changes are coming to the Soil Judging Career Development Event (CDE), starting in the upcoming school year, to better reflect today's challenges with soil. Some of Ohio's biggest statewide environmental issues are directly related to soil science. The modernization of the soil CDE's will help students to better understand and relate to these important statewide issues. Whether it's the water quality related issues and the importance of soil health, or home site development, one way or another these students will come across a soil related issue in their lives. This modernization will prepare the students understand and make decisions when faced with soil related issues in their professional and personal lives.

- The soil CDE's will still consist of 2 contest, Rural and Urban.
- The contest scorecards have been updated to be consistent in format that should allow teachers and students the ability to switch between the contests without confusion. Ultimately, both urban and rural issues are important for students to learn and understand.
- In this modernization, the rural contest has undergone the biggest change. The format of both contests will closely resemble that of the old urban scorecard. If you understand the old urban contest, you will understand the new contest format.
- For the most part the "Organization of Contest" in the old books will be followed.

Items necessary for soil judging

Contest organizers will provide the following:

- Slope stakes for shooting slope
- Buckets (or similar) with soil samples for texture – with assistance from official judge, (students will be given samples of each soil texture they are to identify to ensure uniformity).
- Tests; General knowledge and Soil Survey.
- Site information, for fertility, root and pores/100cm^2, etc. – with assistance from official judge.
- Control section in the soil pit for students to evaluate structure, take measurements as it relates to different features, ie drainage, restrictive features, bedrock, topsoil depth, and compaction.
- Restroom facilities.
- Scorecards

Students/Schools will provide the following:

- Screwdrivers/digging apparatus to evaluate soil.
- Tape measure to evaluate depths (measurements will be taken in inches)
- Water for texturing
- Abney level, clinometer, other hand level, slope board and string to measure slope. (all are optional) – Slope stakes will be provided to determine grade.

Overall contest format

Each contest scorecard will consist of 3 parts.

Part 1 – Soil Properties

- Students will evaluate and determine the soil properties of the site and soil pit. The majority of both contests focus on basic soil properties that have been evaluated in previous years. Notable additions to the contest include, structure determination, presence of compaction, infiltration, and living organisms. Additionally, 2 new soil textural classes were added to further challenge the students and to develop a level of consistency to the Ohio Soils CDE and the National Land Judging Contest in Oklahoma. This consistency should better prepare students who qualify to compete at the national level.

Part 2 – Overall Degree of Limitation

- This section will work exactly as it did in the old urban contest. Students will determine the most severe limitation as it relates to a certain land-use.

Part 3 – Best Management Practices (BMPS)

- In this section students will select the best management practices, to best utilize the land as it relates to the specific land-use. A table has been prepared to list conditions that would call for each of the listed BMPS.

Organization of Contest

1- Land judging contest are adapted to either team or individual participation. Both of these options will be used in Ohio. Typically, a team would consist of 3 or 4 members per team, taking the highest 3 scores per pit to calculate the team total.

2- Four soil sites/pits should be selected in advance. These sites should be chosen to exhibit a variety of soil conditions that affect the various land-uses for each contest. Typically pits should be located within a reasonable walking distance to keep the contest from getting too long. Care should be taken by the judges to ensure that observations and decisions can be made to avoid “borderline” conditions.

3- A pit should be dug for each site to be judged in the contests. Each pit should be excavated to a maximum depth of 5 feet (per OSHAA standards). The pit should be of sufficient length and width (at least 4 feet wide) to accommodate the contestants and

allow for adequate entry and exit for safety. A minimum of 2 access points should be easily accessible for safe entry of the pit. The side of the pit to be judged should be oriented in a way to receive direct sunlight at the time of the contest. One area of each pit will be designated as the control section and will be off limits for any type of digging or disturbance during the contest. This will ensure that every student will have the same opportunity to see what the judges saw while evaluating the soil. The control section will be 1 to 2 feet wide and clearly marked. Students who dig in this area will be disqualified from the contest.

4- A separate answer sheet should be used for each site. Each sheet should be clearly marked to represent the site being evaluated, with the site number, contestants name and school. The use of different colored sheets would further help in keeping the sites separate, and help with recordkeeping logistics.

5- Each group will be given a time limit of 15 to 20 minutes at each station, to judge a pit or to take the examination. At the end of the prescribed time, a signal will be given and student will be required to turn their answer sheets into the group leader. Once all of the scorecards are collected, students will rotate to the next pit or station in the scheduled rotation.

6- The representative slope for the site will be marked using stakes. The top of the stakes will be as close to the same elevation as possible to accurately represent the natural slope, but may fluctuate as necessary to avoid getting a slope close to a borderline slope class. The tops of the stakes will be used to determine the contest slope. The land area surrounding each pit to be considered in the judging should be designated by stakes or flags.

7- Each pit site will be supplied with buckets (or similar) containing soil samples of the textures to be determined at each site. Each pit may be supplied with water for convenience as well.

8- Two written test are part of the CDE. A general soils test, and soil survey test. The general soils test will consist of 10 to 25 questions, and will be based on basic soil science knowledge. The soil survey test will consist of 10 to 25 questions, and will be based on the official soil survey information (web soil survey). The soil survey test will contain scenario questions based on land-use, and will contain questions that require students to look up information in the soil survey.

Soil Properties (front of card)

Landforms

Geologic activities that formed the parent materials and shaped the surface of the earth are called landforms. Groups of landforms are called landscapes. The common landforms in the Ohio landscape are the floodplains, terraces/outwash plains, and uplands. Rare landforms that occur in Ohio are the dunes, eskers, kames, beach ridges, end moraines, and old lake beds. Landforms are recognized by their shape and the position with respect to other landforms.

Flood Plain

Flood plains are landforms that occur next to river systems on the lowest lying position on the landscape. These flat lying landforms are a result of flooding events from the rivers or streams overflowing the channels and spreading out. It is the landscape position where eroded sediments from uplands are transported, sorted, and deposited according to the sediment load being carried by the energy of floodwaters creating the parent material Alluvium.

Flood plains may occur on several levels above the primary channel. The immediate adjacent level is a natural levee. The natural levee is an area that is higher than the rest of the flood plain because this is the area where the stream first deposits its load during a flood. The rest of the flood plain may have subtle rises which are covered by water based at different flooding levels. Old channels may be abandoned and segmented by a new channel cutting and subsequently isolated as a depression or slough which can retain water long after the water has retreated. Flood plains size range from a few feet in width to several miles wide along the Mississippi River.

How do you know you are in a floodplain? Floodplains are very flat and nearly level slope gradient. This is the first clue that tips an evaluator standing in a floodplain. If the slope position is none then locate a stream that should be nearby. The soil profile will give evidence of alluvium with stratifications. All these components are a part of the floodplain.

Terraces/Outwash Plains

Terraces lay in between a floodplain and the upland. These landforms are intermittence of an old flood plain thousands of years ago. Terraces are mostly a result of the outwash from the melt water of glaciers. The intensity of the water dropped off sand and gravel creating the present day benches that rise above the floodplain. The once floodplains are now stream terraces with a parent material of Outwash or Lacustrine.

How to recognize a stream terrace? If a stream terrace is present it will lay in between a floodplain and upland. However, the stream terrace does not always occur. In some cases neither a floodplain nor a terrace borders a river but rather the river is immediately adjacent to upland. Stream terraces will have risers and then a bench. The riser begins at the edge of a

flood plain when the slope begins to rise to a higher elevation. The bench is the level position at the top of the riser. Most of the terrace parent material is coarse sand and gravel, however, sand and gravel is not always associated with terraces. Other unique landforms such as eskers, kames, beach ridges, dunes, and some spots on the end moraines are characterized by sand and gravel, but don't occur on a terrace landform positions, but rather on uplands. Make special note of the position on the landscape and also observe the soil profile to correctly determine the location of a terrace.

Upland

Upland landform is a result of weathered sedimentary rock, glacial till, and lacustrine sediments. These landforms make up the majority of the Ohio landscape, and are the highest positions on the land above the terraces and flood plain. Upland landforms have a range in slope positions and variations in gradient.

To recognize an upland landform one must have concluded that there is no evidence of a floodplain or a terrace. Another big clue to an upland position is the parent material. Is the parent material glacial till, bedrock, and colluvium? If so the soil is more than likely on the upland positions.

Other landforms that occur in the Ohio landscape but are rare include the sand dunes, eskers, kames, and old lake beds. More information about these landforms can be found on the various sources.

To distinguish the type of landform involves analyzing the surrounding area in conjunction with the soil and parent material. The process involves putting the puzzle together.

Note- Any upland above a 2 percent slope will be considered an upland hillslope.

Flood Hazard

Flooding is a severe limitation to all urban uses that are considered with the exception of lawns gardens and landscapes. Flooding is still an issue with lawns gardens and landscapes, but only at moderate level. Home sites should never be considered in areas that are subject to flooding, and state rule prohibit the siting of a sewage treatment system in an area that is subject to flooding.

Soil Stability

The vast majority of soil conditions in Ohio are typically stable. However, some areas of the state have soil features that create stability issues resulting in landslides, and subsidence. In fact, per capita wise, the Cincinnati area is often called the slip prone capital of the US.

Slippage typically occurs on slopes that are greater than 12 percent, where impervious strata (bedrock) underlie clay or fine textured materials.

Subsidence is settling of organic soils, soils containing semifluid layers or materials that are dissolved in solution.

Texture

Soil texture refers to the combination of the three soil separates: sand, silt, and clay. The size range of each separate is as follows:

Clay – particles with diameter less than 0.002 mm
Silt – particles with diameter between 0.002 to 0.05 mm
Sand – particles with diameter between 0.05 to 2.0 mm

The percentages of each separate in a given sample are combined to determine the texture. The soil texture can be determined using the textural triangle. Texture is an important characteristic that allows you to draw many conclusions about the probable behavior in the field. Soil structure, water holding capacity, drainage, consistence, and chemical properties are all affected by soil texture. In general, coarse-textured soils with lots of sand particles hold relatively little water, drain rapidly, and are low in fertility. Fine-textured soils with lots of clay particles hold large amounts of water, drain slowly, and are very chemically reactive.

Flow diagram for estimating soil texture in the field

Start by taking approximately 1 tablespoon of soil and wet by adding water in small amounts. Knead to break down and mixed the aggregates. Soil is at the proper consistency when plastic, moldable, moist putty.

1- Try to form a ribbon of uniform thickness and width by gently pushing the soil between thumb and forefinger. Allow the ribbon to emerge and extend over the finger, breaking from its own weight

A – Soil does not ribbon – ***Coarse Texture***

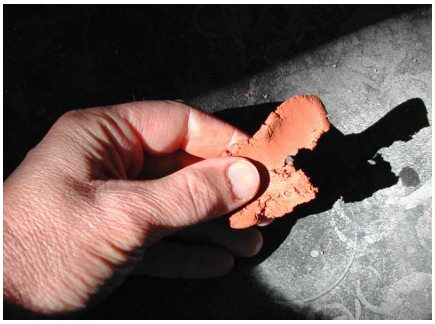
B – Soil does ribbon – What is the length and shine of ribbon

B1 – Ribbon is 2 inches or longer and sample is shiny – ***Fine Texture***

B2 – Ribbon is 1 to 2 inches long and sample is shiny – ***Moderately Fine Texture***

B3 – Ribbon is less than 2 inches long and sample is not shiny – ***Go to step2.***

2- Wet a small pinch of soil in the palm of your hand and rub with forefinger.

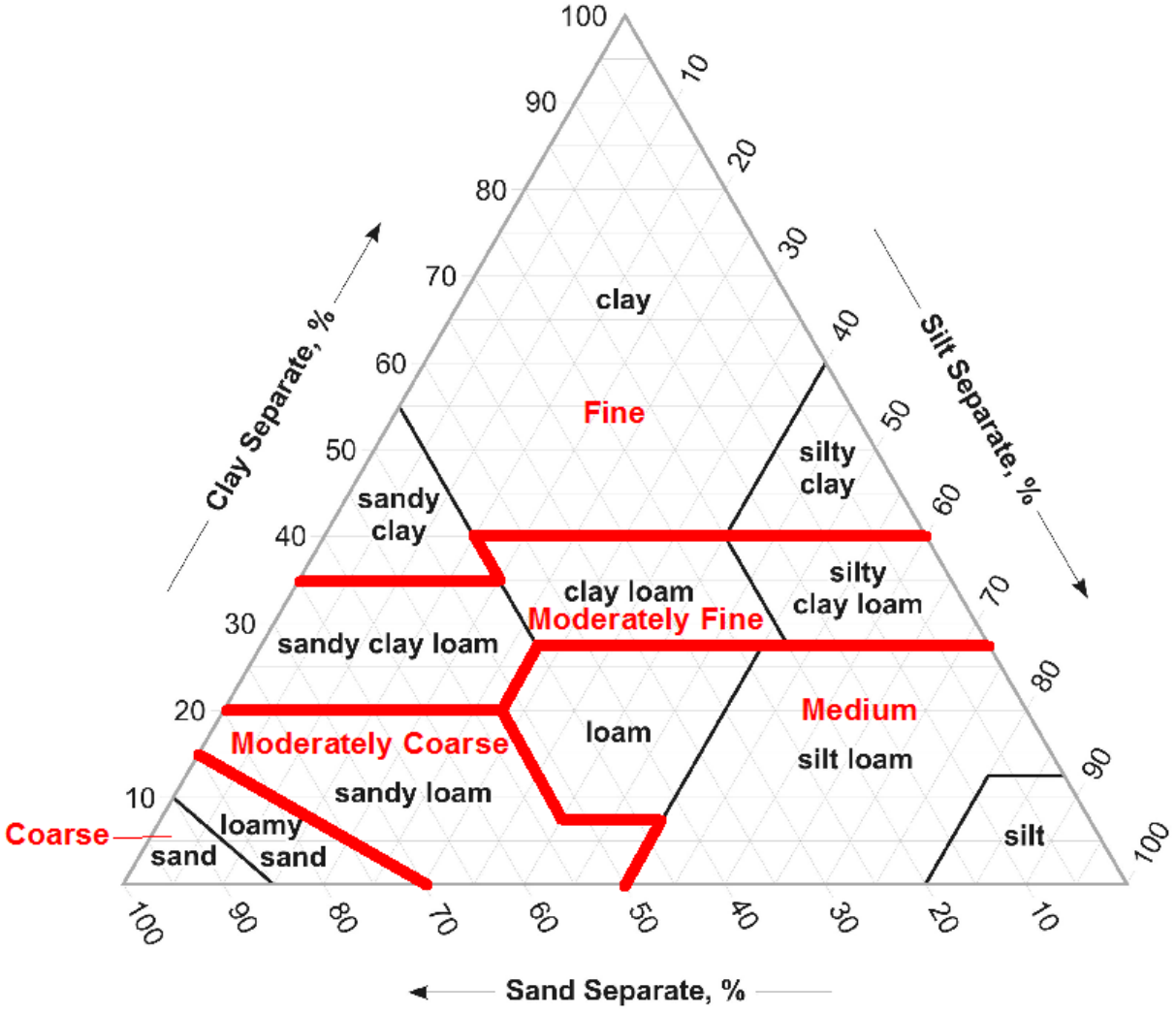


C – Is the soil gritty? (>50% Sand)

C1 – Soil is not gritty – ***Medium Texture***

C2 – Soil is gritty – ***Moderately Coarse Texture***

Soil Textural Triangle

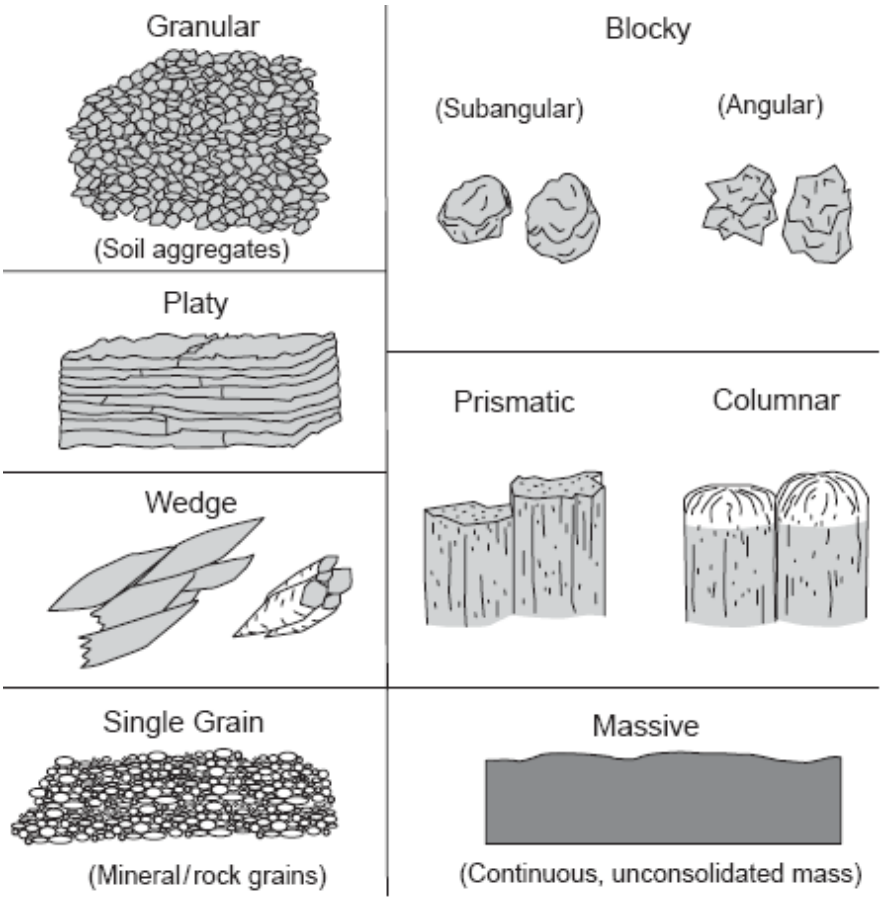


Soil Structure

Soil structure is the most important indicator of soil development. Soil structure is the arrangement of aggregates and the arrangement leads to different shapes of structure. In examining the soil it is important to make note of the type and strength of a particular structure. The most common soil structure shapes which describe the presence of natural soil development are granular, blocky, and prismatic. Structural units that are not associated with soil development but are used to describe the activity caused by heavy equipment or signs of parent material are platy, massive, and single grains.

Structure can be observed in two ways. One way of observing soil structure is take a knife and sample a horizon. The other way to observe soil structure as is in place on the soil profile. Taking the time to observing soil structure in both ways is highly suggested. In both methods one could make a distinction between the individual blocks and shapes made by natural breaks if soil structure is present. On the profile one will notice several faces of the soil structure. We refer to the peds still in place of the soil profile as faces because they resemble faces sticking out of the profile very much like the faces of the Presidents on Mount Rushmore.

For the urban contest, soil structure should be evaluated the subsoil material at a depth specified by the official judges on the pit information card.



Redoximorphic Features – Estimating soil saturation.

At some point in time throughout the year, all soils become saturated. The duration of saturated conditions may vary depending on the relief, the permeability of the parent material, the evapotranspiration, and overall drainage capabilities of the soil. The duration of saturated conditions will contribute to certain chemical reactions which influence the soil color. These variations in soil color are key components in identifying the soil drainage. The color differences are tools to identify the length of time at which a soil is saturated and the soil drainage class.

Colors are good clues to the drainage capabilities if the soil. Bright brownish colors indicate well drained soil whereas dull grey colors indicate long term waterlogged soils. Clues in the soil profile that indicate some duration of saturated soil conditions are called redoximorphic features. The redox features do not indicate the point at what the water table reaches but rather indicates the duration of the water table for a given soil horizon. The overall color in addition to the abundance of redoximorphic features, provide information to the evaluator as to what length of time the soil will experience saturation.

Redoximorphic features are red, yellow and gray colored depletions and concentrations that are indicative of a saturated zone within the soil profile. Redox depletions are gray in color (chromas of $\leq$ 2) where elements solubilized by anaerobic or reducing conditions have been removed. For the purpose of this contest redox depletions are used to determine the depth of the seasonal water table. Redox concentrations are the red or red-yellow concentrations of iron oxides. Redox features are described by their presence, abundance, and contrast.

Restrictive Soil Features

A restrictive soil feature is any soil layer that limits water and roots altogether, or into vertical seams and planes of weakness. Bedrock is not considered a restrictive soil feature because it is not soil. For urban development, bedrock would pose different challenges to overcome. For example, an excavator can easily overcome a restrictive soil feature when digging a basement, but bedrock would create issues adding significant cost to the project. The following are examples that could be looked at as restrictive soil features, but ANY layer limiting water or roots can be considered a restrictive feature.

- Dense Glacial Till
- Fragipans
- Dense Lacustrine Deposits.

* These are only examples of layers that could be considered restrictive soil features. Other layers not listed could still limit water and roots, and would still be considered restrictive soil features.

Depth to Bedrock

Bedrock that is too shallow is considered a limitation for most all urban related land-uses. Bedrock within 60 inches typically presents construction issues for building with basements and sewage treatment systems. Bedrock within 40 inches limits the ability of the area to be used as a road or driveway, and limits plant growth in trees and landscape plantings.

Some bedrock is soft in place and can be excavated. Typically after the material is uncovered, it will harden. Siltstone, sandstone and shale are examples of soft bedrock. For this contest, both soft and hard bedrock will be considered bedrock.

Best Management Practices to Consider. (back of card)

a. Buildings With Basements

Problem or soil condition	BMP Practice
Slopes between 6 and 35 percent	- Moderate to extensive landshaping is required; a protective soil cover should be used to reduce erosion during construction.
Areas subject to flooding, slippage, subsidence, seasonal high water table less than 8 inches on nearly level concave slope, or slopes greater than 35 percent	- Choose an alternate site. *when this is selected , no other selection should be marked
Fine texture present in the subsoil or substratum	- Basement walls should be reinforced and porous material used for backfill to reduce damage from shrinking and swelling.
Seasonal high water table present within 40 inches	- Footer drains, elevated site, exterior waterproofing coatings on the basement walls, and granular porous material for backfill should be used to prevent wet basements.
Single grained soil structure in the subsoil	- Basement excavation should include 3/1 side slopes to decrease the likelihood of soil sloughing and undercutting.
Bedrock within 60 inches	- Moderate to extensive excavation of bedrock is required, or redesign the building to accommodate the site.
No moderate or severe limitations	- Good site; limitations are easy to overcome.

b. Sewage Treatment Systems *Choose 1, most appropriate

Problem or soil condition	BMP Reasoning
Slopes greater than 18 percent	- Manufacturer's prohibitions and instructions should be followed when installing components on steep slopes. An alternative method of distribution should be used.
Areas subject to flooding, slippage or subsidence	- Choose an alternate site.
Any of the following present: Slopes 6 to 12 %; coarse or fine texture in any layer; single grained, platy or massive soil structure; or moderately deep to restrictive soil features or bedrock.	- Use an alternative system or design component such as drip distribution, spray irrigation, or an approved pretreatment device to ensure uniform dispersal and water quality standards.
Seasonal high water table within a depth of 16 inches, with no other moderate or severe limitations.	- Design and implement an engineered drainage system to effectively lower the seasonal water table.
Less than 20 inches to restrictive soil features or bedrock.	- Elevate the infiltrative surface of soil absorption components above the ground surface to increase the vertical separation distance through the use of approved sand fill material.
No moderate or severe limitations	- Conventional leaching trenches will work well on this site.

c. Driveways and Local Roads

Problem or soil condition	BMP Reasoning
Slopes greater than 6 percent	- Contruct driveways and local roads across the slope to reduce the angle of incline. Place drainage ditch on the upslope side.
Flood plains	- Elevate driveways and local roads above the anticipated high water level
Soils subject to slippage or subsidence	- Costly measures are needed to reduce the hazard of slippage or subsidence.
Any of the following present: medium textured soil in any layer; moderately fine textured soil in the surface; or single grained and granular structure in the subsoil.	- Replace the surface soil and/or subsoil with suitable base material to prevent damage due to low soil strength.
Seasonal high water table within a depth of 16 inches	- Surface and/or subsurface drainage is needed to reduce wetness and increase soil strength.
Bedrock within a depth of 40 inches	- Costly measures are needed for excavating, filling, and grading roadbeds and driveways.
No moderate or severe limitations	- Good site; limitations are easy to overcome.

d. Lawns Gardens and Landscapes

Problem or soil condition	BMP Reasoning
Slopes greater than 6 percent	- Avoid unnecessary cutting of the soil during construction. Provide mulch on new lawns and around trees and shrubs to prevent erosion.
Areas subject to slippage or subsidence	- Choose an alternate site. . *when this is selected , no other selection should be marked
Soils subject to flooding	- Use and manage this site within its limitations
Fine, moderately fine, or coarse surface texture	- Mix an adequate layer of medium topsoil in the existing soil surface layer.
Any of the following present: fine, moderately fine, or coarse subsoil or substratum texture; or platy or massive subsoil structure.	- Use plants adapted to adverse subsoil conditions or use an 8 inch cover of medium topsoil to increase the favorable soil depth.
Seasonal high water table within a depth of 16 inches	- Provide surface and/or subsurface drainage. Use plants tolerant of wetness.
Bedrock or restrictive soil feature within a depth of 30 inches	- Select shallow rooted trees and shrubs. Use a medium cover of soil material to increase soil depth to at least 30 inches
No moderate or severe limitations	- Good site; limitations are easy to overcome.