

Getting to know your soil: Easy tools to keep at hand.

Joan R. Davenport
WSU-Prosser

jdavenp@wsu.edu

<http://css.wsu.edu/irrsoils/>

WATER

GIS AND
MAPPING

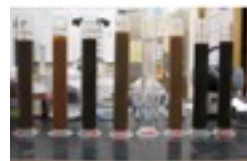
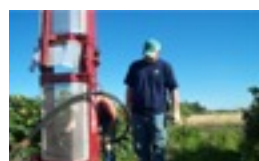
NUTRIENTS

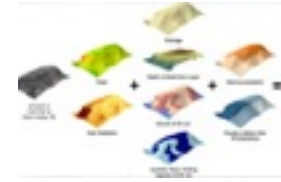
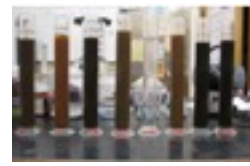
TESTING

CHEMISTRY

SOILS

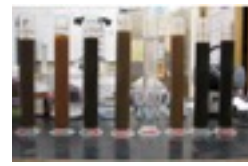
PLANTS





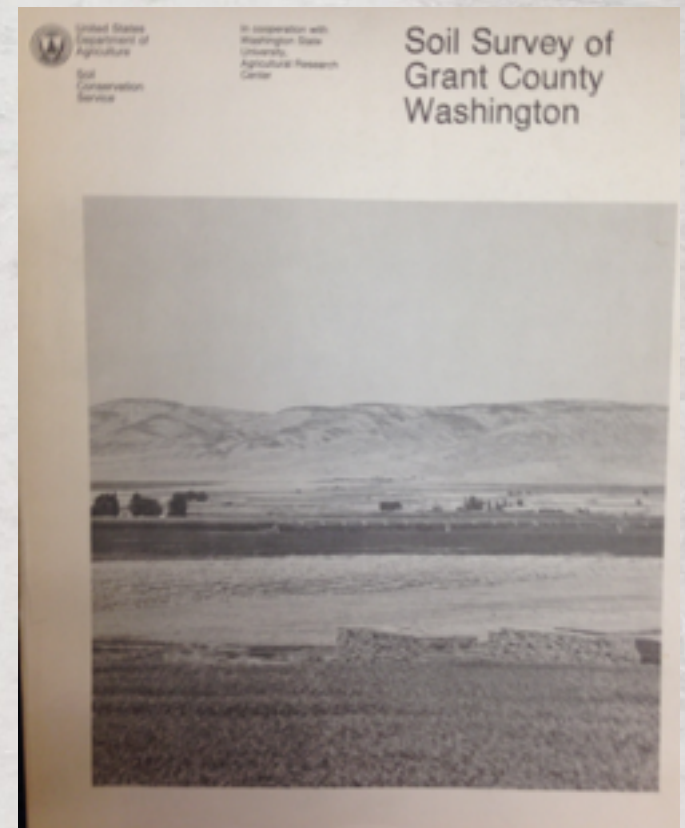
Outline of Presentation

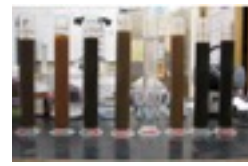
- Identifying Your Soil
- Getting a “Feel” for your Soil
- Soil Sampling and Testing
- Soil Moisture and Water Management



Identifying Your Soil

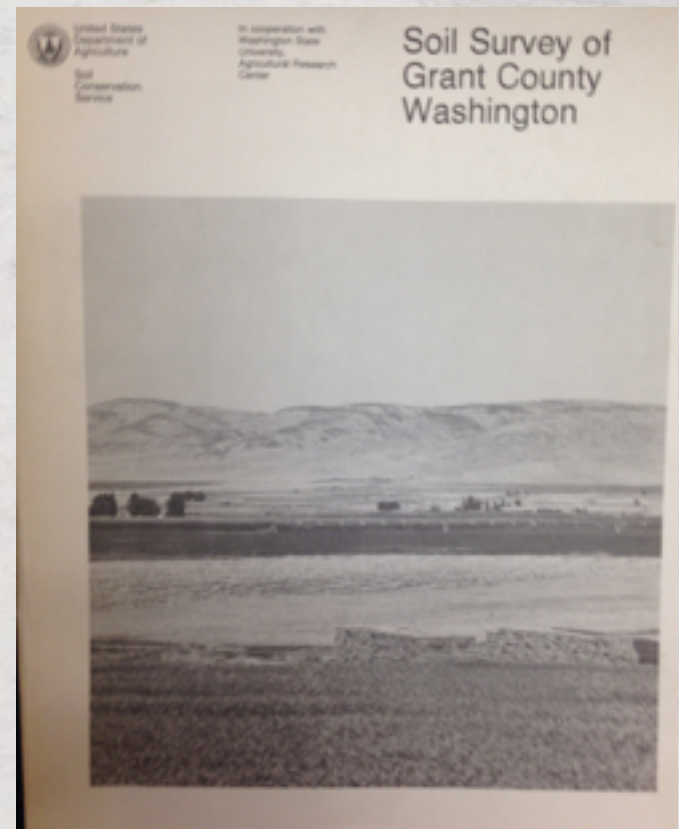
- By County Soil Survey
- Web Based Tools
- Using Your Smart Phone

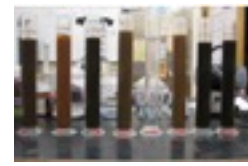




By County Soil Survey - NRCS

- Paper copy
- Large
- Last update Jan 1984



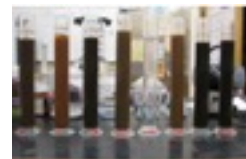


NRCS Web Soil Survey

- Launched in the early 2000s
- Coverage of the entire US
- GIS driven
- Free - no login

A screenshot of the NRCS Web Soil Survey homepage. The header features the USDA logo and the text "Web Soil Survey". Below the header, there is a navigation bar with links for "Home", "About Soils", "Help", and "Contact Us". The main content area includes a search bar, a "START WSS" button, and a "Welcome to Web Soil Survey (WSS)" section. The left sidebar contains a "Browse by Subject" menu with links to various soil-related topics. The right sidebar contains sections for "I Want To..." and "I Want Help With...". The bottom section features a "Four Basic Steps" guide for using the survey.

Navigating Web Soil Survey



USDA National Resources Conservation Service Web Soil Survey

You are here: Web Soil Survey Home

Search
Enter Keywords
All NRCS Sites

Browse by Subject

- Soils Home
- National Cooperative Soil Survey (NCSS)
- Approved Soil Surveys
- Status Maps
- Official Soil Series Descriptions (OSDs)
- Soil Series Extent Mapping Tool
- Soil Data Mart
- Geospatial Data Gateway
- eFOGIS
- National Soil Characterization Data
- Soil Geochemistry Spatial Database
- Soil Quality
- Soil Geography
- Geospatial One Stop

START WSS

Welcome to Web Soil Survey (WSS)

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Four Basic Steps

1. Define...

Area of Interest (AOI) Use the Area of Interest tab to define your area of interest.

I Want To...

- Start Web Soil Survey (WSS)
- Know the requirements for running Web Soil Survey
- Know the Web Soil Survey hours of operation
- Find what areas of the U.S. have soil data

Announcements/Events

- Web Soil Survey 2.3 has been released! View description of new features.
- Web Soil Survey Release History

I Want Help With...

- How to use Web Soil Survey
- How to use Web Soil Survey Online Help
- Known Problems and Workarounds
- Frequently Asked Questions
- Citing Web soil survey as a source of soil data

Search

Area of Interest

Quick Navigation
Address
State and County

State:
County (optional):

Soil Survey Area
Latitude and Longitude
PLSS (Section, Township, Range)
Bureau of Land Management
Department of Defense
Forest Service
National Park Service
Hydrologic Unit

Area of Interest Interactive Map
View Extent:
Scale:

FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | USA.gov | White House

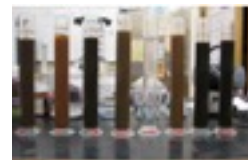
Search

Area of Interest

Quick Navigation
Address
State and County

State:
County (optional):

Soil Survey Area
Latitude and Longitude
PLSS (Section, Township, Range)
Bureau of Land Management
Department of Defense
Forest Service
National Park Service
Hydrologic Unit



Navigating Web Soil Survey

Search

Area of Interest

Import AOI

Quick Navigation

Address

State and County

View

State: Washington

County (optional): Benton

View

Soil Survey Area

Latitude and Longitude

PLSS (Section, Township, Range)

Bureau of Land Management

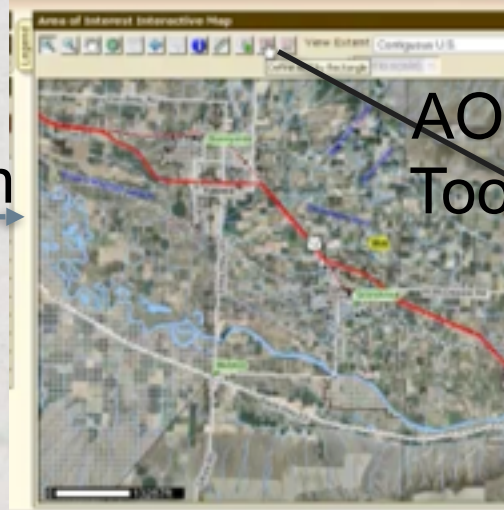
Department of Defense

Forest Service

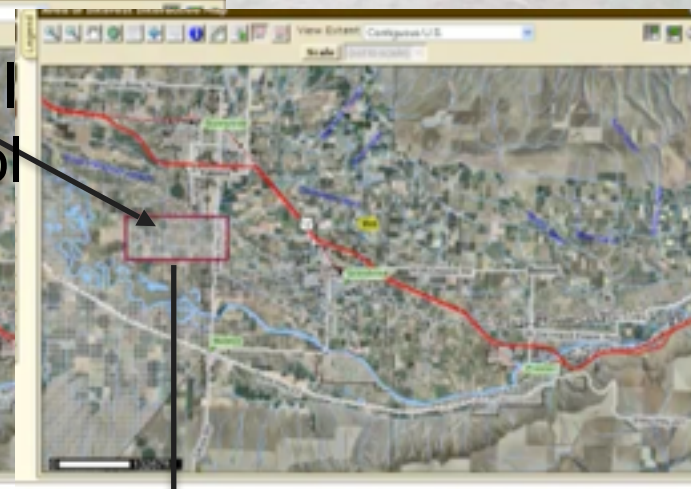
National Park Service

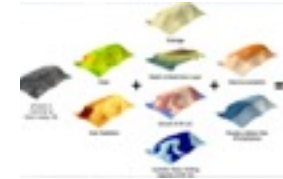
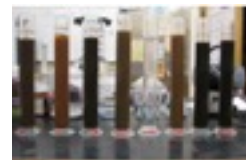
Hydrologic Unit

Zoom
Tool



AOI
Tool





Navigating Web Soil Survey

Map Screen

Explore the Soil Data

Area of Interest Interactive Map

View Extent: contiguous U.S.
Scale: 1000 to 1000000

Symbol	Map Unit Name	Acres in AOI	Percent of AOI
18	Clatsop very fine sandy loam, 0 to 2 percent slopes	266.4	10.0%
32	Esquatzel silt loam, 0 to 2 percent slopes	728.9	27.3%
33	Esquatzel silt loam, 2 to 5 percent slopes	33.4	1.2%
66	Kittitas silt loam	181.1	6.6%
92	Outlook silt loam	59.4	2.2%
95	Quincy loamy fine sand, 0 to 10 percent slopes	328.1	12.3%
129	Silver silt loam, 0 to 2 percent slopes	28.4	1.1%

Map Unit Description

Report — Map Unit Description

Yakima County Area, Washington
32—Esquatzel silt loam, 0 to 2 percent slopes

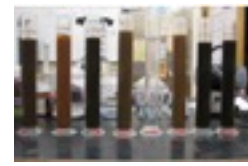
Map Unit Setting
Elevation: 300 to 2,900 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 130 to 200 days

Map Unit Composition
Esquatzel and similar soils: 100 percent

Description of Esquatzel

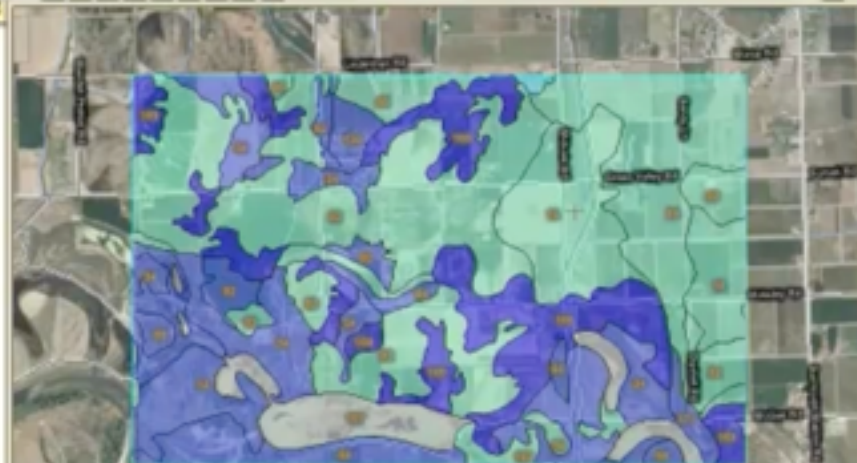
Setting
Landscape: Flood plains
Parent material: Alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (pond): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 60 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.8 mmhos/cm)
Available water capacity: Very high (about 12.6 inches)



Navigating Web Soil Survey

Maps



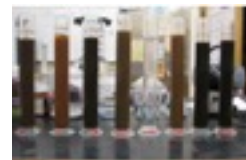
Tables

Tables - pH (1 to 1 Water) - Summary by Map Unit - Yakima County Area, Washington (WA677)

Map unit symbol	Map unit name
18	Clemat very fine to 2 percent slopes
30	Esquatzel silt loam

Tables - Percent Sand - Summary by Map Unit - Yakima County Area, Washington (WA677)

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
18	Clemat very fine sands loam, 0 to 2 percent slopes	60.8	256.4	30.0%
30	Esquatzel silt loam, 0 to 2 percent slopes	26.3	726.9	27.3%
33	Esquatzel silt loam, 2 to 5 percent slopes	26.3	33.4	1.3%
34	Rander silt loam	6.1	401.8	25.1%
66	Kestac silt loam	14.0	181.1	6.9%
90	Outlook silt loam	50.7	59.4	2.2%
95	Quincy loam fine sand, 0 to 10 percent slopes	79.9	308.1	12.3%
139	Series silt loam, 0 to 2 percent slopes	21.7	26.4	1.1%
169	Umapine silt loam, drained, 0 to 2 percent slopes	14.2	407.8	25.3%
171	Wardner loamy fine sand	89.2	22.2	0.8%
174	Warden fine sandy loam, 5 to 8 percent slopes	62.6	1.5	0.1%
176	Warden silt loam, 0 to 2 percent slopes	20.8	6.0	0.2%
190	Zlich silt loam	14.2	42.9	1.6%
197	Water		150.2	5.9%
Totals for Area of Interest			2,666.1	100.0%



UC Davis Google Based Web Soil Data

The screenshot displays the UC Davis California Soil Resource Lab website. The header includes the university name and a navigation menu with links to HOME, SOILWEB APPS, PEOPLE, PROJECTS, SOFTWARE, LINKS, and BLOG. The main content area is titled "SoilWeb Apps" and provides information about accessing USDA-NCSS detailed soil survey data (SSURGO) for most of the United States. It offers two main interfaces: "SoilWeb" and "SoilWeb Earth".

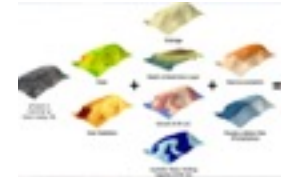
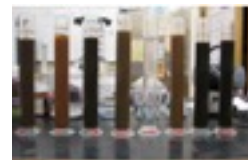
SoilWeb
Explore soil survey areas using an interactive Google map. View detailed information about map units and their components. This app runs in your web browser and is compatible with desktop computers, tablets, and smartphones.

SoilWeb Earth
Soil survey data are delivered dynamically in a KML file, allowing you to view mapped areas in a 3-D display. You must have Google Earth or some other means of viewing KML files installed on your desktop computer, tablet, or smartphone.

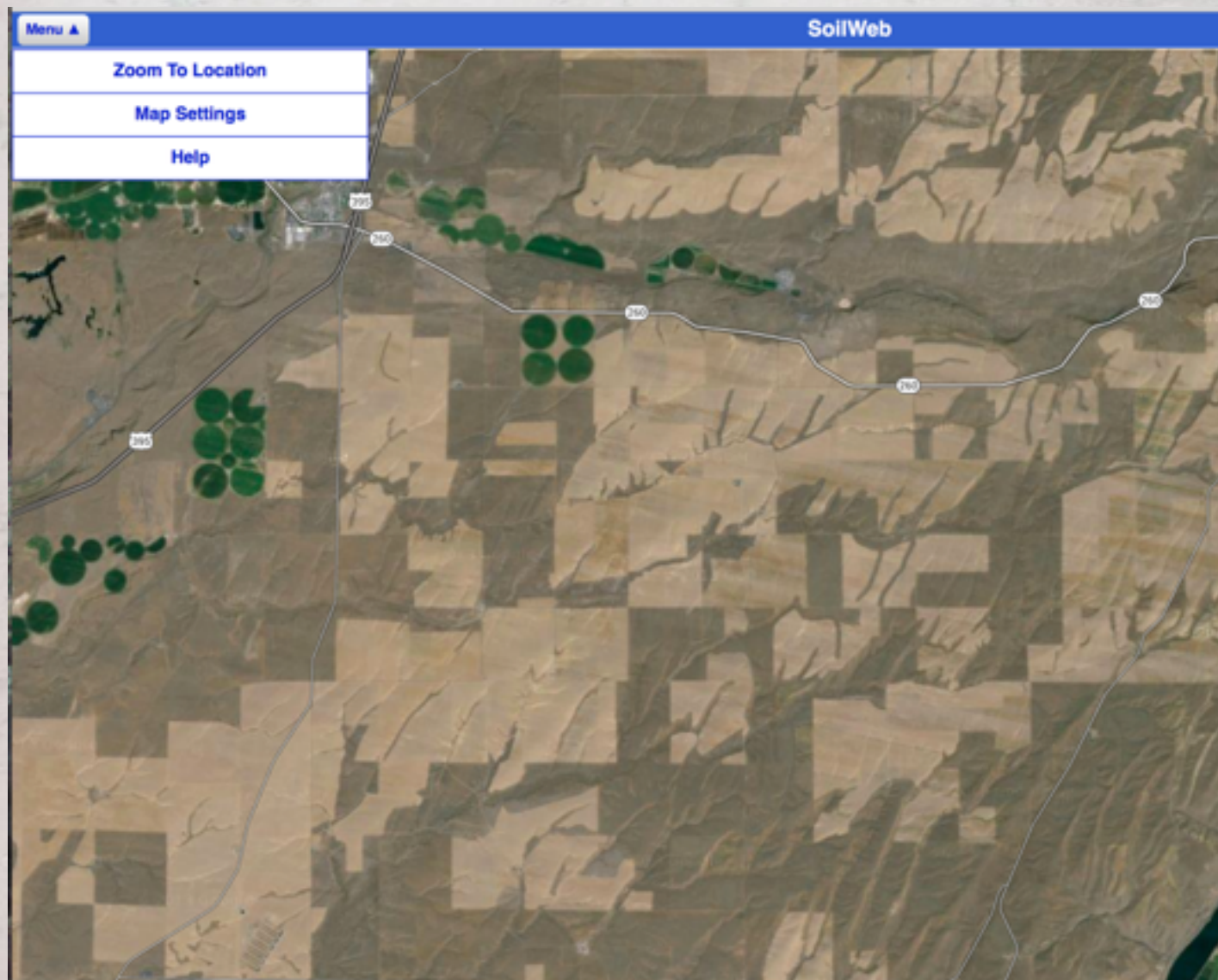
SEE: Soil Series Extent Explorer
SEE allows users to explore the spatial extent of soil types nationwide.

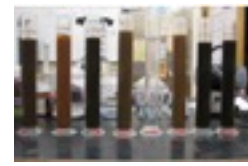
Soil Properties App
This app allows users to explore a variety of soil properties in map form.

<http://casoilresource.lawr.ucdavis.edu/soilweb-apps>

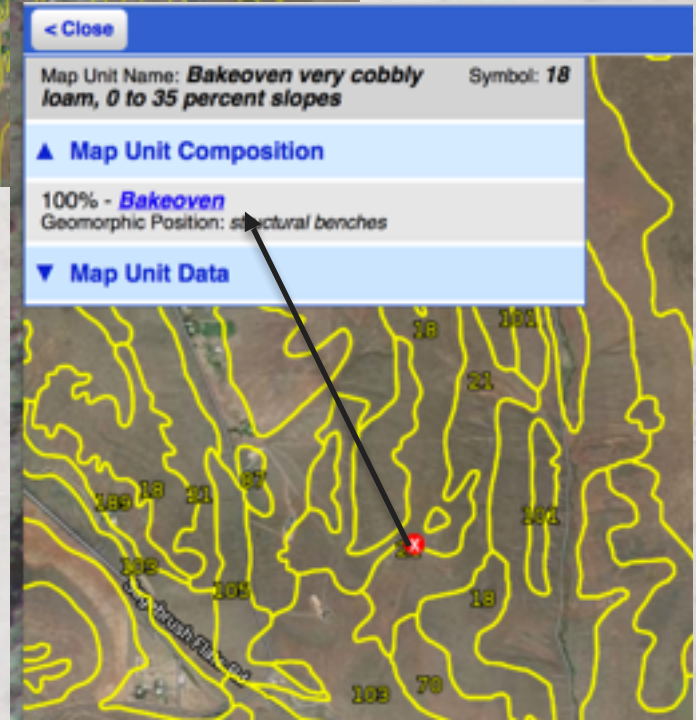
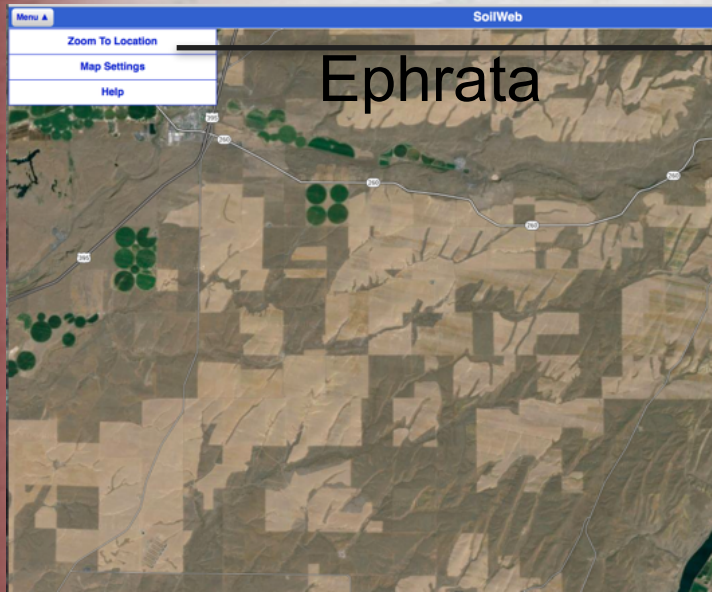


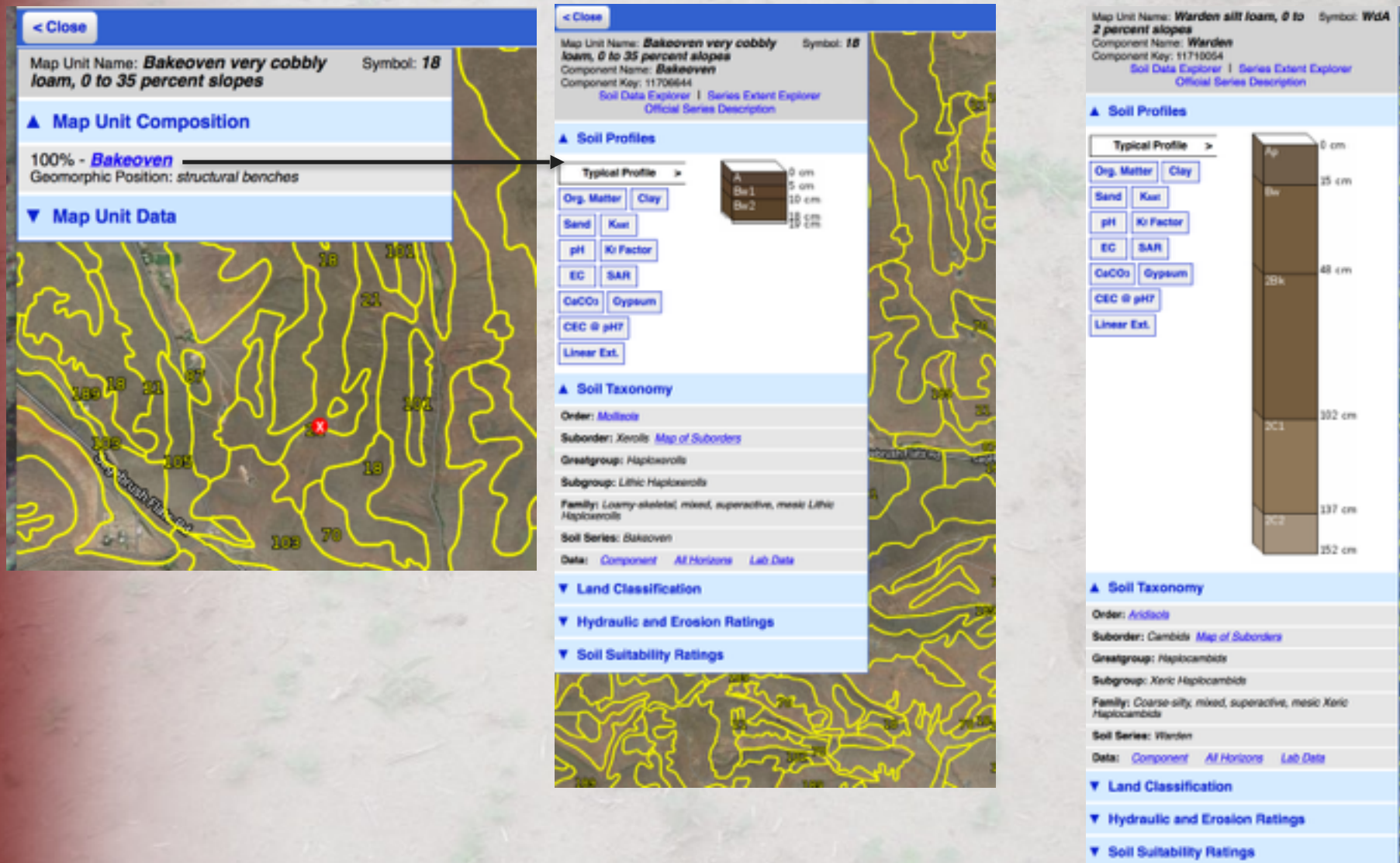
UC Davis Google Based Web Soil Data

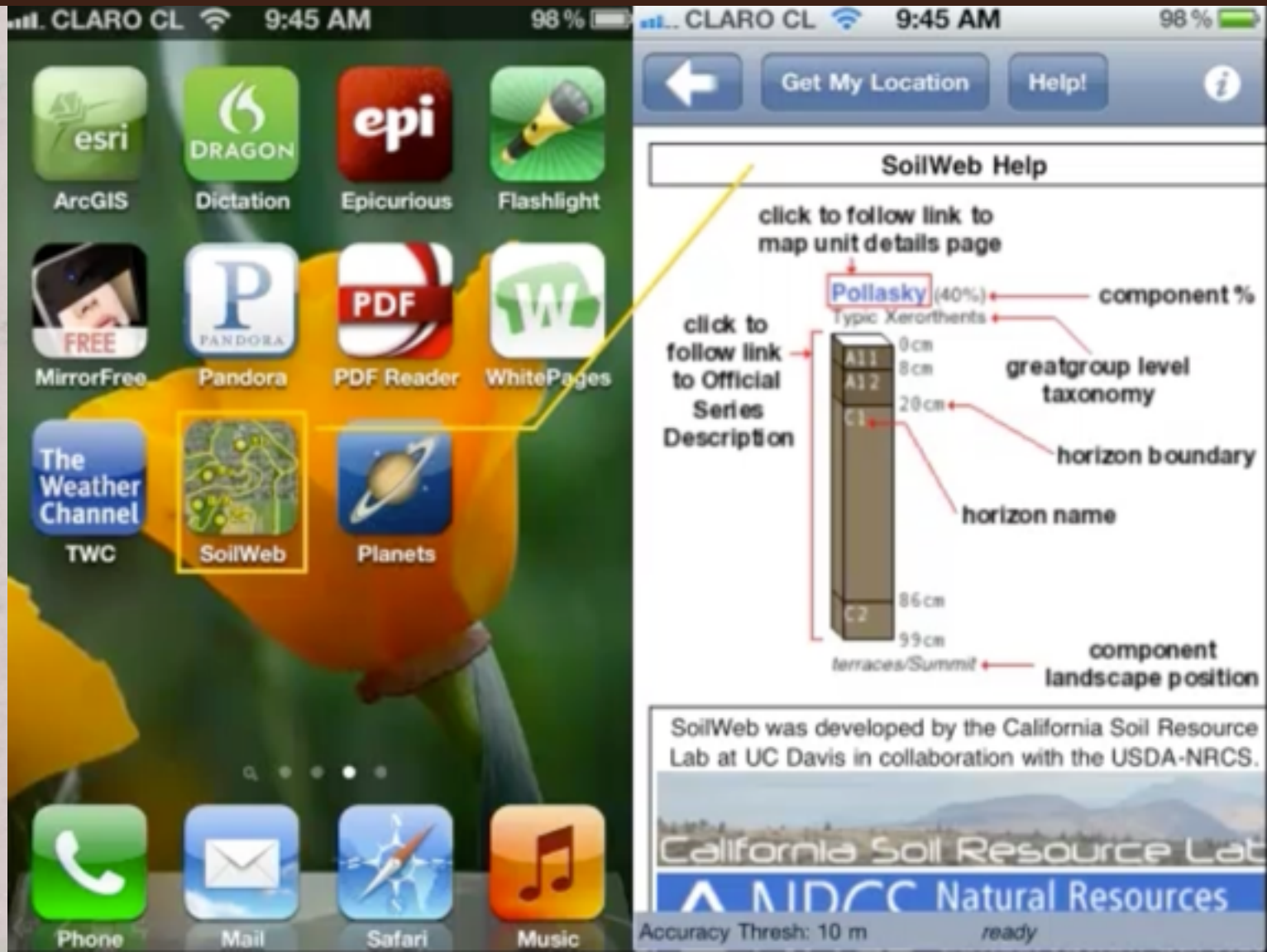


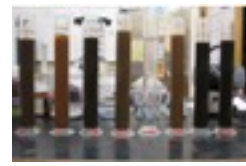


UC Davis Google Based Web Soil Data









SmartPhone App

CLARO CL 9:45 AM 98%

← Get My Location Help! ⓘ

SoilWeb Help

click to follow link to map unit details page

Pollasky (40%) ← component %

Typic Xerorthents ← greatgroup level taxonomy

click to follow link to Official Series Description

horizon boundary

horizon name

8 cm

8 cm

20 cm

86 cm

99 cm

terraces/Summit ← component landscape position

SoilWeb was developed by the California Soil Resource Lab at UC Davis in collaboration with the USDA-NRCS.

California Soil Resource Lab

ANRCC Natural Resources

Accuracy Thresh: 10 m ready

CLARO CL 9:59 AM 96%

Save **SoilWeb for iPhone**

GPS Accuracy Threshold (m)

10 250 500 750 1000

outside clear outside covered indoors or dense canopy I feel lucky

SoilWeb is developed and maintained by Dylan E. Beaudette and Anthony T. O'Geen of the Soil Resource Laboratory, Dept. LAWR, UC Davis. Data are provided for educational purposes only, and should not be used for final land-use decisions.

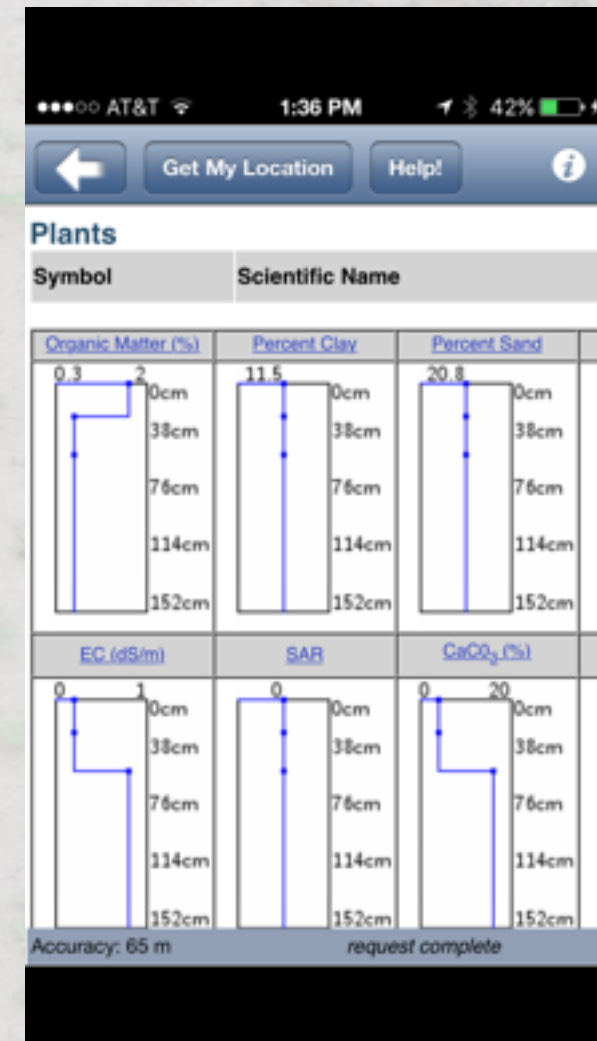
For more information on SoilWeb, please see: [http://www.cslr.ucdavis.edu/soilweb/](#)

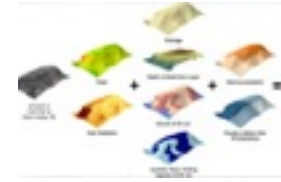
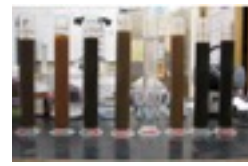
Soil Survey (SSURGO) data was collected from the NRCS Soil-Data Mart. [[http://websoilsurvey.sc.egov.usda.gov/](#)]

California Soil Resource Lab

Department of
LAND, AIR AND WATER RESOURCES
University of California, Davis

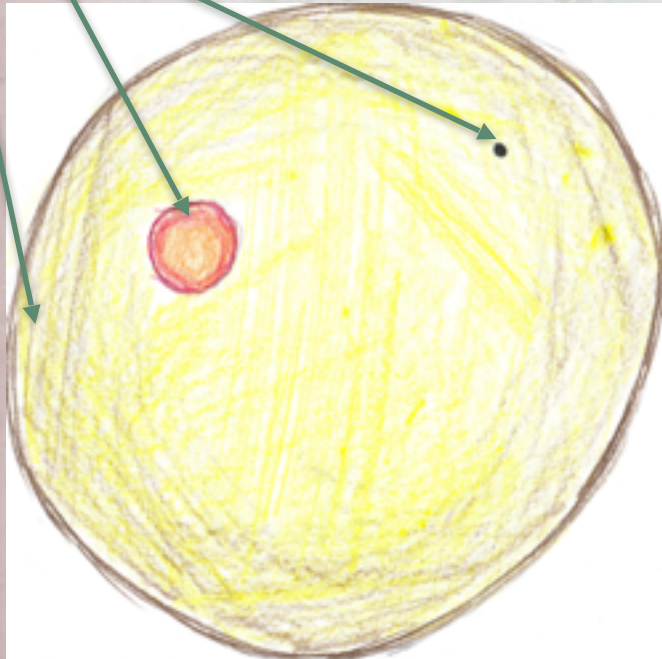
Climate Change • Sustainable Agriculture
Environmental Quality • Landscape Processes

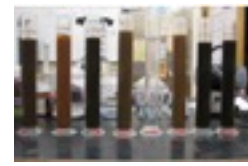




Soil Texture

- Sand (0.05 - 2.0 mm)
- Silt (0.002 - 0.05 mm)
- Clay (<0.002 mm)

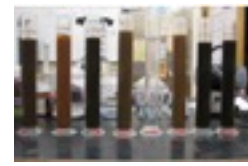




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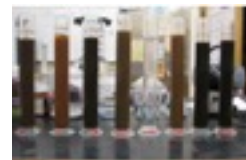




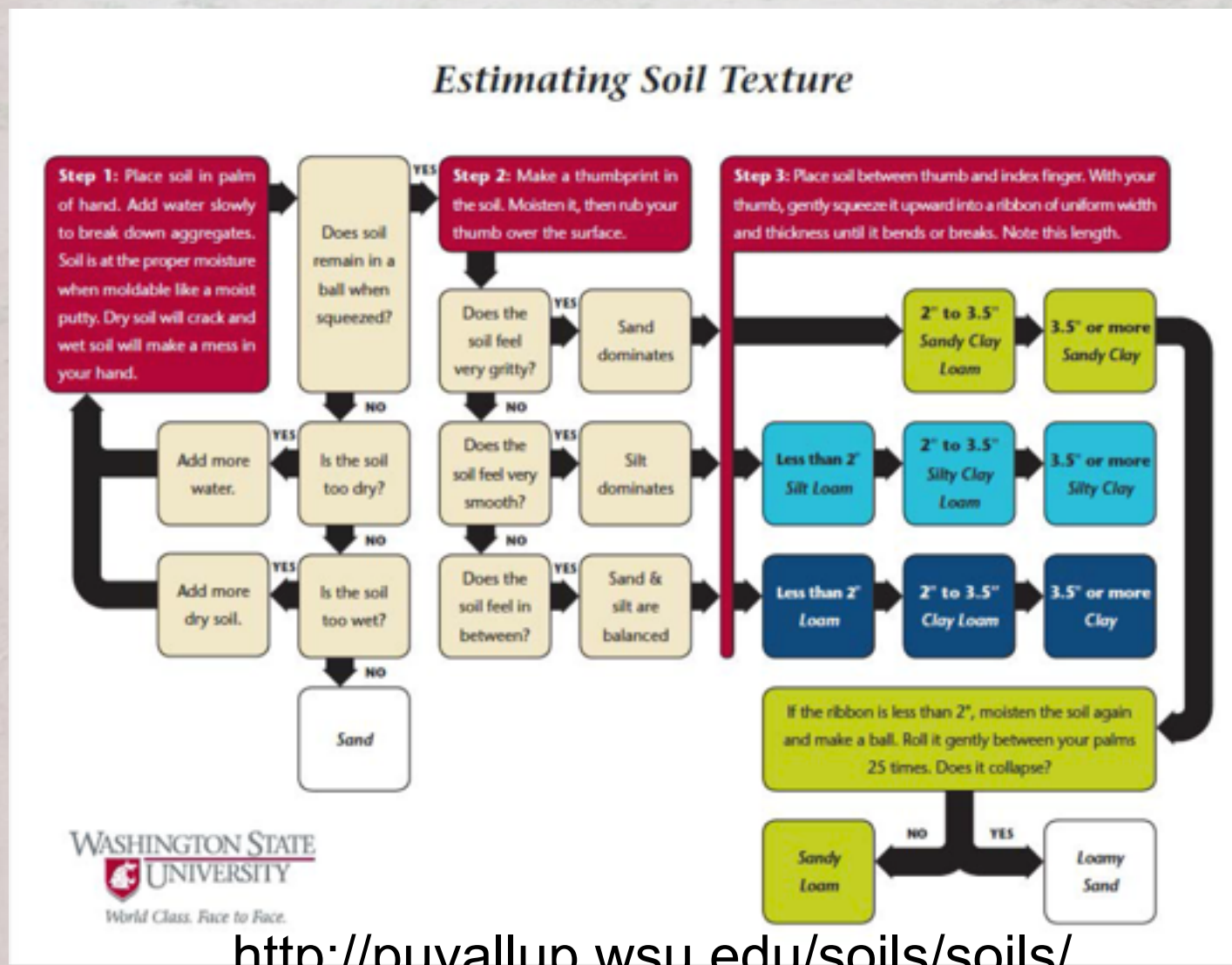
Soil Texture

- Soil water holding capacity
- Cation exchange
- Nutrition
- Organic matter “modifies”





Soil Texture - Let's try it!



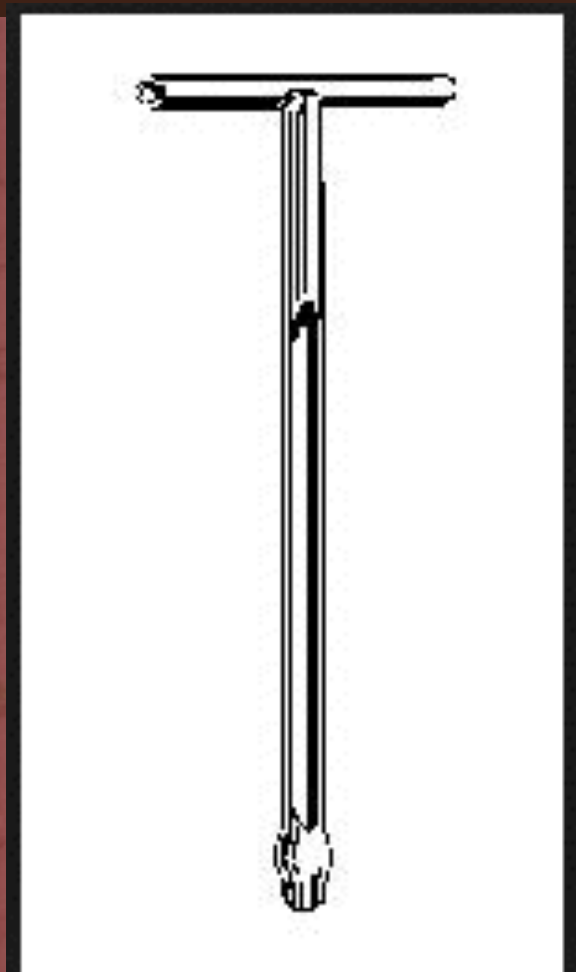
What is a Soil Test?

- Snapshot in time
- Combination of actual and extrapolated measurements
- Interpretation is **EVERYTHING**
- Test labs, kits, calibration

Collecting the Sample

- Troubleshooting vs planning management
- Representative sample collection
 - Random
 - Zone sampling
 - Area Sampling
- Z pattern
- W pattern

Tools



Collecting the Sample

- Sample depth considerations
- Composite the sample
- Mix well
- Sub sampling
- Sample handling
 - Plastic bag
 - Kept cool
 - Get to the lab quickly

Choosing a Lab

- Local!
- Proficiency Testing (NAPT or other)
- Sample drop off location
- Turn around time

Reference material - WSU EB 1971E

EB1971E



Home Gardener's Guide to Soils and Fertilizers

By Craig Cogger
Extension soil scientist, Washington State University

Soil is a mixture of weathered rock fragments and organic matter at the earth's surface. It is biologically active—a home to countless microorganisms, invertebrates, and plant roots. It varies in depth from a few inches to five feet or more. Soil is roughly 50 percent pore space. This space forms a complex network of pores of varying sizes, much like those in a sponge.

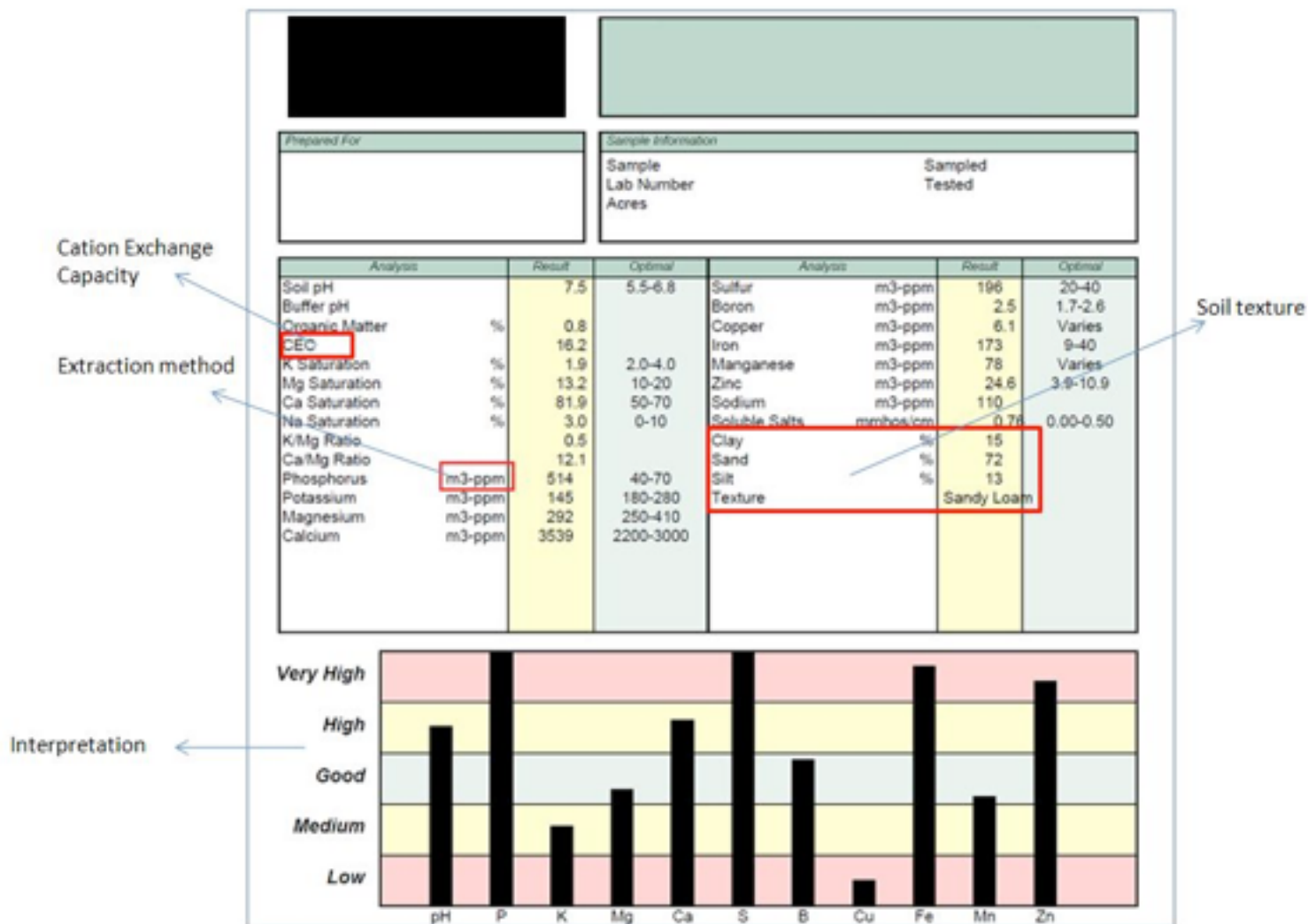
Soil provides nutrients, water, and physical support for plants as well as air for plant roots. Soil organisms are nature's primary recyclers, turning dead cells and tissue into nutrients, energy, carbon dioxide, and water to fuel new life.

Soil and water

Soil Pores, Water, and Productivity

Topics

- Soil and water
- Soil organisms
- Soil nutrients
- Understanding fertilizers
- How much fertilizer to use
- When to fertilize
- Adding organic matter
- Soil pH
- Soil salinity



WASHINGTON STATE UNIVERSITY

IRRIGATED SOIL MANAGEMENT

Soil Test Report

Client: **AgriLife, Richard**
 Location: **1711 University Dr, Washington, NC 28080**

Report No: **10000**

Received: **10/10/2011** Completed: **10/10/2011** [Link to related information](#) New Release Center

Field Information

Sample No.	Location	Depth	Soil Type	Plant	Year	Moisture	Temp	pH	EC	Ca	Mg	K	Na	Fe	Mn	Zn	Cu	B	Other
101	Field	0-10 cm	Loam	Wheat	2011	10.0	15.0	6.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Test Results

Sample No.	Location	Depth	Soil Type	Plant	Year	Moisture	Temp	pH	EC	Ca	Mg	K	Na	Fe	Mn	Zn	Cu	B	Other
101	Field	0-10 cm	Loam	Wheat	2011	10.0	15.0	6.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

University Extension
Soil Test Report

Soil Testing Laboratory
 20 Mumford Hall, MU
 Columbia, MO 65211
 Phone: (573) 682-0623

or
 Soil Testing Laboratory
 P.O. Box 160
 Portageville, MO 63873
 Phone: (573) 379-5431

FIELD INFORMATION

Field ID: **Hill top field** Sample no: **1**
 Acres: **40** Last Used: **Not known** Irrigated: **No**
 Last crop: **019 Cool-Season Grass Pasture**

This report is for:
Example Report
University of Missouri
Columbia, MO 65211

Soil sample submitted by:

Serial no. M3299 Lab no. 9999999
 Area: **0.15** County: **010** Region: **3**
 Submitted: **05/10/96** Processed: **06/12/96**

B SOIL TEST INFORMATION

Parameter	Value	Rating
pH (sat pH)	4.9	Very Low
Phosphorus (P)	22 lbs/acre	Low
Potassium (K)	103 lbs/acre	Medium
Calcium (Ca)	2091 lbs/acre	High
Magnesium (Mg)	278 lbs/acre	Very High
Sulfur (S)	ppm	Excess
Zinc (Zn)	ppm	
Manganese (Mn)	ppm	
Copper (Cu)	ppm	
Boron (B)	ppm	
Electrical Conductivity	6.0 mmhos/cm	
Cation Exchange Capacity	12.8 meq/100g	

C RATING

Rating	Very Low	Low	Medium	High	Very High	Excess
Phosphorus (P)						
Potassium (K)						
Calcium (Ca)						
Magnesium (Mg)						
Sulfur (S)						
Zinc (Zn)						
Manganese (Mn)						
Copper (Cu)						
Boron (B)						

D NUTRIENT REQUIREMENTS

Yield goal	N	P ₂ O ₅	K ₂ O	Zn	S
0	20	55	0		
10	20	45	0		
20	0	80	235		
30	90	30	20		

E LIMESTONE SUGGESTIONS

Yield goal	N	P ₂ O ₅	K ₂ O	Zn	S
0	20	55	0		
10	20	45	0		
20	0	80	235		
30	90	30	20		

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-6880 • FAX (209) 529-6728

REPORT NUMBER: 00-336-047

CLIENT NO: 9999-D

SEND TO: A & L WESTERN AGRICULTURAL LABS
 1311 WOODLAND AVE.
 MODESTO, CA 95351-

SUBMITTED BY:

GROWER: EXAMPLE REPORT

DATE OF REPORT: 04/03/04

SOIL ANALYSIS REPORT

PAGE 1

SAMPLE ID	LAB NUMBER	Organic Matter		Phosphorus		Potassium	Magnesium	Calcium	Sodium	pH		Hydrogen	Cation Exchange Capacity (C.E.C. meq/100g)	PERCENT CATION SATURATION (COMPUTED)				
				P1 (Weak Br) ppm	P2 (Oven Method) ppm	K ppm	Mg ppm	Ca ppm	Na ppm	Soil pH	Buffer Index	H meq/100g		K %	Mg %	Ca %	H %	Na %
		% Rating	DB Soil															
130-1	55331	4.0H	110	23M	14**	110L	480M	992VL	104L	4.7	6.2	9.7	12.1	1.5	12.8	25.9	50.5	2.4
130-2	55332	1.5L	60	27H	6**	41VL	569M	1154VL	185M	4.6	5.9	13.3	24.7	0.4	19.0	23.3	54.0	3.3
10-1	55333	3.5M	100	12L	11**	64L	471VH	841VL	87L	5.2	6.5	4.5	13.1	1.2	29.5	31.9	34.5	2.9
10-2	55334	2.8M	86	8VL	9**	29L	553VH	665VL	89M	5.3	6.6	3.7	12.1	0.6	37.7	27.5	31.0	3.2

** NaHCO₃-P unreliable at this soil pH

SAMPLE NUMBER	Nitrogen (N)	Sulfur (S)	Zinc (Zn)	Manganese (Mn)	Iron (Fe)	Copper (Cu)	Boron (B)	Selenium (Se)	Chloride (Cl)	PARTICLE SIZE ANALYSIS			
										SAND %	SILT %	CLAY %	SOIL TEXTURE
100-1	5L	5L	0.2VL	3M	53VL	0.2VL	0.1VL	L	0.3L	44	25	31	CLAY LOAM
100-2	3VL	41VL	0.1VL	1VL	14M	0.2VL	0.1VL	L	0.6L	60	16	25	SANDY CLAY LOAM
10-1	2VL	5L	0.1VL	2L	50VL	0.1VL	0.3VL	L	0.2VL	42	36	23	LOAM
10-2	2VL	4L	0.1VL	1VL	53VL	0.1VL	0.2VL	L	0.1VL	40	35	25	LOAM

CODE TO RATING: VERY LOW (V), LOW (L), MEDIUM (M), HIGH (H), AND VERY HIGH (VH).
 ** ESTIMATED NITROGEN RELEASE
 ** MULTIPLY THE RESULTS IN PART B BY 2 TO CONVERT TO LBS PER ACRE OF THE ELEMENTAL FORM

This report applies only to the services listed. Services are retained a maximum of 10 days after testing.

limestone needs in tons/acre, divide E3M requirements by the
 or limestone dealer.

ment for cool-season grass exceeds 90 lbs/acre, apply 2/3 of it
 i from December through February, and the remainder in August.

rogen on spring seedlings of legumes after May 1st because of
 competition.

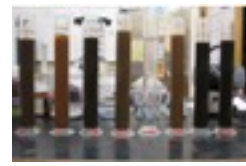
Money Specialist Phone: (573) 882-1000

Mr. Pink-Extension MP 169 Revised 1/04 Signature

University of Missouri, U.S. Department of Agriculture & Local University Extension Councils Cooperating
 equal opportunity institutions

Soil Moisture and Water Management

- Soil water holding capacity
- Water movement in soils
- Depth of water
- Water quality
- Salts and salinity



How Water Moves in Soils (Timelapse)

Video 1: Sand



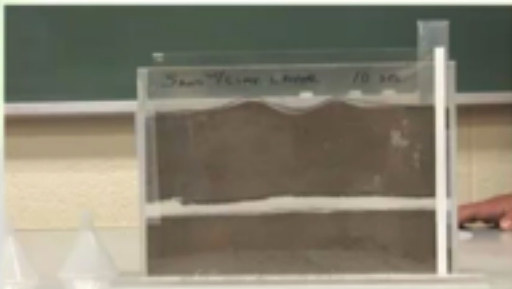
Sand

Video 3: Silt Loam

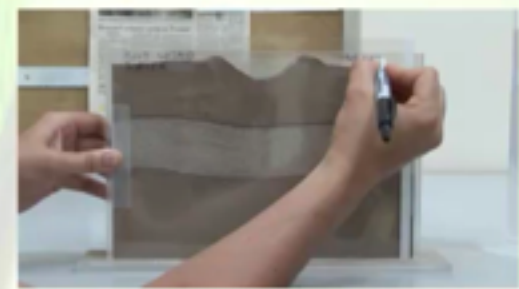


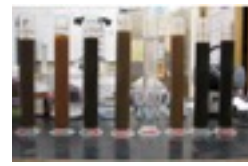
Silt Loam

Video 2: Sand with Clay Layer



Video 4: Silt Loam with Sand Layer





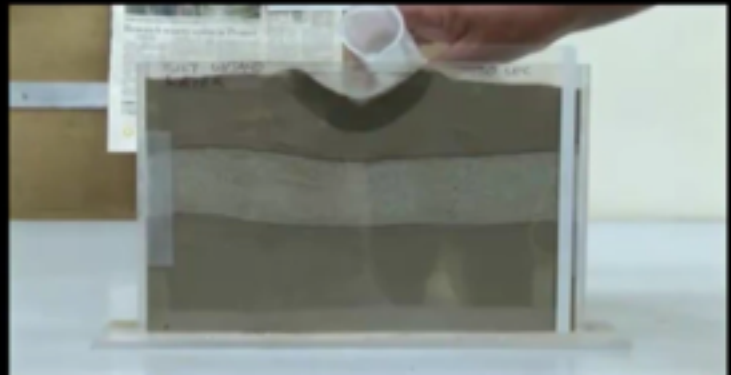
How Water Moves in Soils (Timelapse)

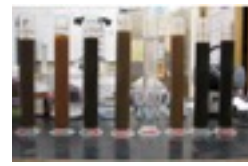


Sand

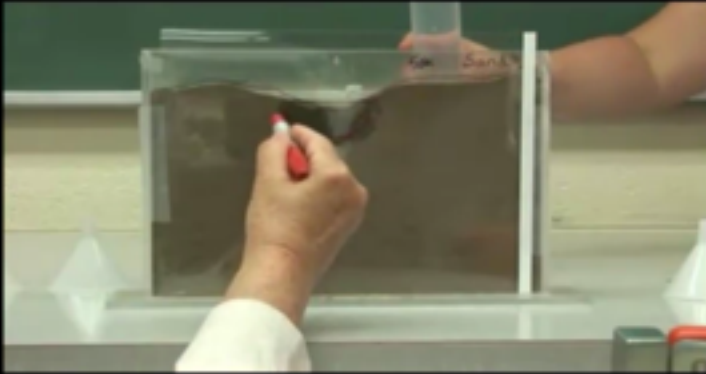


Silt Loam





How Water Moves in Soils (Timelapse)

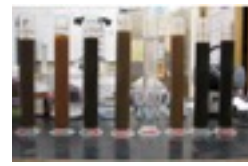


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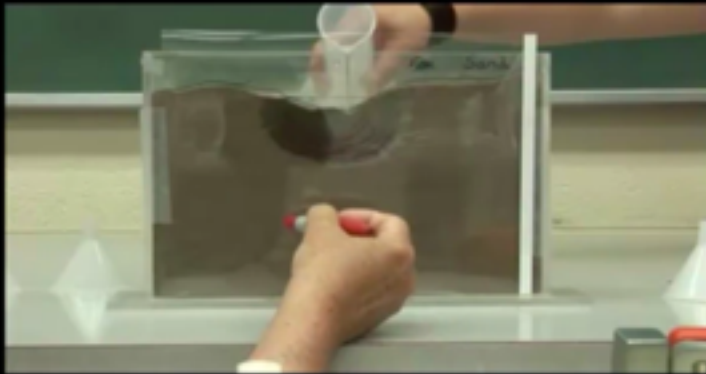


Silt Loam





How Water Moves in Soils (Timelapse)

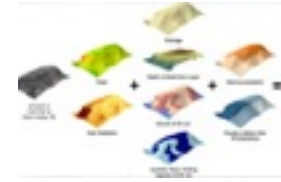
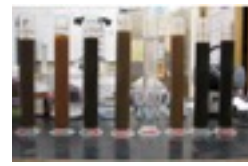


Sand



Silt Loam

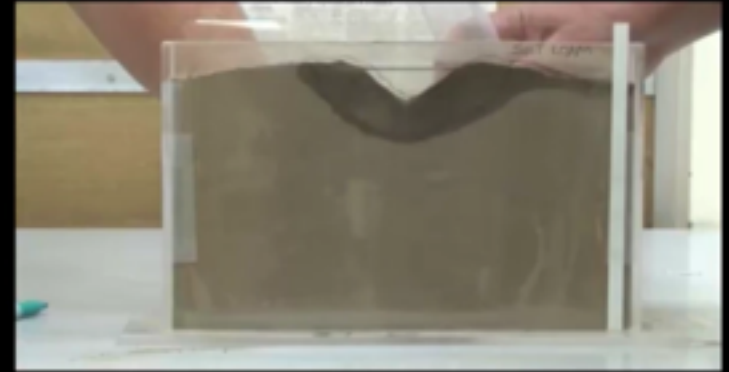




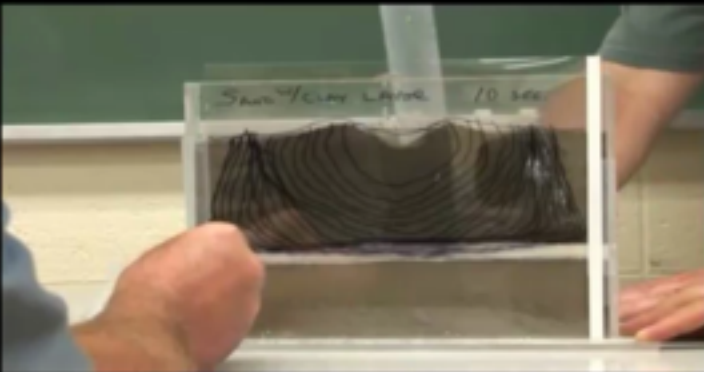
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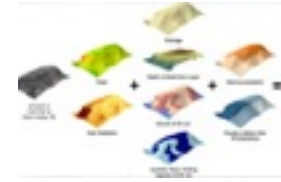
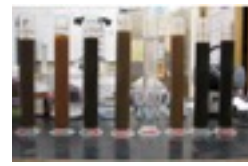


Sand



Silt Loam





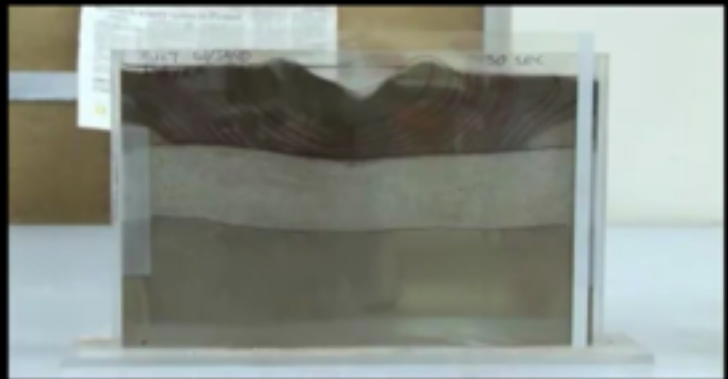
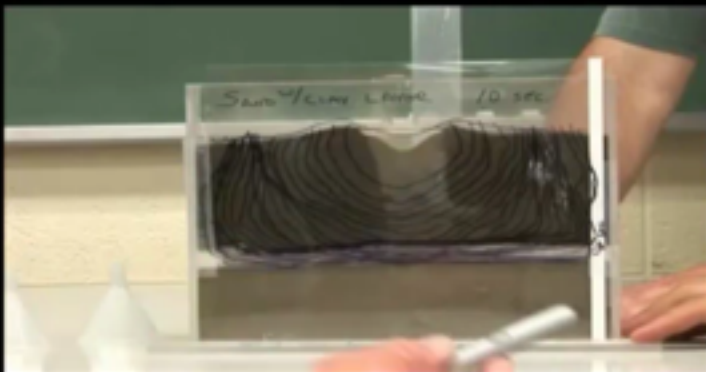
How Water Moves in Soils (Timelapse)

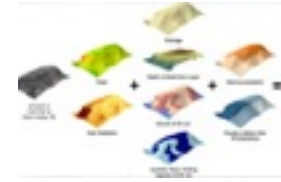
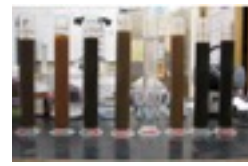


Sand



Silt Loam

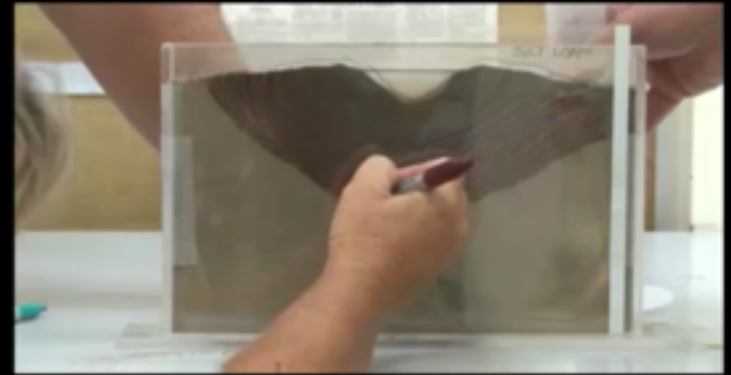




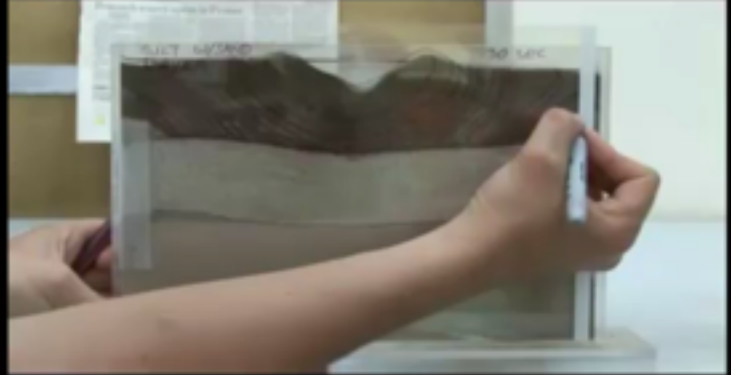
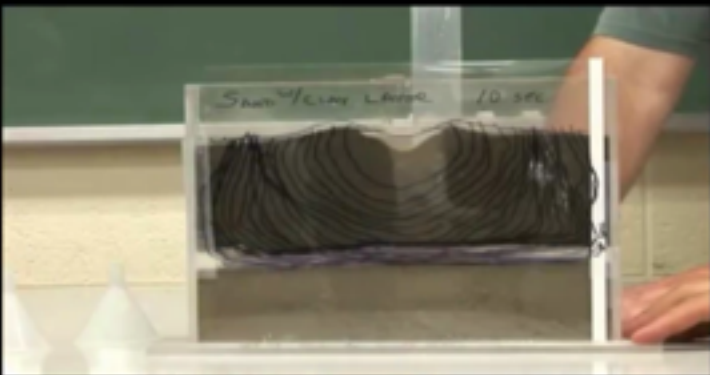
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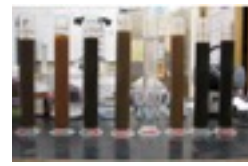


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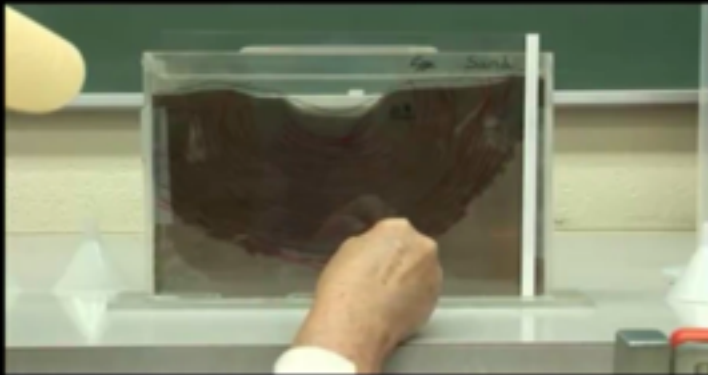


Silt Loam





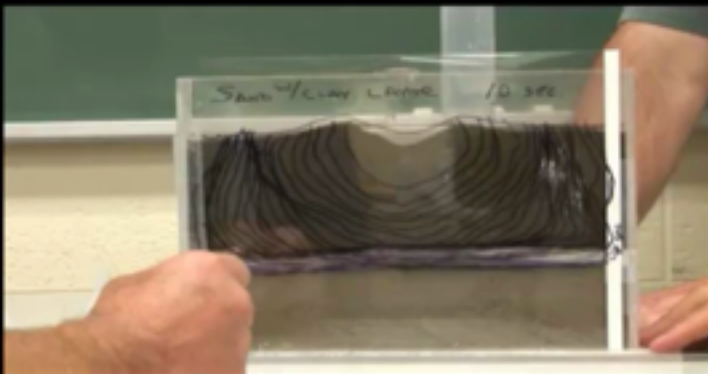
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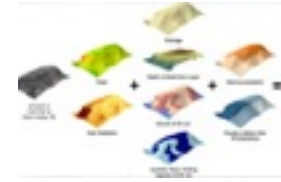
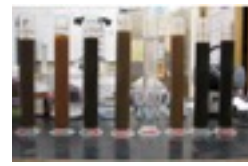


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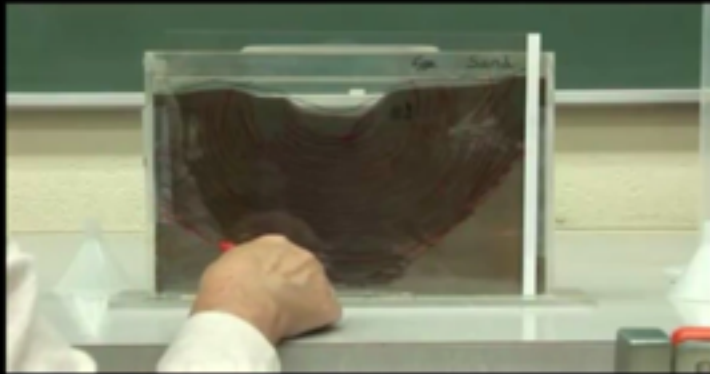


Silt Loam





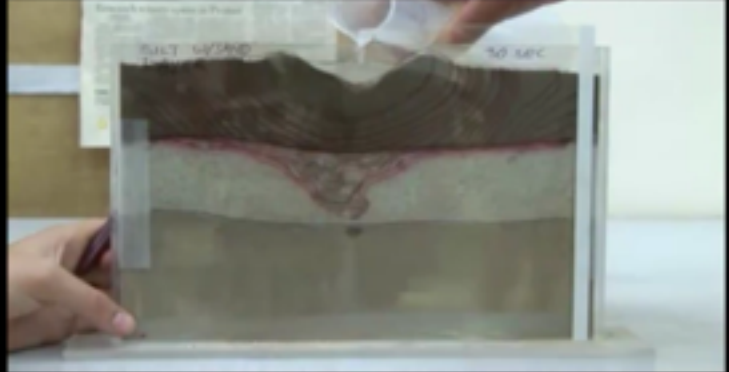
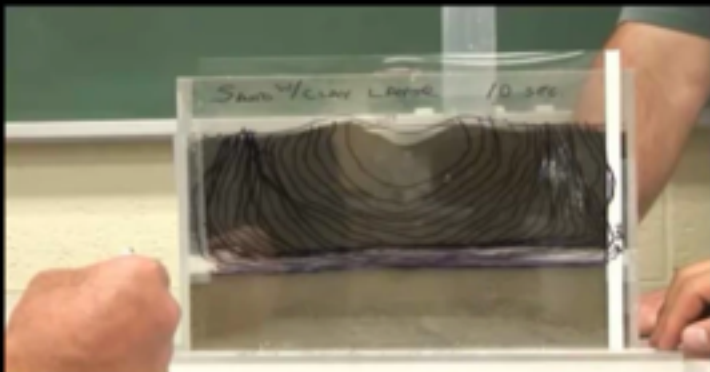
How Water Moves in Soils (Timelapse)



Sand

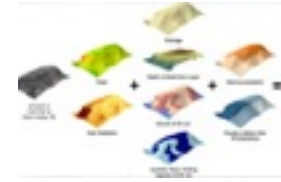
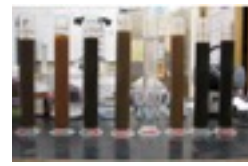


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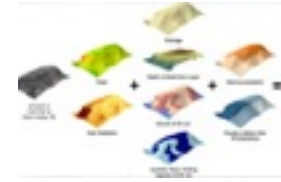
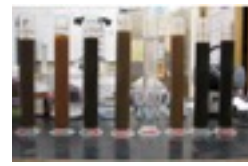
Soil Moisture and Water Management

- More movement by gravity in sandier soils
- More lateral movement in finer texture soils
- Impacts of layers and texture changes



Outline Revisited

- Identifying Your Soil
- Soil Texture
- Soil Sampling and Testing
- Soil Moisture and Water Management



Questions?

