

Conducting Soil Profiles MAY 2020

David Hammonds

Environmental Consultant

Florida Department of Health

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

OBJECTIVES

- Discuss proper methodology for performing soil profiles with soil augers and sharpshooter-type shovels
- Discuss proper use of tools
- This presentation is not about coloring or texturing soils or determination of the SHWT

Important Information

- Proper performance of soil coloring and texturing still required
- Must have and properly use all required equipment
- Review all Master II ACT presentations before attending field component

Proper use of tools

- Improper use of correct tools may lead to incorrect results or poor performance
- Use tools correctly to obtain the best results and improve performance
- All tools need to be well-maintained to perform well, decreasing the amount of time needed to perform the job

Soil Survey Browser

- Download a soil survey browser onto your phone, such as SoilWeb, which can be found as a link provided on the USDA NRCS website
- Use app in the field to help determine information of soils in the area
- Has link to official USDA NRCS soil series descriptions; use to identify the soil series in field

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

USDA NRCS Soil Series Descriptions

Provides additional information, including following:

- Soil horizonation
- Range of soil characteristics
- Associated soils and their comparisons
- Vegetation routinely found in area
- SHWT ranges (normal range, but can be out of the given range)

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.



You are Here: [Home](#) / NRCS Maps, Data, Mobile Apps



NRCS Maps, Data, Mobile Apps

Overview

NRCS has numerous websites and mobile applications that are rich in data on soils, water, air, energy, and other natural resources. View the list on the right for links to those resources, and see more in-depth information on this page about these websites and apps.

For assistance with any of these NRCS websites, [please fill out our feedback form](#), and an NRCS expert with that site will assist you.

Conservation Client Gateway

Conservation Client Gateway is a USDA public website that allows individual landowners and land users the secure ability to request conservation technical and financial assistance from [NRCS](#).

URL: www.nrcs.usda.gov/clientgateway

Soil maps, data, & mobile apps

Title: SoilWeb

Description: The SoilWeb app provides GPS based, real-time access to USDA-NRCS soil survey data, formatted for mobile devices. This application retrieves graphical summaries of soil types associated with the user's current geographic location. Images are linked to detailed information on the named soils. The app



Quick links - Soils

- > [Soil Web](#)
- > [Web Soil Survey](#)
- > [Soil Data Access](#)
- > [Soil and Water Resources Conservation Act \(RCA\) Data Viewer](#)

Quick links - Water

- > [DamWatch](#)
- > [SNOTEL - Water Supply Data & Forecasting](#)
- > [NRCS National Water & Climate Center Climate Reports](#)
- > [NRCS National Water & Climate Center GIS Products](#)

Quick links - Plants

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.



USDA NRCS Web Soil Survey

- Same type of information found in SoilWeb
- Use this information in office
- Has a 7.5 minute series topographic quad available (note: no date on quad)
- Has other useful information
- Go investigate soil survey

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

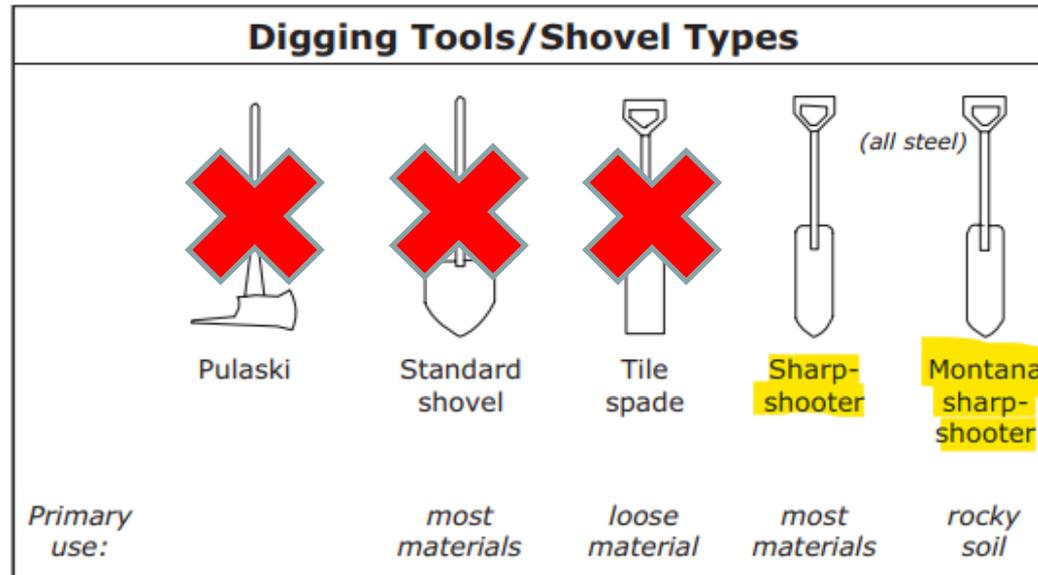
Shovel Requirements for DOH Personnel

- A sharpshooter shovel with a minimum 12” or longer blade is to be used
- The Montana Sharpshooter is an all-steel shovel that will normally never break; weighs about 15 pounds

Types of Shovels

EXAMPLES OF COMMON SOIL-SAMPLING EQUIPMENT

(Use of trade or company names is for informational purposes only and does not constitute an endorsement.)



Field Book For Describing and Sampling Soils, Version 3.0
National Soil Survey Center Natural Resources Conservation Service
U.S. Department of Agriculture

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Proper Shovels

**Montana
Sharpshooter
All metal;
≈ 15#; longer
blade;
≈ 4' tall**



**Sharpshooter-
type
Wood and
metal; 4.24#;
shorter blade;
≈ 4' tall**

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Soil Augers

Different augers for different conditions

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Use of Best Bucket Auger

- Different types of bucket augers
- Open or Closed (sides of bucket)
- Sand (for finer or very dry sands)
- Mud/Clay (obvious)
- Six-foot minimum length is required; telescoping auger or extra extensions are useful
- Suggest minimum 3” auger buckets, NEVER smaller (why?)

Division of Disease Control and Health Protection

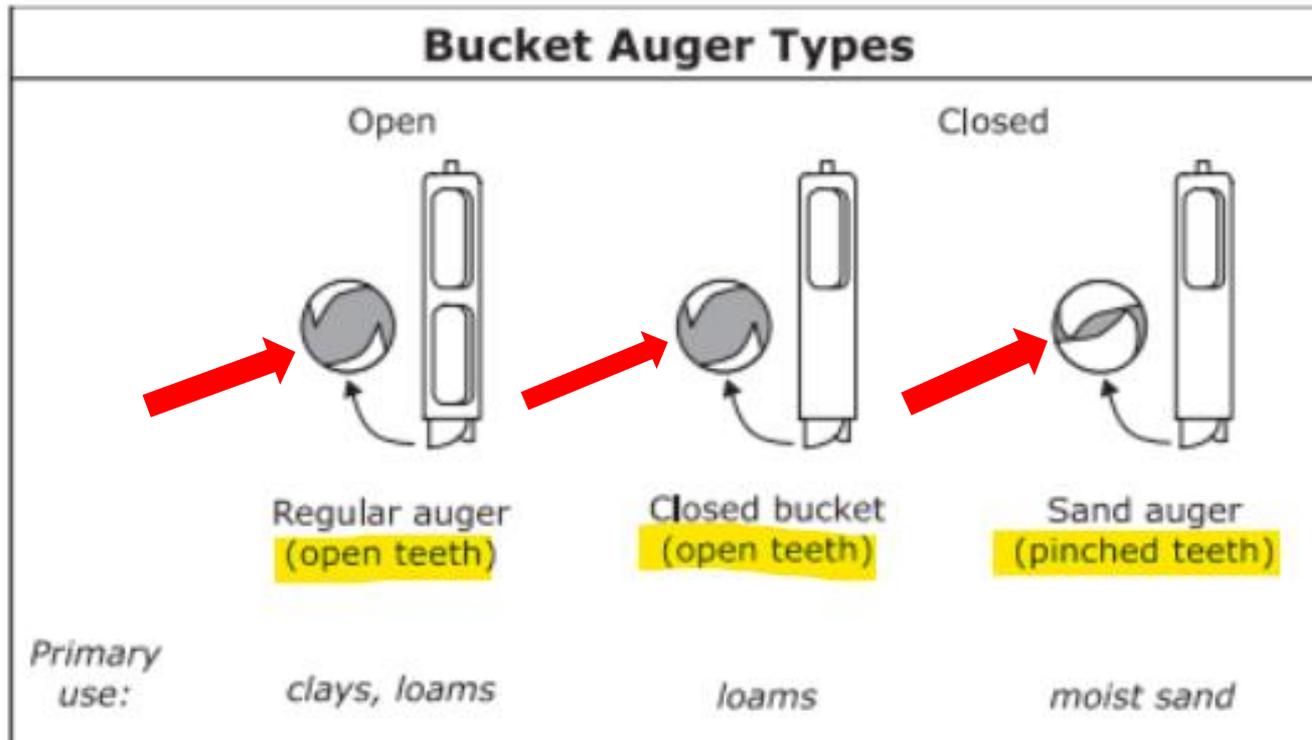
To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Sample Sizes of Auger Buckets

A 2-inch auger bucket has a cross-section area of 3.14 square inches; volume is 18.85 cubic inches for a 6" long bucket

A 3-inch auger bucket has a cross-section area of 7.07 square inches; volume is 42.41 cubic inches for the same 6" long bucket; which is 2.25 times more volume than the 2-inch auger bucket (larger sample!)

Bucket Auger Types



Field Book For Describing and Sampling Soils, Version 3.0
National Soil Survey Center Natural Resources Conservation
Service U.S. Department of Agriculture

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Closed Auger with Clay Soil



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Open Auger



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Open Auger-End View



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Open Auger benefits-viewable area



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

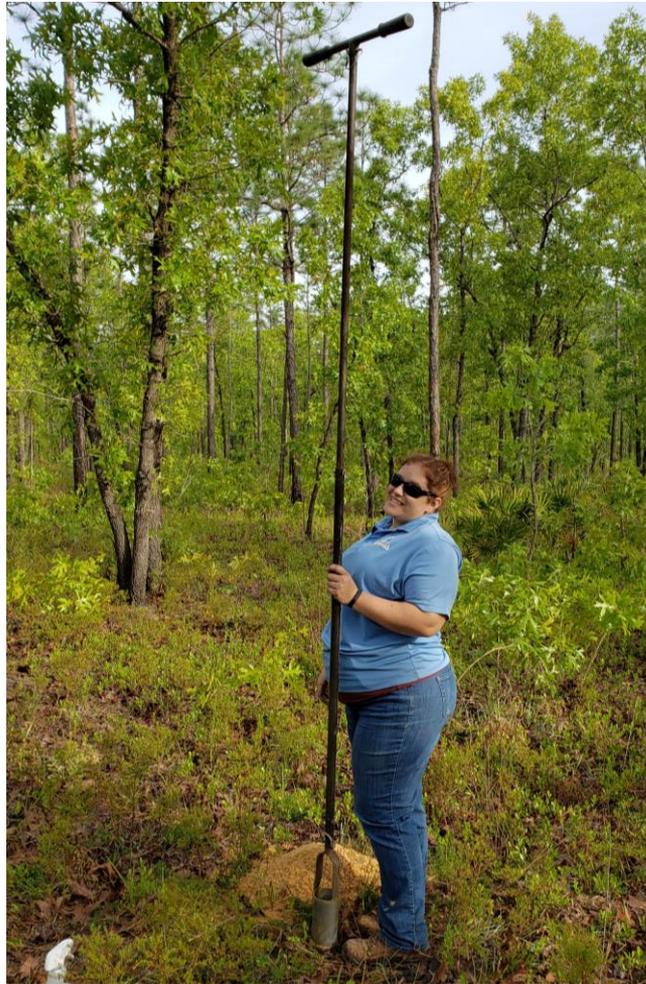
Auger length

- Must be able to bore down to at least 72 inches
- Can use extensions, or have telescoping auger (next slide)
- Begin augering with handles not higher than shoulders, if at all possible (decreases stress on shoulders/back)
- Can begin hole with shovel, complete with auger (why not?)

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Telescoping Auger



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Site Preparation for Soil Profiles Sharpshooter or Auger

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

- Remove any non-soil material from area (e.g. pine straw, pine cones, leaves, etc.)
- Do not remove any soil material (fill or natural) from area
- Note non-soil items such as gravel or debris at soil surface



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Auger Use

- Twisting handles clockwise 3 times (90 degrees each time) while exerting firm downward pressure on auger will normally fill the bucket with soil
- Not required to get full bucket each time
- Sometimes best to not fill auger
- Can feel changes in soil density and textures

Auger Use Tips

- Density of horizon may be due to long-term water occurrence in soil
- May want to look at (or smell) a very small section of soil (smell?? Yes: H_2S)
- Check top and bottom of bucket each time (next slide)
- SHWT indicators or new soil horizon may be at bottom or in middle of sample

Top/Bottom of Auger Bucket



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Auger Use Tips

- Remove sample carefully
- Sand may be dry and pour out quickly
- Use hand to keep soil in auger
- Bump T-handle on ground as needed to assist soil removal from top of bucket
- Moisten soil if needed to help stabilize soil in bucket prior to removing any soil, as needed (small, even stream over entire surface area, don't get too wet)

Common Problem

When the soil is very dry and/or fine sandy material, the soil may be hard to excavate

Sand will flow out of bucket or may collapse when dug with shovel



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Sand collapsing using shovel



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Answer: Add Water

- Adding water to the soil will help hold the soil together while digging in it
- Don't just pour water onto surface
- Reduce the amount of disturbance of top layer of soil so as to maintain natural profile
- Can be achieved by using the following method

Adding Moisture to Soil

- Use 4” diameter PVC pipe, about 6” long
- Use highly permeable cloth, I suggest multiple layers of cheesecloth (do not use fine weave material; e.g. shop cloth)



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

How much water?

- The volume of water for a 6" pipe is 75.4 cubic inches, about 1/3 gallon, however most likely much more water will enter the soil over a few minutes if you keep adding water
- Presuming soil porosity of $\approx 50\%$, for each inch of water in pipe, water penetration would be about 2" deep in sandy soil
- Water penetrates straight down (mostly)

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Pipe/cloth Use

- Place cheesecloth on top of soil (see 1)
- Place pipe on top of cheesecloth which must extend past edges of pipe (2)
- Can use a little more cheesecloth in pipe if desired, however don't pack it in
- Press down firmly on top of pipe to help “seal” pipe to soil (2)

1



2



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Pipe/cloth Use

- Pour water into pipe to try and fill pipe (3)
- If needed, use fingers or hand to divert water stream when pouring
- Maintain downward pressure on pipe (4)
- Remove pipe and cloth when water is absorbed (5)
- Works best in sandy soils
- *3" auger will fit within this water column*

3



4



5



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Final Result



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Now what?

- Must wait long enough for the water to penetrate (minimum 5 minutes; depends on volume of water and soil textures)
- While waiting, perform other tasks: benchmark location/setting/placing on site plan; required measurements; locating wells on neighboring property, etc.
- Use shovel or auger to begin soil profile

Dig around wetted soil



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.



Plug stays together

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Proper use of the Sharpshooter Shovel

No, it's not just digging a hole

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Cutting Soil Plugs

- Remove non-soil debris from soil as before: do not disturb or remove material such as grass, or any soil material
- Insert shovel at angle (12-30°) until shovel stops; may be unable to fully insert blade
- Cut in circle and overlap shovel insertion by about 1/3 of blade width to help cut roots
- *Ensure all roots have been cut through*

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Use of Sharpshooter Shovel

- Width of soil plug at top should be about 6 inches, not smaller
- Larger plug is bulky and could fall apart more easily, depending on soil moisture and texture
- Can use pruning shears to cut through roots as needed when trying to remove soil plug

Shovel Blade Position

Incorrect

Correct (note large angle)



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Cutting Soil Plug



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

**≈ 30° blade angle of shovel
creates wider/shallower cone**



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Soil Plug, about 6" diameter



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Angle Ramifications

- Larger the angle, larger the top, less deep into ground
- Maintain sharper angle (want a 6-8" plug)
- Keep plug uniform and cylindrical, not a cone



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

If you do have a “cone”

- Can pick the face/sides to make cylindrical and even
- This provides extra soil material to remove
- Larger plugs can be problematic to hold together
- Large cone may fall apart easier when picking

Shovel Blade Angles using Clockface

- Each one-minute increment on a clockface is 6 degrees
- 5 minutes on clock is 30 degrees
- Suggest using 12-18 degrees for soil plug, which equates to 2 - 3 minutes on clockface
- Don't forget to insert shovel at a slight angle

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

- Shovel handle is perpendicular to soil (**yellow arrow**)
- Angle of shovel blade (gold arrow) is about 2 minutes on clockface, or 12 degrees
- Suggest initially digging hole in this position, or with slightly more angle on shovel



Removing Soil Plug

- After soil plug released from adjacent soil, fully insert blade back into the pre-cut edge
- Lean back hard on the shovel, remove plug
- If resistance is felt, could have roots still attached



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Removing Soil Plug



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Cleaning (Picking) Soil Plug

- Clean the soil with a straight edge of some type, such as knife blade or a putty/drywall/joint knife (get 2, can slice and obtain a sample for observation between them)
- Metal blade is suggested as it has a finer edge and will work much better, can transect soil and cut through thin roots

Picking Plug Face

Note moisture in soil plug

Always clean side to side, not up and down

Note vertical side, NOT diagonal

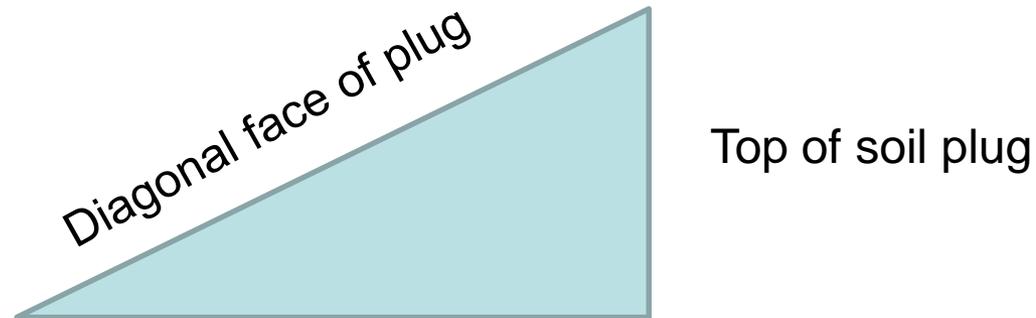


Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Measurement of Soil Plugs

- Do NOT measure diagonal face of soil plug for depths
- NOT true depth in respect to vertical measurement into soil plug
- Geometry is issue



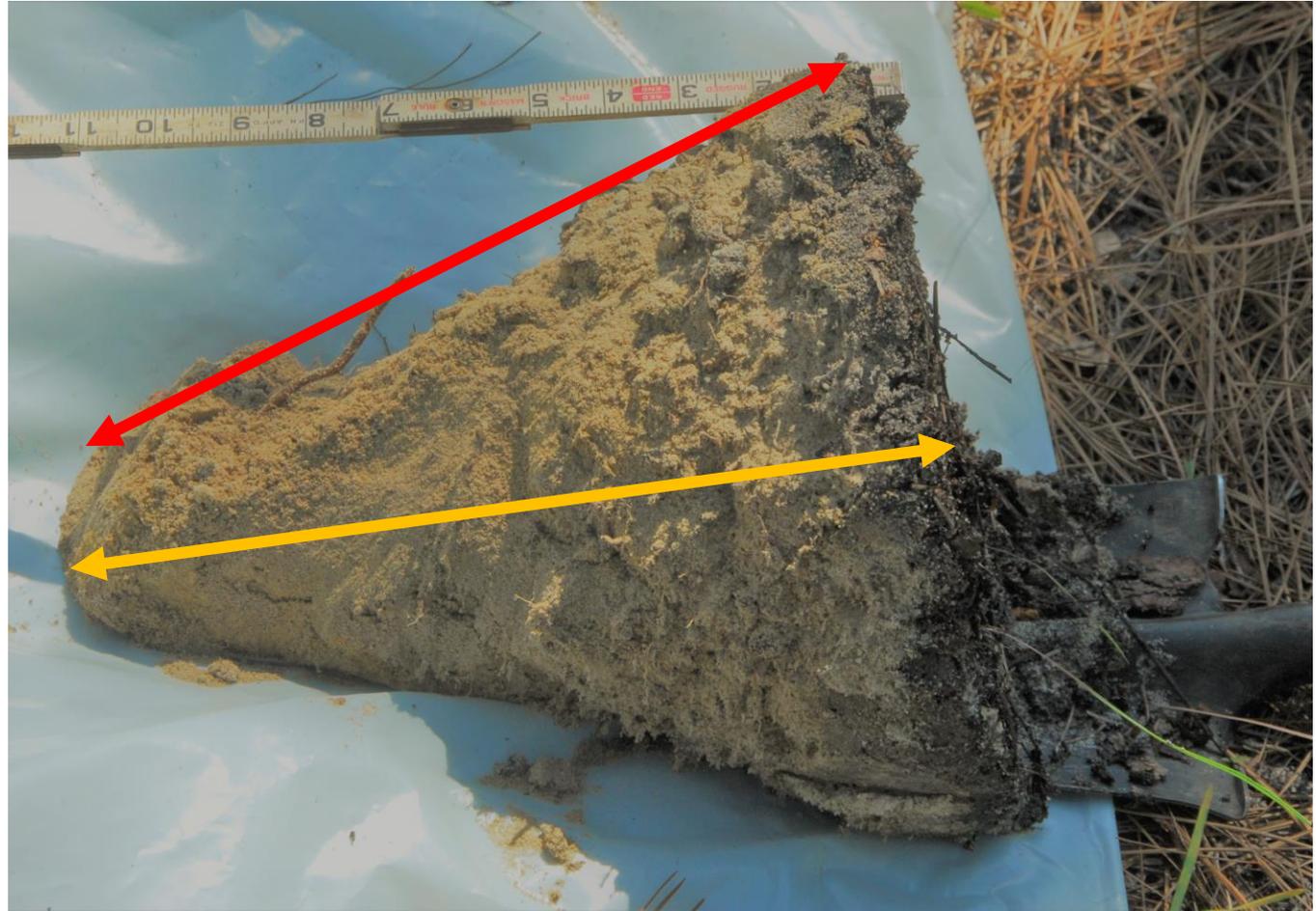
Horizontal slice through middle of plug (actually the vertical face of soil plug)

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

10-12" Soil Plug

Note long diagonal slope (red arrow) versus “vertical” measurement into soil (gold arrow)



Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

Additional Equipment

- Best to not pry soil out of soil bucket, need to dislodge intact, as much as possible
- Pruning shears to cut roots from soil plugs; see following picture **A**
- Rubber mallet/long heavy screwdriver or other heavy object to strike the outside of the soil bucket to break bonding between soil and bucket; see following picture **B**

Additional Equipment

- \$1 Native American Dollar Coin to measure soil ribbon thickness; see following picture **C**
- Drywall/putty knife (suggest 6” wide metal blade) or other edged object to help pick soil from plug; see following picture **D**

Non-required Equipment

A



B



D

C

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.

END OF PRESENTATION

ASK QUESTIONS DURING
FIELD TRIPS

Division of Disease Control and Health Protection

To protect, promote and improve the health of all people in Florida through integrated state, county, and community efforts.