WASHINGTON STATE UNIVERSITY
IRRIGATED SOIL MANAGEMENT

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

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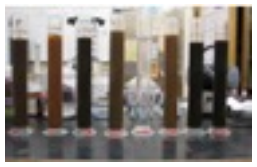
http://css.wsu.edu/irrsoils/

WATER | GIS AND MAPPING | NUTRIENTS | TESTING | CHEMISTRY | SOILS | PLANTS







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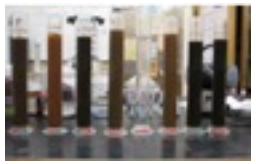
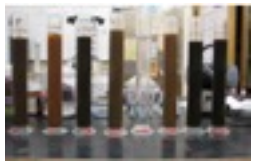


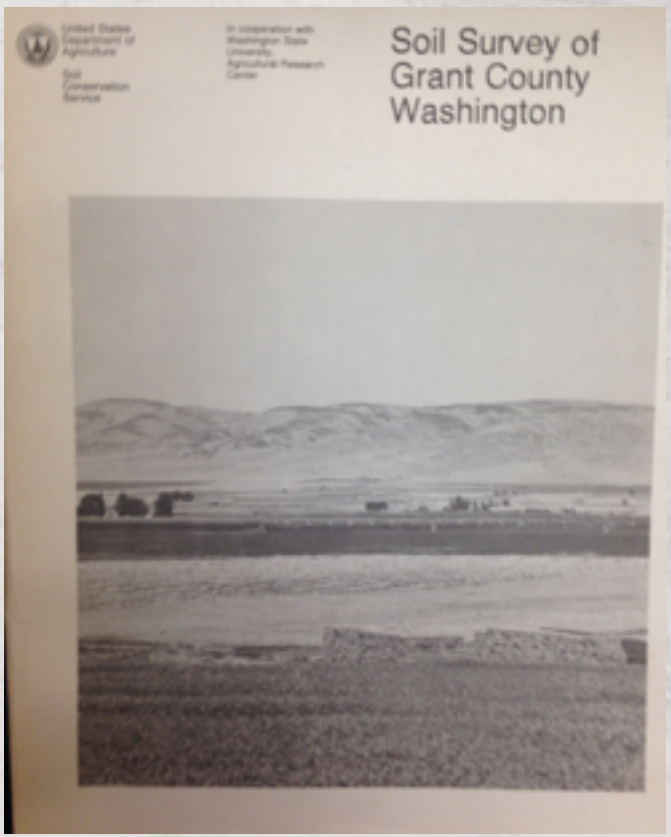
Outline of Presentation

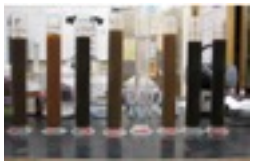
- Identifying Your Soil
- Getting a “Feel” for your Soil
- Soil Sampling and Testing
- Soil Moisture and Water Management



Identifying Your Soil

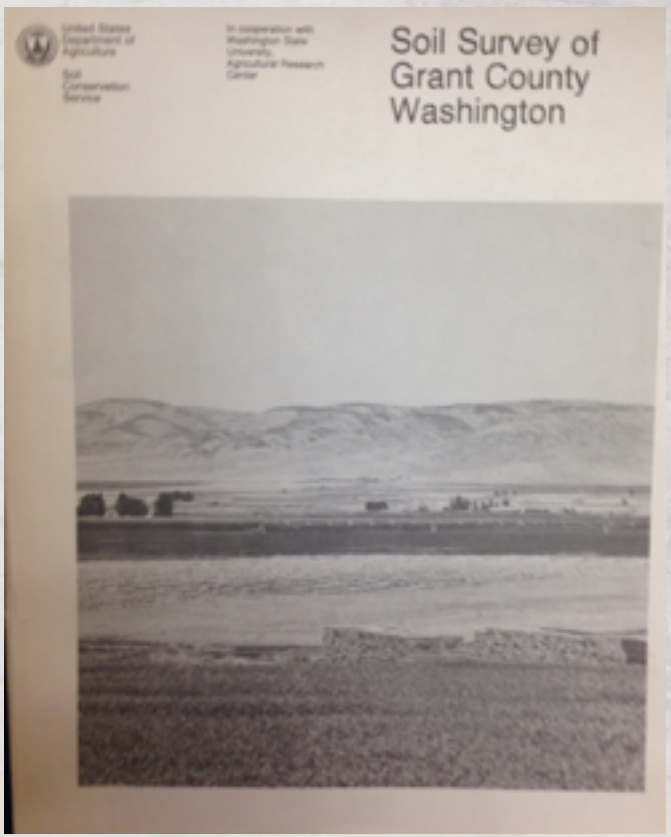
- By County Soil Survey
- Web Based Tools
- Using Your Smart Phone

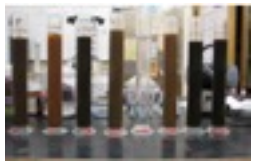




By County Soil Survey - NRCS

- Paper copy
- Large
- Last update Jan 1984





NRCS Web Soil Survey

- Launched in the early 200s
- Coverage of the entire US
- GIS driven
- Free - no login

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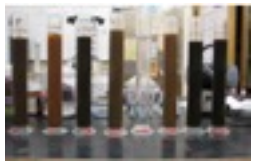
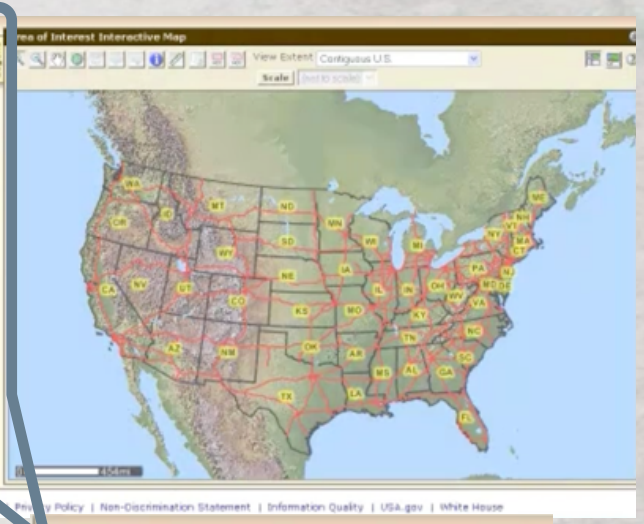


Navigating Web Soil Survey



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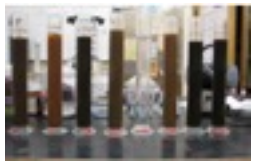
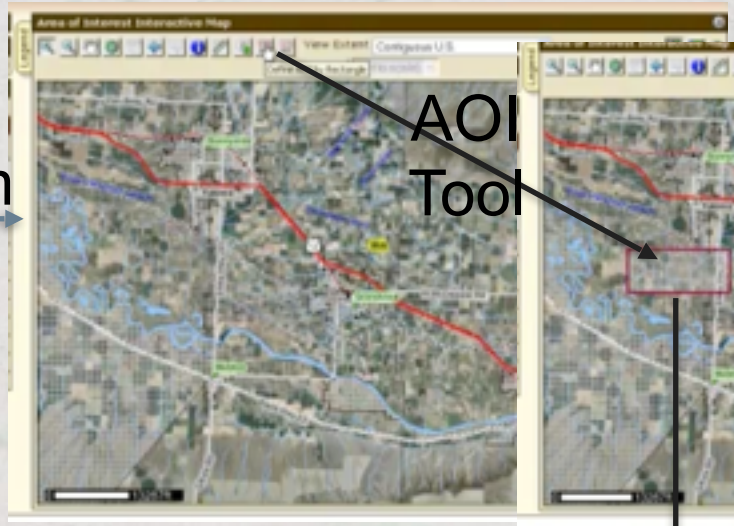
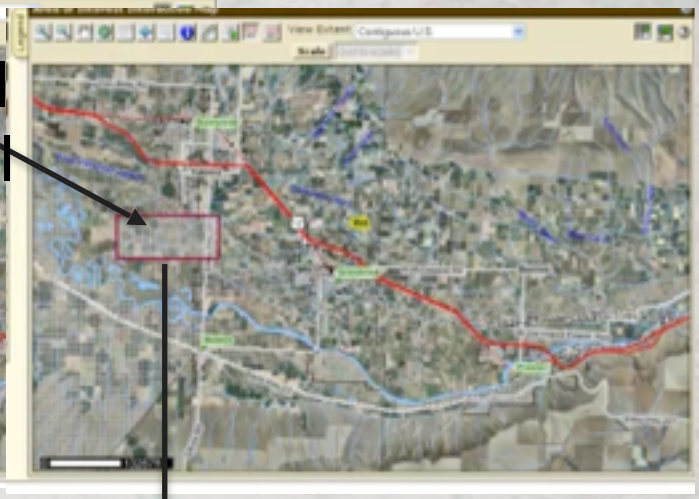


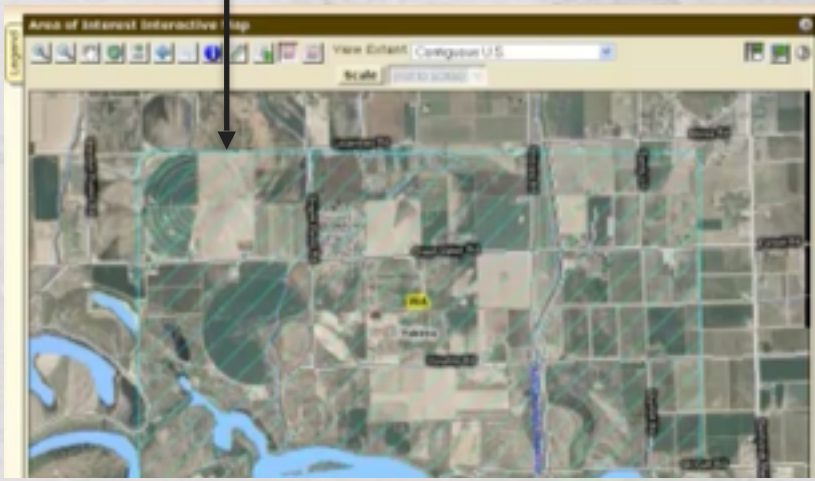
Navigating Web Soil Survey

Zoom Tool

AOI Tool







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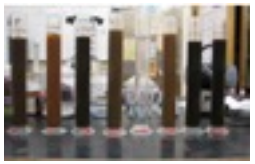

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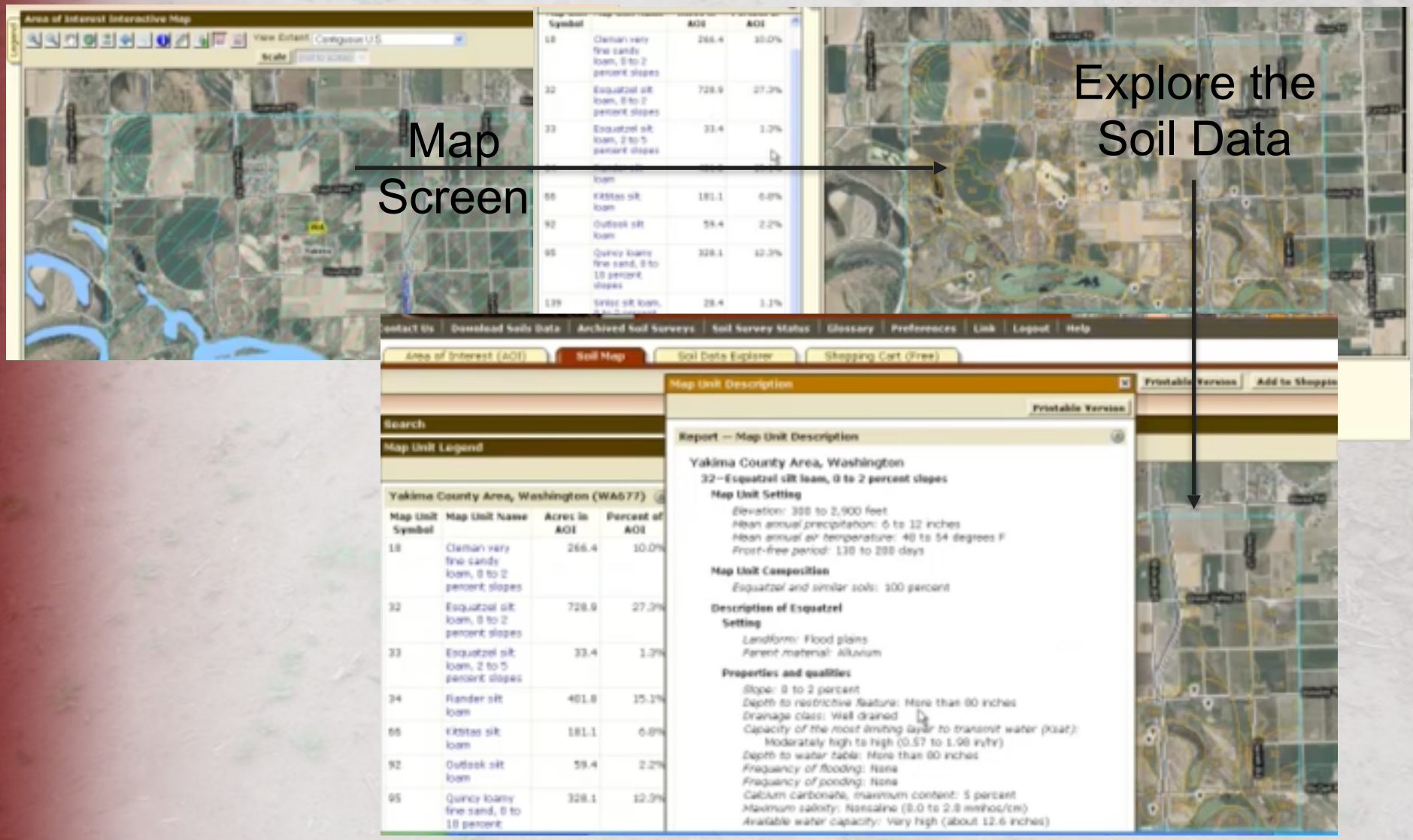

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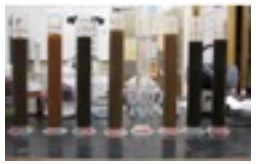

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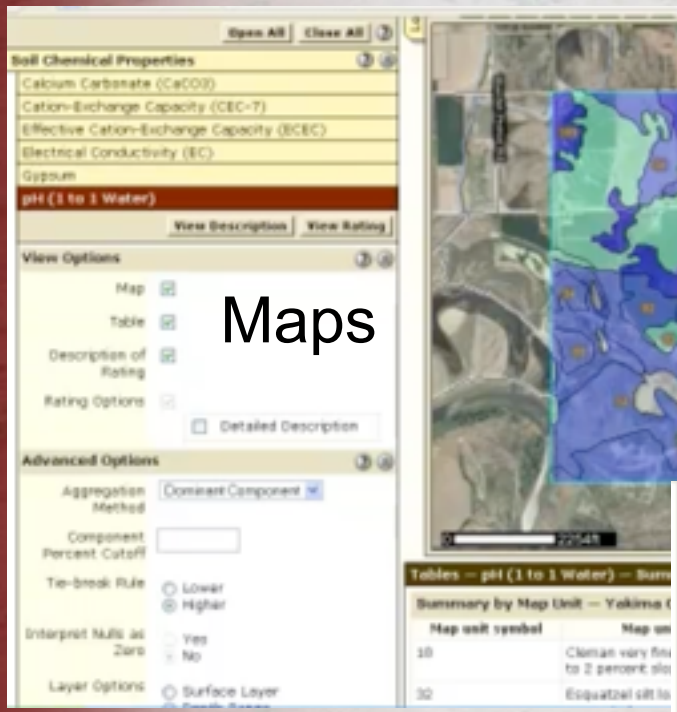
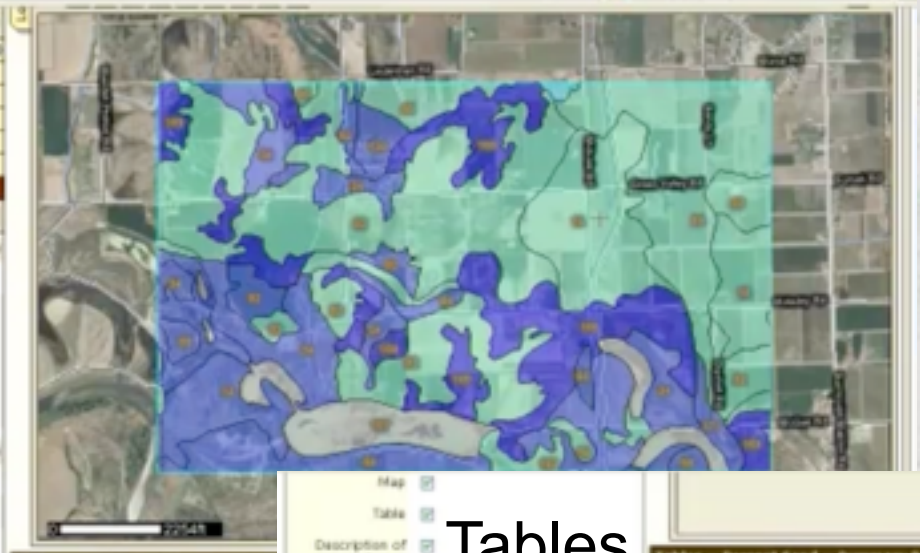
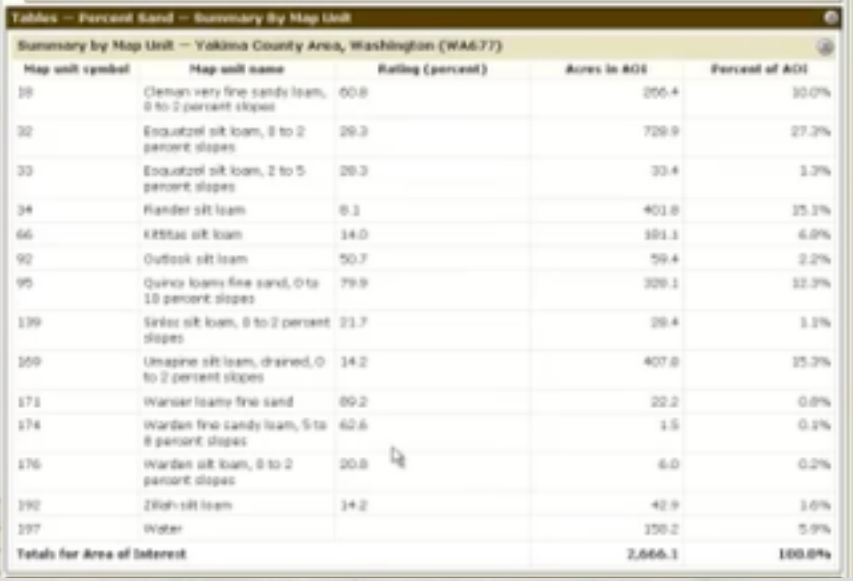
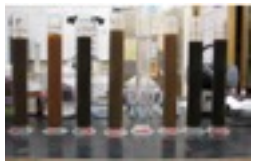


Maps

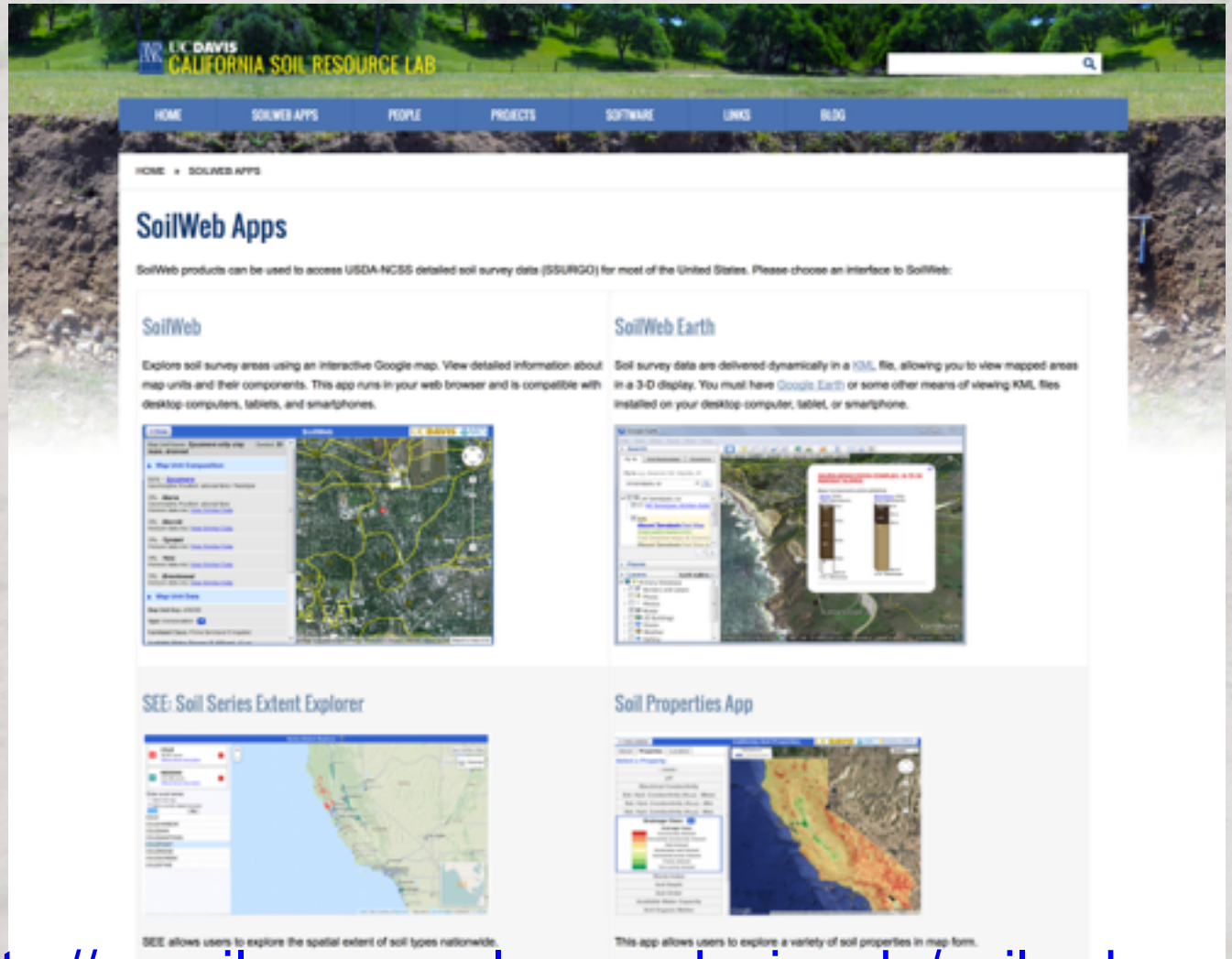


Tables





UC Davis Google Based Web Soil Data



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

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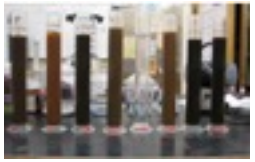

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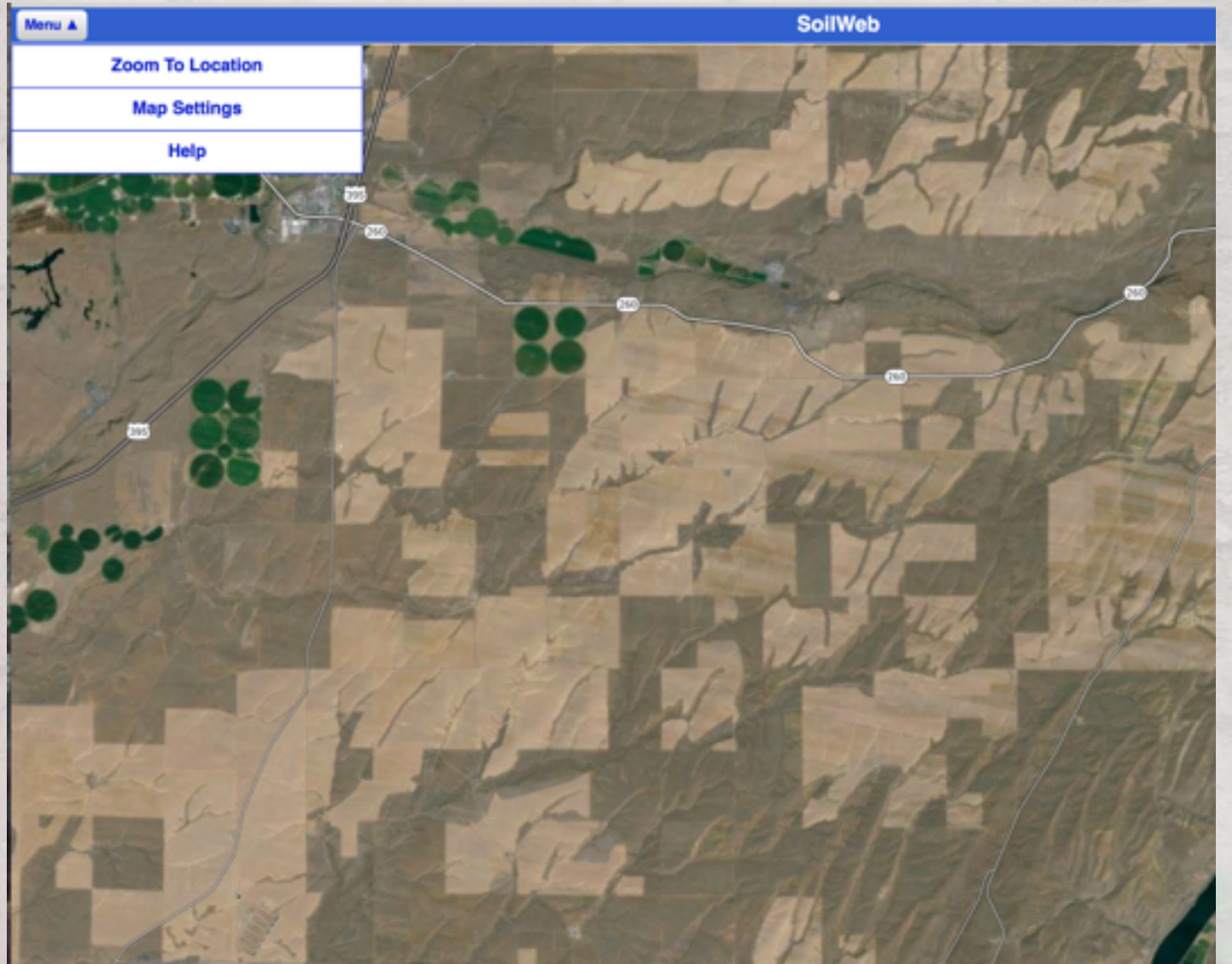

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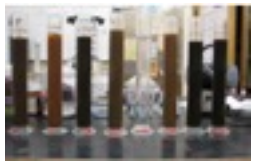

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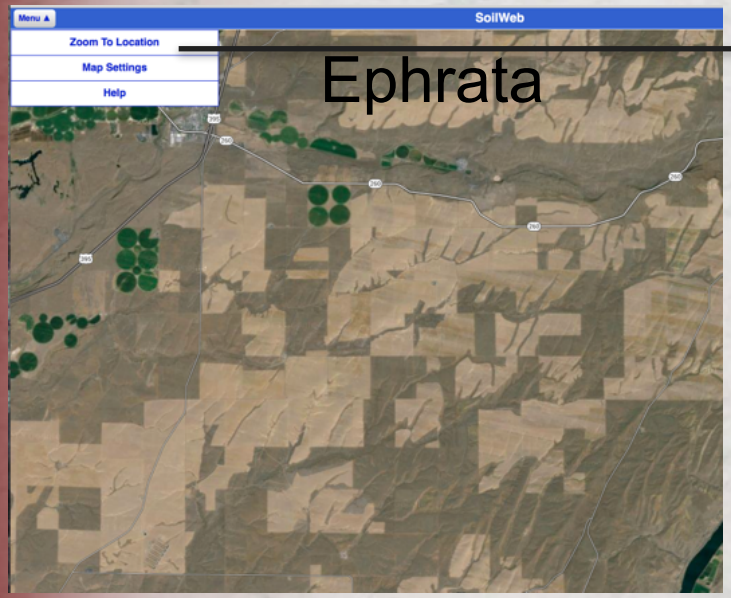

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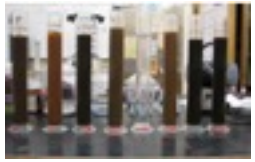

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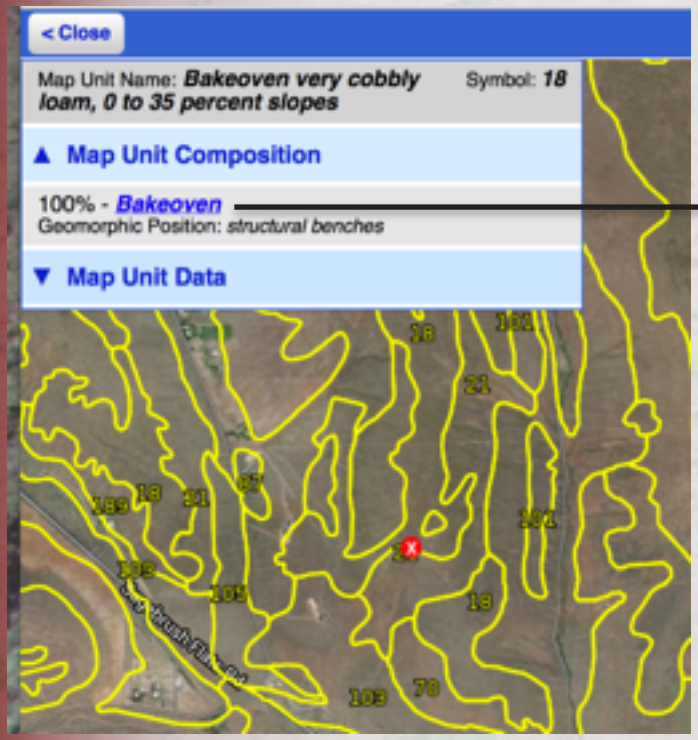
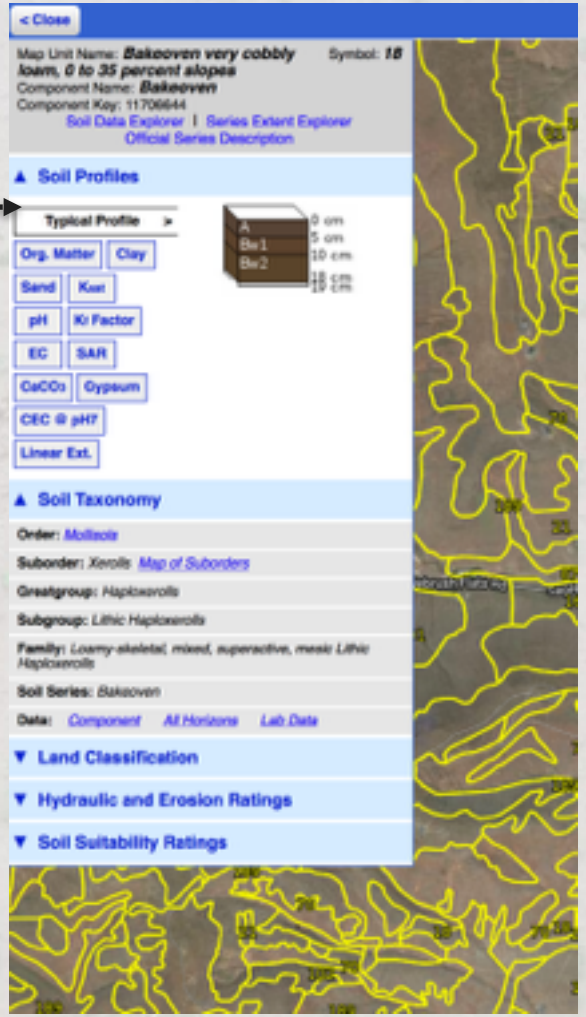
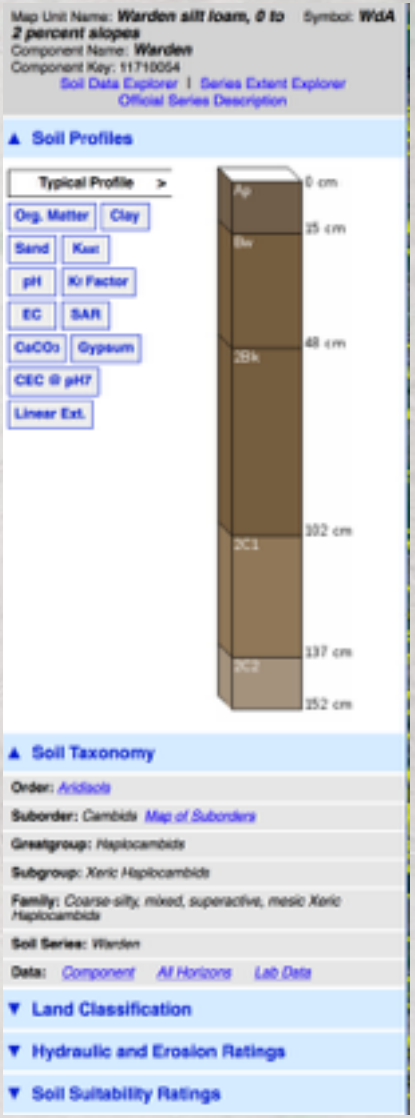
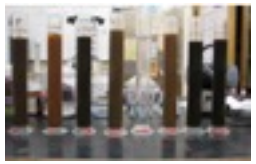
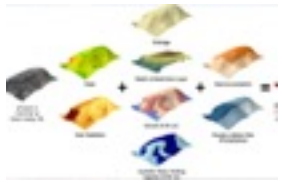
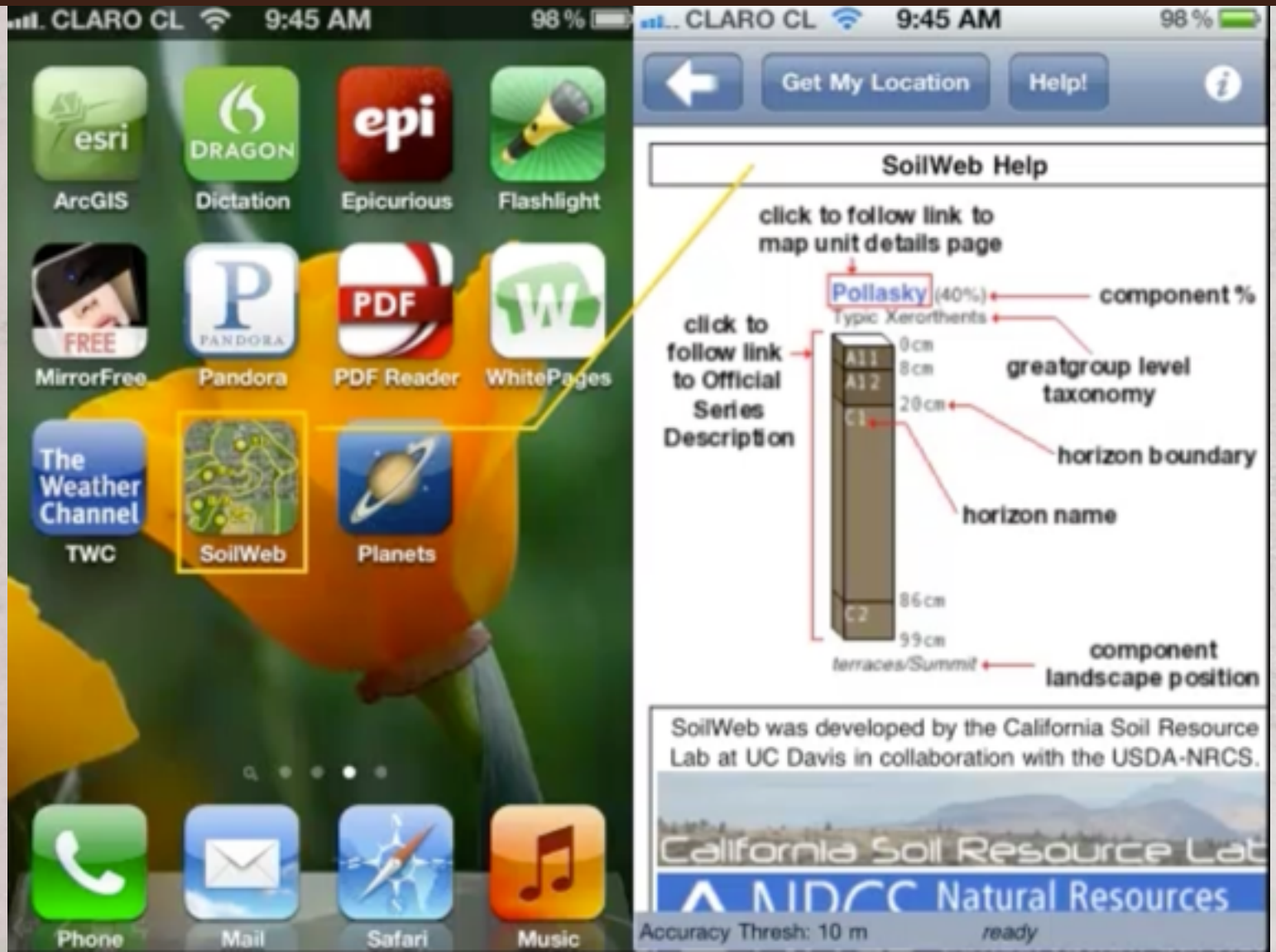


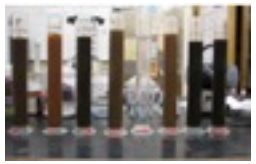
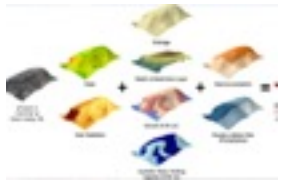





SmartPhone App

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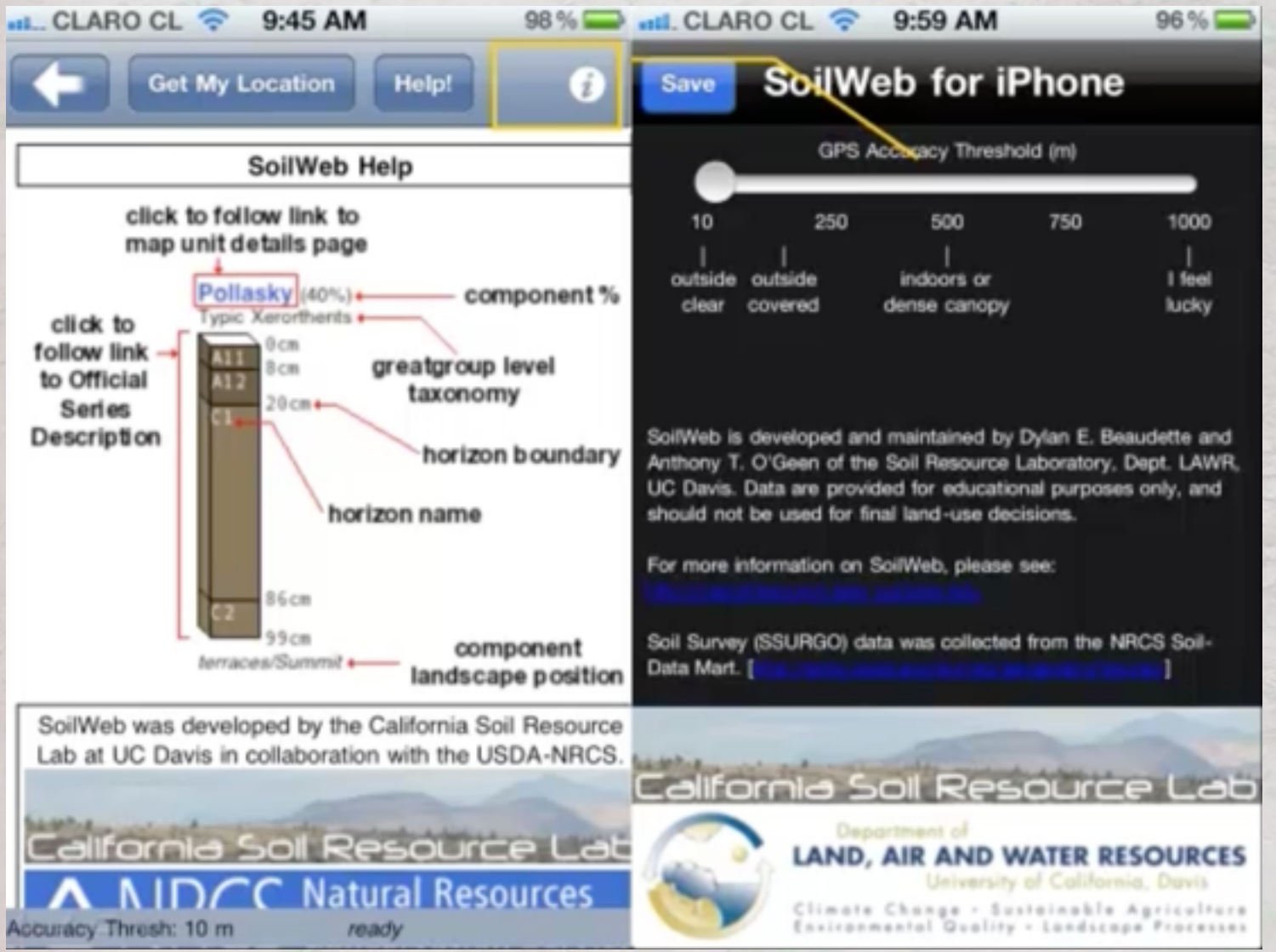

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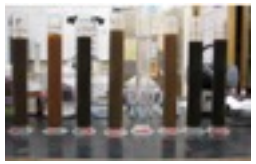

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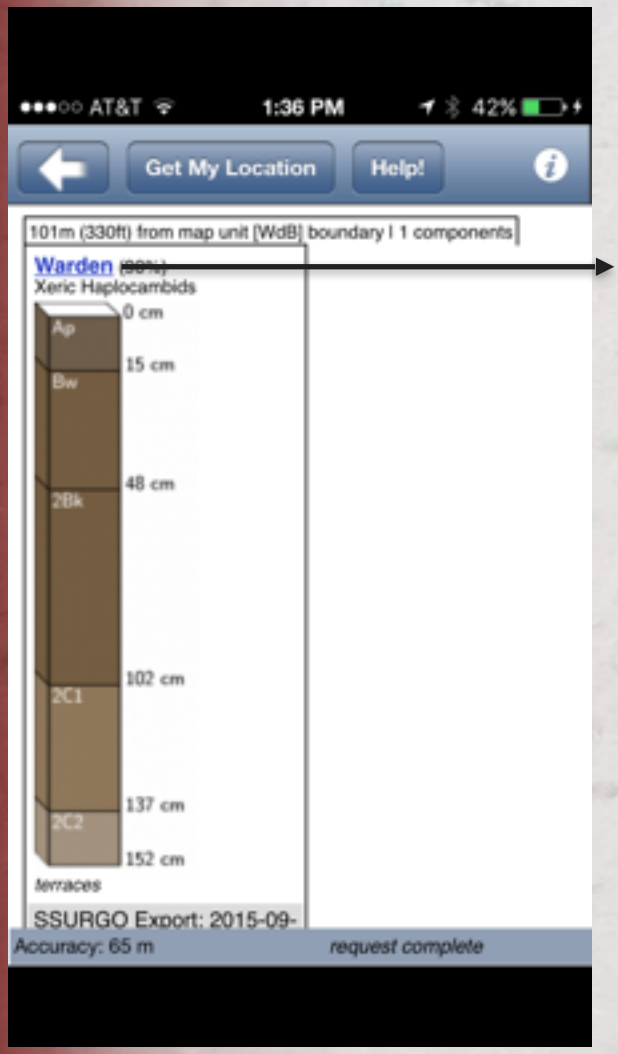
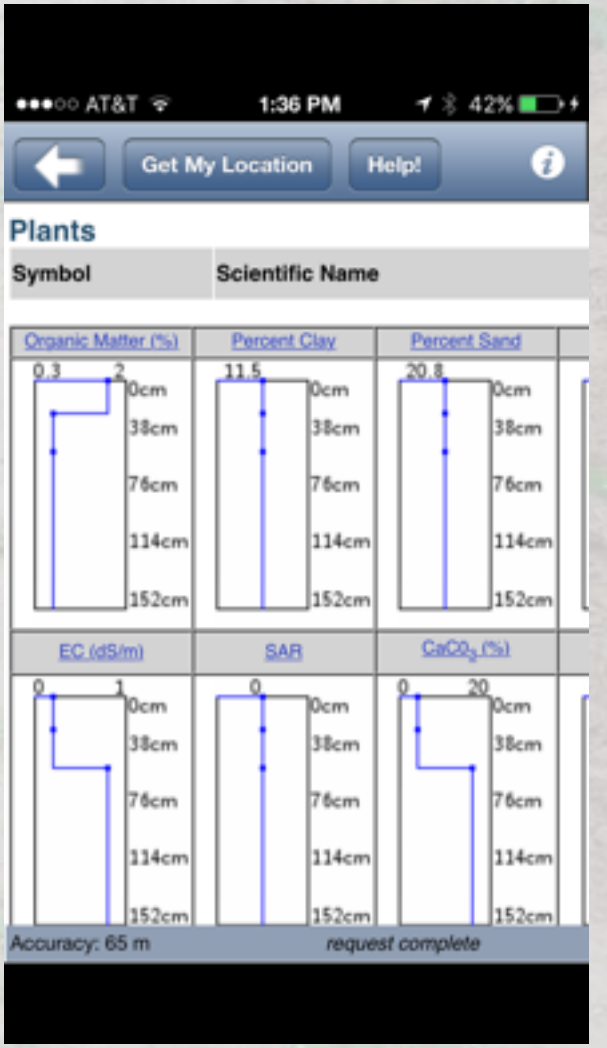
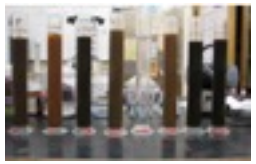
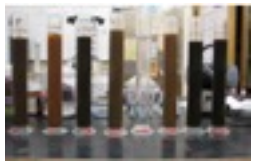






Soil Texture

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



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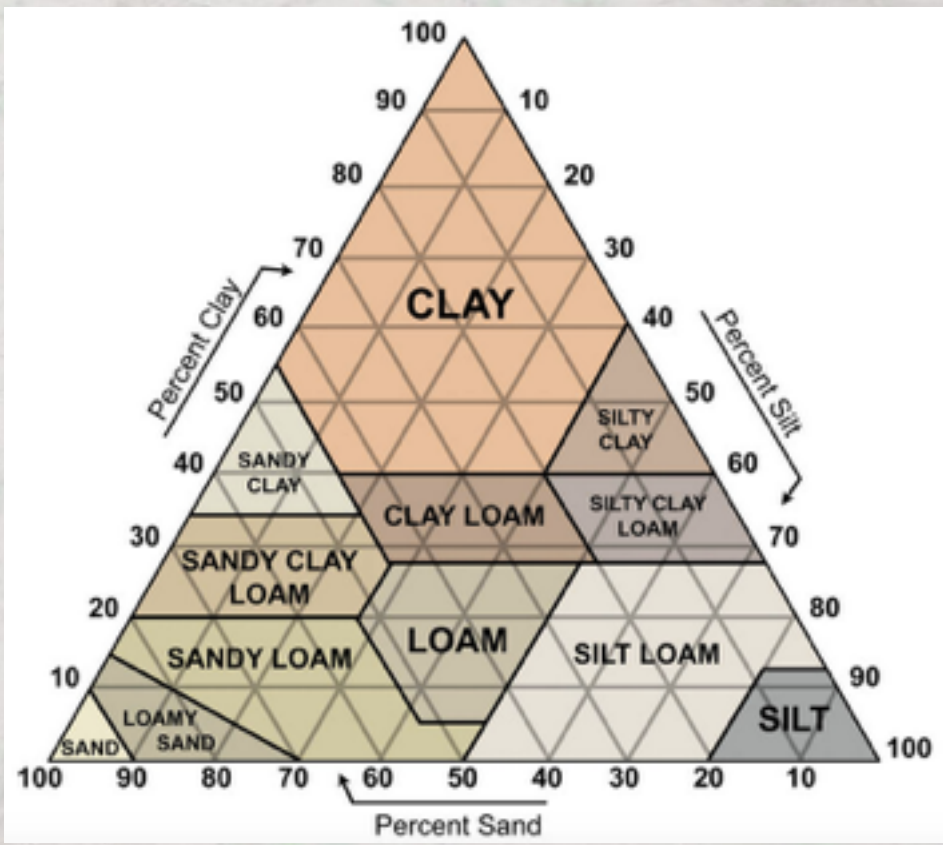
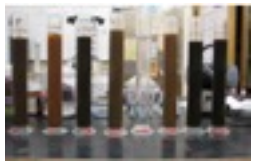
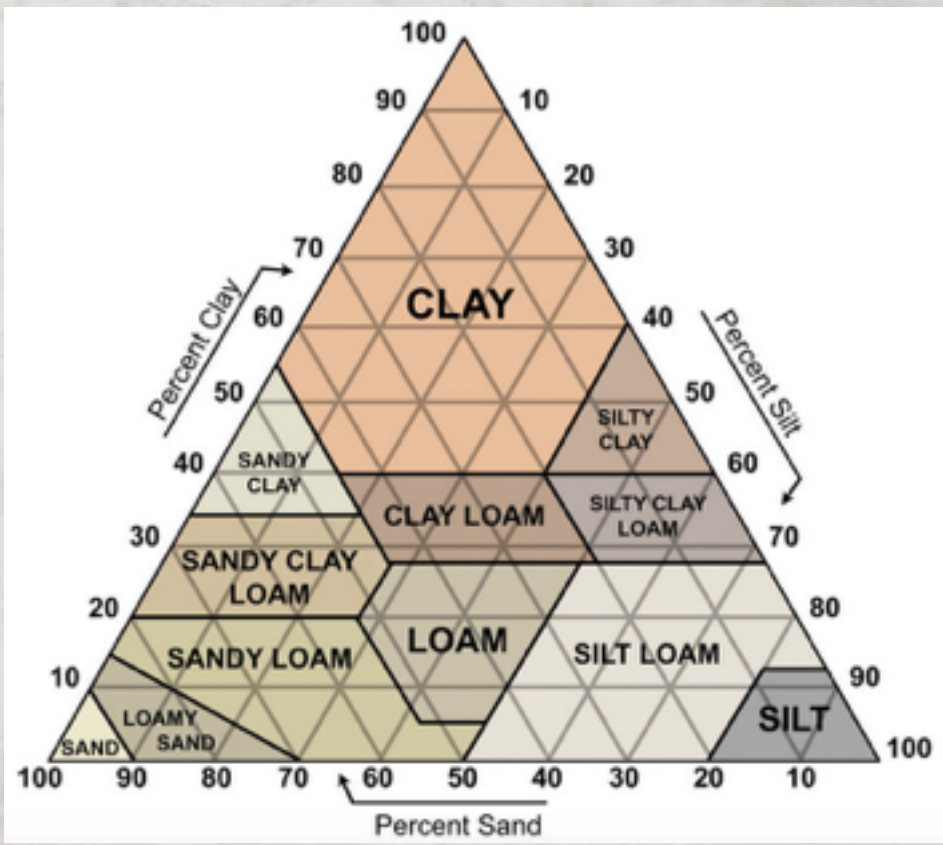


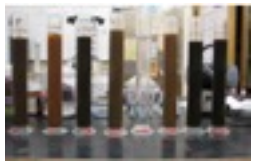


Soil Texture

- Soil water holding capacity
- Cation exchange
- Nutrition

- Organic matter "modifies"





Soil Texture - Let's try it!

Estimating Soil Texture

Step 1: Place soil in palm of hand. Add water slowly to break down aggregates. Soil is at the proper moisture when moldable like a moist putty. Dry soil will crack and wet soil will make a mess in your hand.

Does soil remain in a ball when squeezed?

- NO → Is the soil too dry?
  - YES → Add more water. → (back to Step 1)
  - NO → Is the soil too wet?
    - YES → Add more dry soil. → (back to Step 1)
    - NO → *Sand*
- YES → **Step 2:** Make a thumbprint in the soil. Moisten it, then rub your thumb over the surface.

Does the soil feel very gritty?

- YES → Sand dominates
- NO → Does the soil feel very smooth?
  - YES → Silt dominates
  - NO → Does the soil feel in between?
    - YES → Sand & silt are balanced

Step 3: Place soil between thumb and index finger. With your thumb, gently squeeze it upward into a ribbon of uniform width and thickness until it bends or breaks. Note this length.

- Sand dominates → 2" to 3.5" *Sandy Clay Loam* → 3.5" or more *Sandy Clay*
- Silt dominates → Less than 2" *Silt Loam* → 2" to 3.5" *Silty Clay Loam* → 3.5" or more *Silty Clay*
- Sand & silt are balanced → Less than 2" *Loam* → 2" to 3.5" *Clay Loam* → 3.5" or more *Clay*

If the ribbon is less than 2", moisten the soil again and make a ball. Roll it gently between your palms 25 times. Does it collapse?

- NO → *Sandy Loam*
- YES → *Loamy Sand*

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World Class. Face to Face.

http://puyallup.wsu.edu/soils/soils/

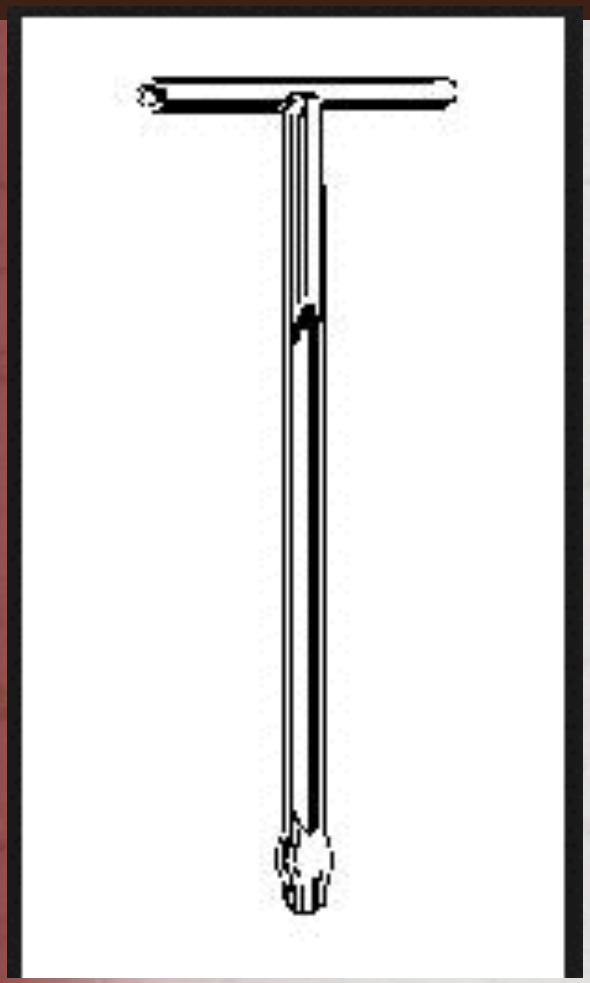
What is a Soil Test?

- 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

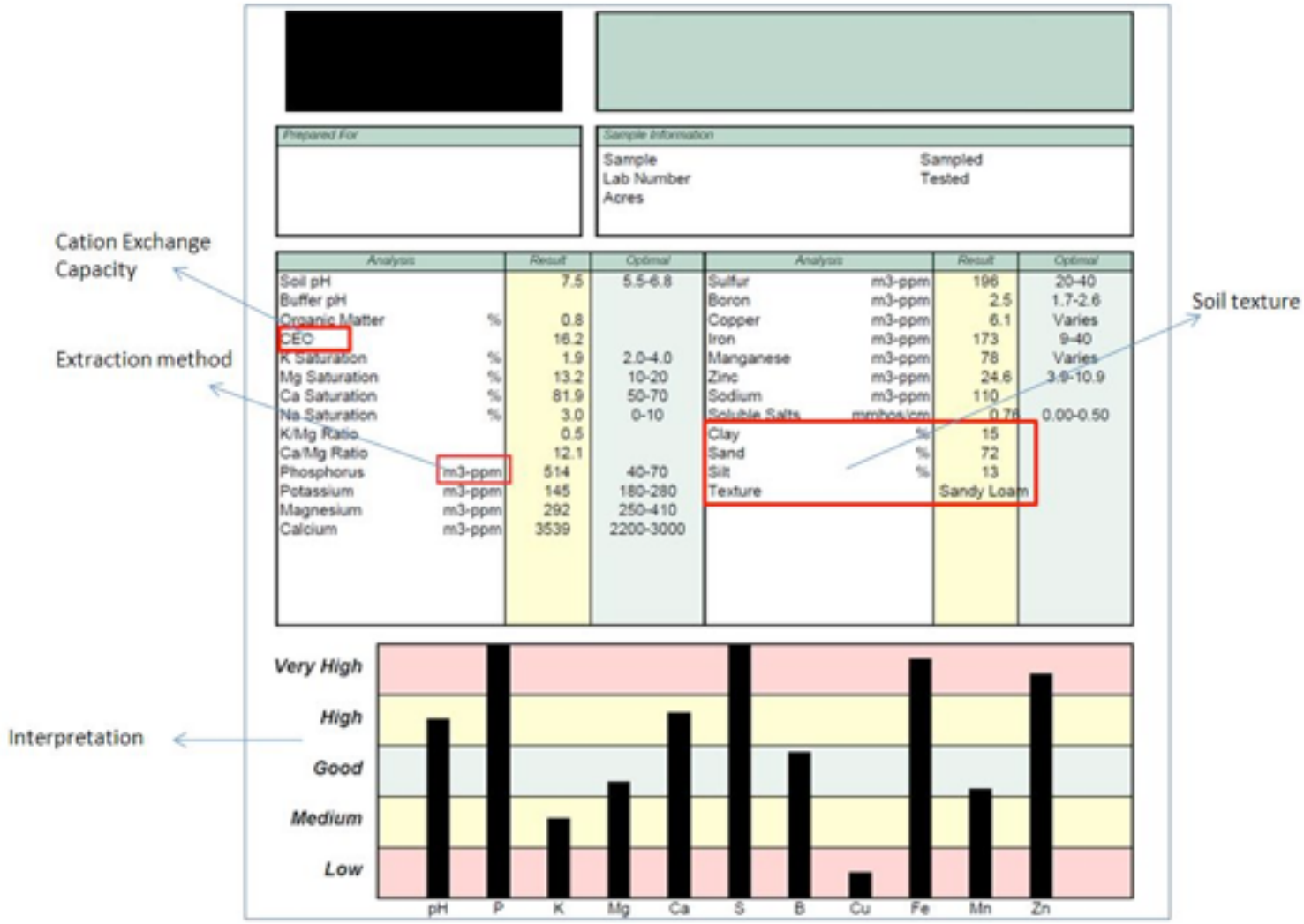
Soil is a mixture of weathered rock fragments and organic matter at the earth's surface. It is biologically active—a home to countless microorganisms, invertebrates, and plant roots. It varies in depth from a few inches to five feet or more. Soil is roughly 50 percent pore space. This space forms a complex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

Topics

Soil and water

Soil Pores, Water, and Productivity



Analysis		Result	Optimal
Soil pH		7.5	5.5-6.8
Buffer pH			
Organic Matter	%	0.8	
CEC		16.2	
K Saturation	%	1.9	2.0-4.0
Mg Saturation	%	13.2	10-20
Ca Saturation	%	81.9	50-70
Na Saturation	%	3.0	0-10
K/Mg Ratio		0.5	
Ca/Mg Ratio		12.1	
Phosphorus	m3-ppm	514	40-70
Potassium	m3-ppm	145	180-280
Magnesium	m3-ppm	292	250-410
Calcium	m3-ppm	3539	2200-3000

Analysis		Result	Optimal
Sulfur	m3-ppm	196	20-40
Boron	m3-ppm	2.5	1.7-2.6
Copper	m3-ppm	6.1	Varies
Iron	m3-ppm	173	9-40
Manganese	m3-ppm	78	Varies
Zinc	m3-ppm	24.6	3.9-10.9
Sodium	m3-ppm	110	
Soluble Salts	mmhos/cm	0.76	0.00-0.50
Clay	%	15	
Sand	%	72	
Silt	%	13	
Texture		Sandy Loam	

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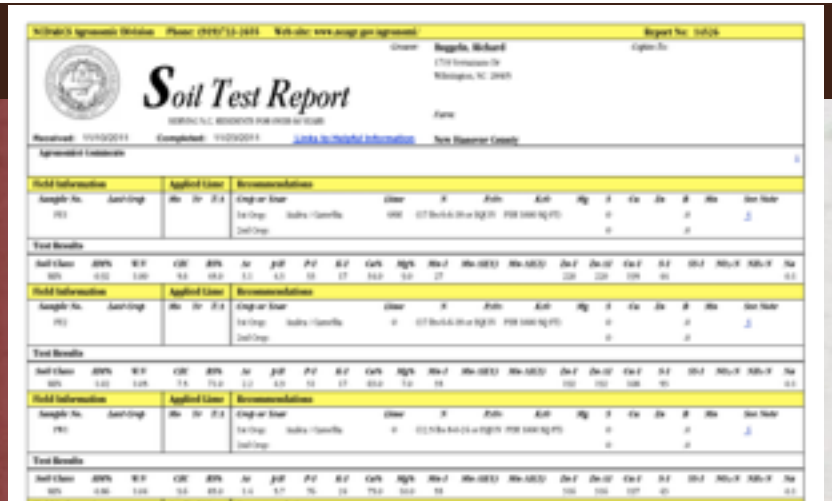
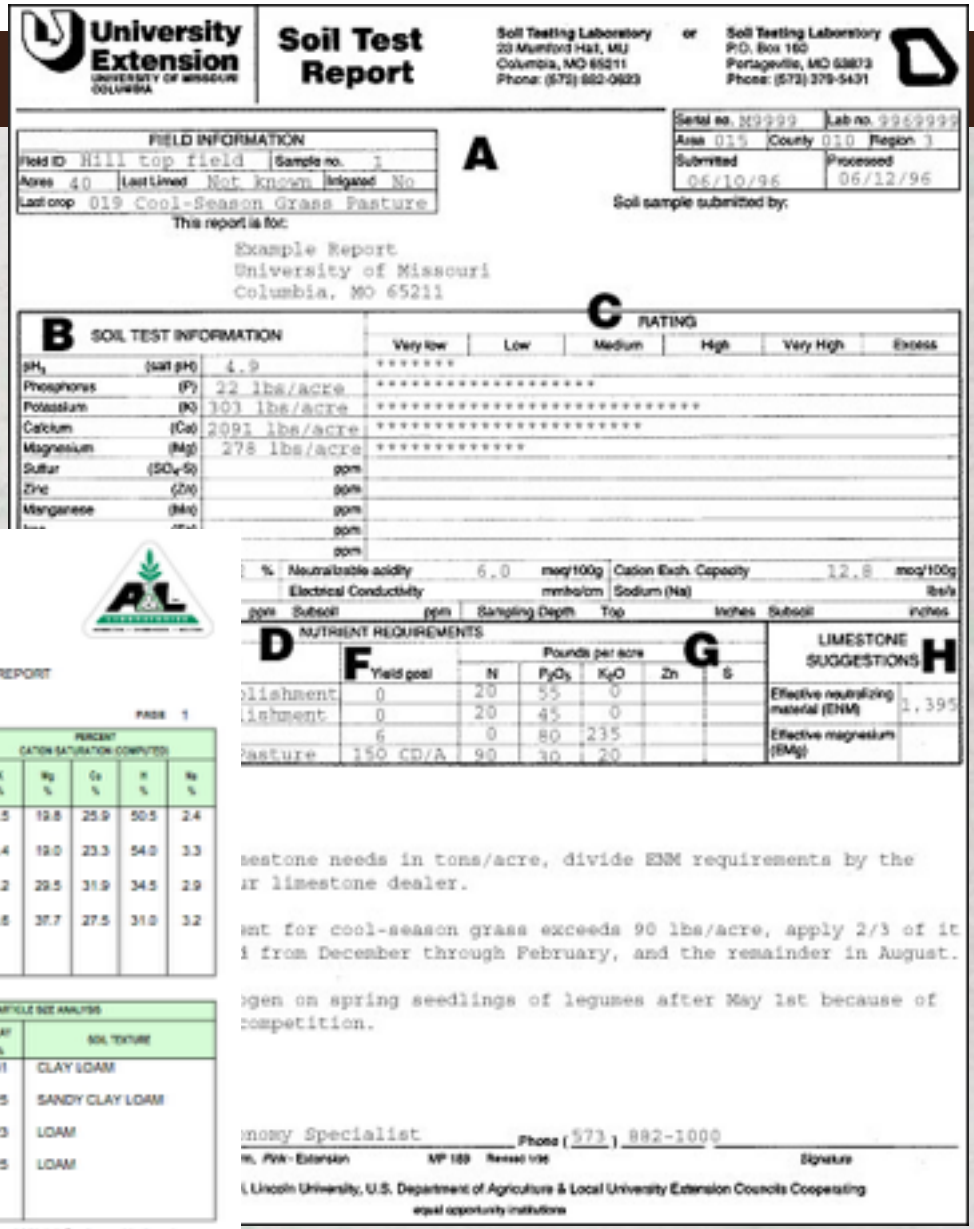


Soil Test Report



University Extension
UNIVERSITY OF MISSOURI COLUMBIA

Soil Test Report

Soil Testing Laboratory
23 Mumford Hall, MU
Columbia, MO 65211
Phone: (573) 882-0623

or

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

D

Serial no. M9999		Lab no. 9969999	
Area 015	County 010	Region 3	
Submitted 06/10/96		Processed 06/12/96	

FIELD INFORMATION — A

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

Soil sample submitted by:

This report is for:

Example Report
University of Missouri
Columbia, MO 65211

B SOIL TEST INFORMATION — **C RATING**

			Very low	Low	Medium	High	Very High	Excess
pH	(salt pH)	4.9	*******					
Phosphorus	(P)	22 lbs/acre		**********				
Potassium	(K)	103 lbs/acre			**********			
Calcium	(Ca)	2091 lbs/acre				**********		
Magnesium	(Mg)	278 lbs/acre			**********			
Sulfur	(SO_4-S)	ppm						
Zinc	(Zn)	ppm						
Manganese	(Mn)	ppm						
		ppm						
		ppm						

% Neutralizable acidity	6.0 meq/100g	Cation Exch. Capacity	12.8 meq/100g	
Electrical Conductivity	mmho/cm	Sodium (Na)	lbs/a	
ppm Subsoil	ppm	Sampling Depth Top	inches	Subsoil inches

D NUTRIENT REQUIREMENTS — **F** — **G** — **H LIMESTONE SUGGESTIONS**

	Yield goal	Pounds per acre N	P_2O_5	K_2O	Zn	S
olishment	0	20	55	0		
lishment	0	20	45	0		
	6	0	80	235		
asture	150 CD/A	90	30	20		

Effective neutralizing material (ENM)	1,395
Effective magnesium (EMg)	

estone needs in tons/acre, divide ENM requirements by the
ir limestone dealer.

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

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

nomy Specialist Phone (573) 882-1000

Ext., /Vet - Extension MP 189 Revised 1/96 Signature

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

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4738

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: 04/30/04

SOIL ANALYSIS REPORT

PAGE 1

SAMPLE ID	LAB NUMBER	Organic Matter %	Organic Matter Rating	Phosphorus P1 (Weak Bray) ppm	Phosphorus NaHCO3-P (Olsen/Modified) ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH Soil pH	pH Buffer Index	Hydrogen H meq/100g	Cation Exchange Capacity C.E.C. meq/100g	PERCENT CATION SATURATION (COMPUTED) K %	Mg %	Ca %	H %	Na %
130-1	55931	4.0H	110	23M	14**	110L	460M	992VL	104L	4.7	6.2	9.7	19.1	1.5	19.8	25.9	50.5	2.4
130-2	55932	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
12-1	55933	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
12-2	55934	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

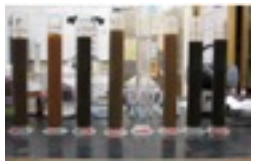
SAMPLE NUMBER	Nitrogen NO3-N ppm	Sulfur SO4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Excess Lime Rating	Soluble Salts mmhos/cm	Chloride Cl ppm		PARTICLE SIZE ANALYSIS SAND %	SILT %	CLAY %	SOIL TEXTURE
130-1	5L	5L	0.3VL	3M	53VH	0.2VL	0.1VL	L	0.3L			44	25	31	CLAY LOAM
130-2	3VL	41VH	0.1VL	1VL	14M	0.2VL	0.1VL	L	0.6L			60	16	25	SANDY CLAY LOAM
12-1	2VL	5L	0.1VL	2L	50VH	0.1VL	0.3VL	L	0.2VL			42	36	23	LOAM
12-2	2VL	4L	0.1VL	1VL	53VH	0.1VL	0.2VL	L	0.1VL			40	35	25	LOAM

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), AND VERY HIGH (VH).
** ENR - TEST NOT TO NITROGEN (N), PART
*** MULTIPLY THE RESULTS (PPM) BY 2 TO CONVERT TO LBS PER ACRE OF THE ELEMENTAL FORM

This report applies only to the samples tested. Samples are retained a maximum of thirty days after testing.

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)

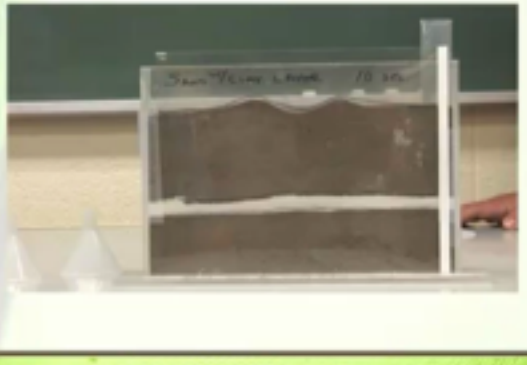
Video 1: Sand

Video 3: Silt Loam

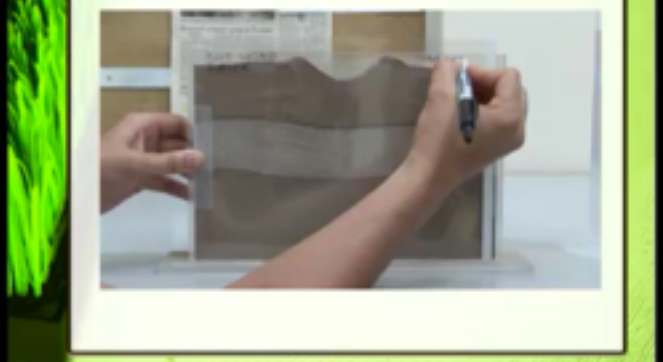
Sand

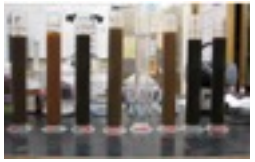
Silt Loam

Video 2: Sand with Clay Layer



Video 4: Silt Loam with Sand Layer





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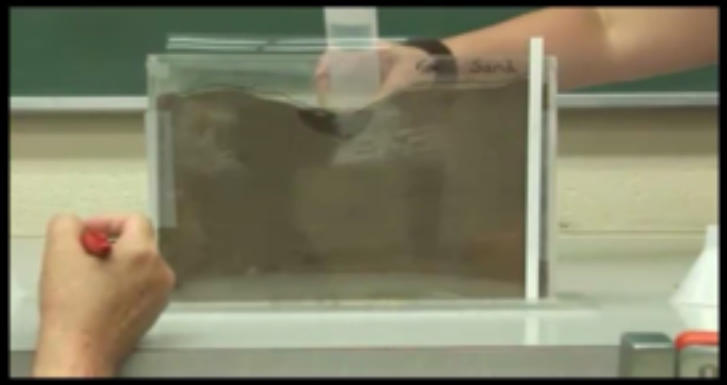
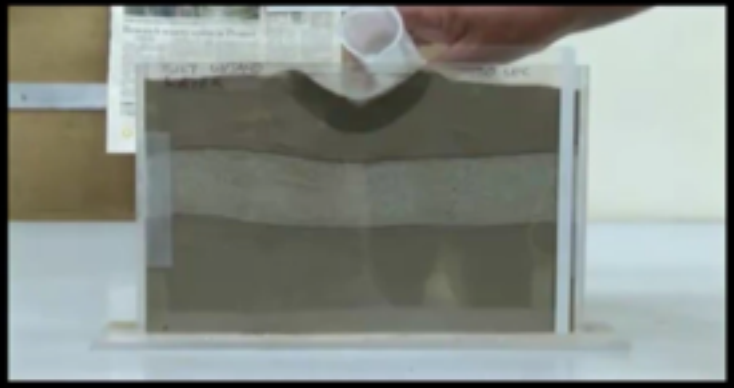
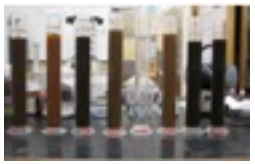



Sand | Silt Loam



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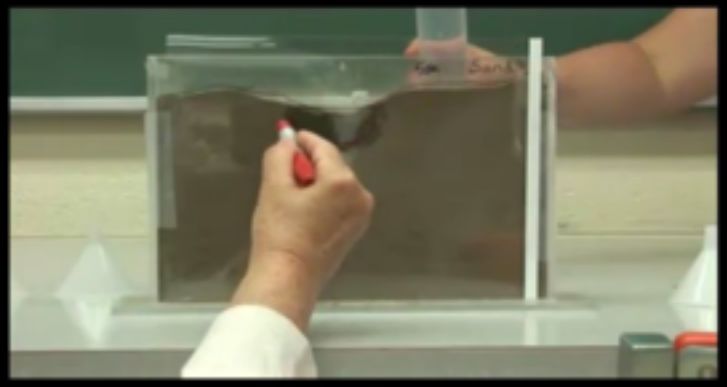
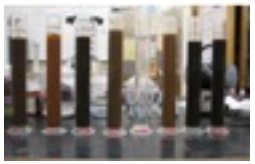



Sand

Silt Loam

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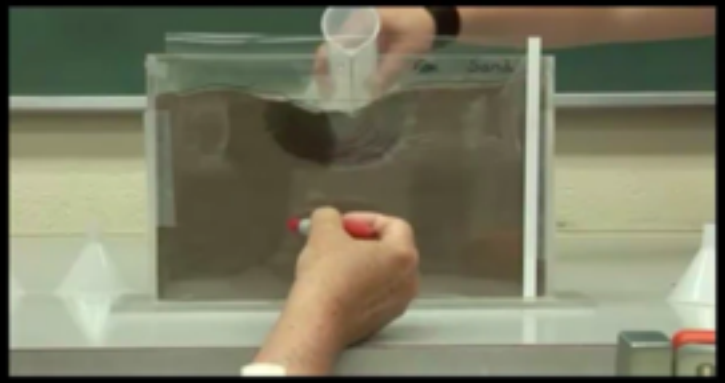
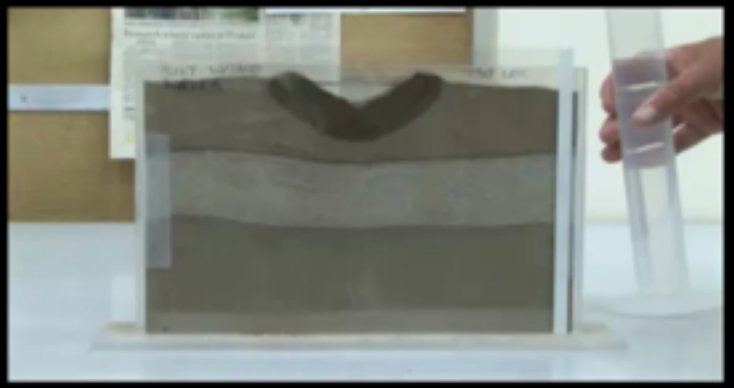
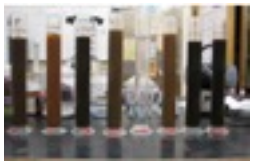



Sand | Silt Loam



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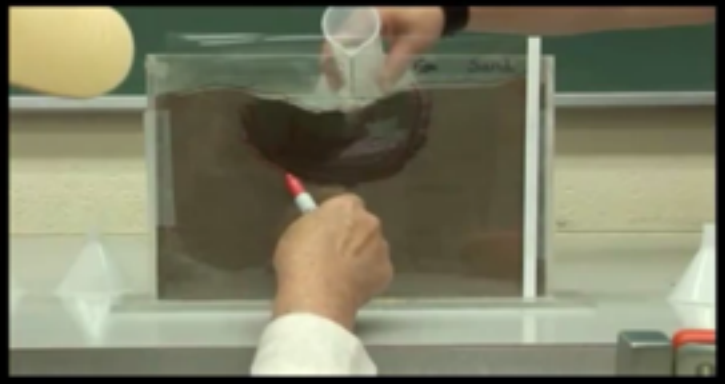
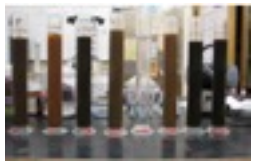



Sand

Silt Loam

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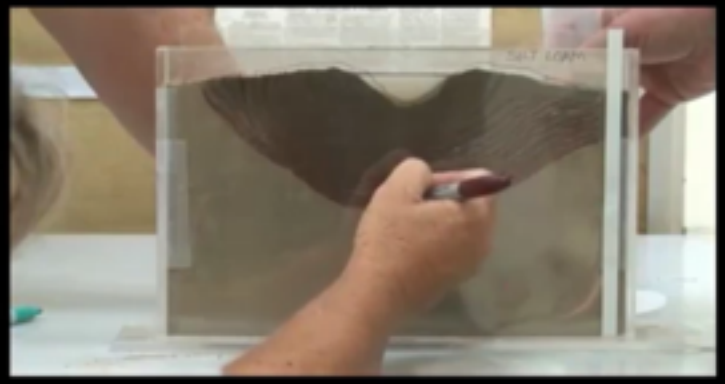
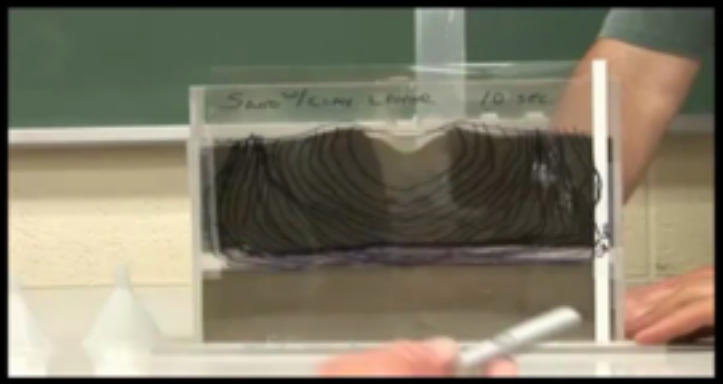
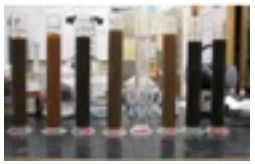


Sand | Silt Loam



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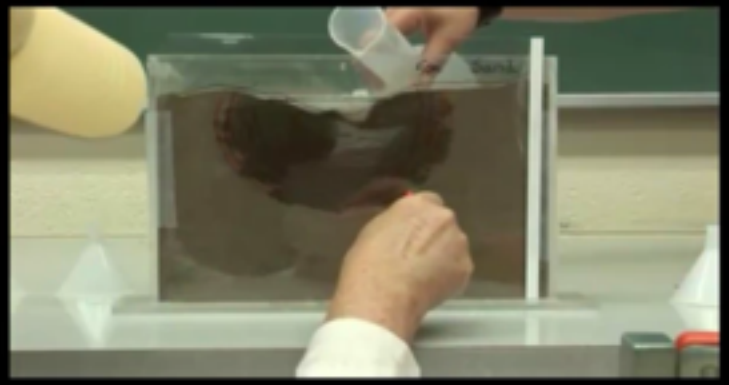
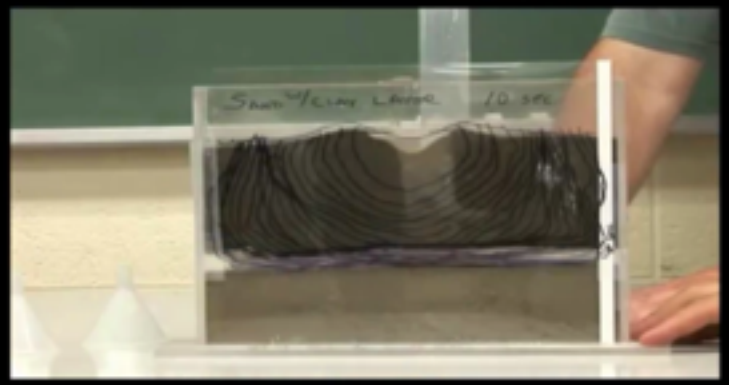
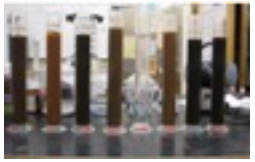



Sand | Silt Loam



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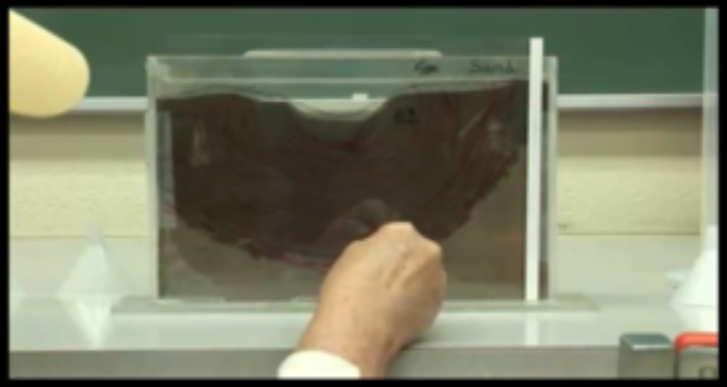


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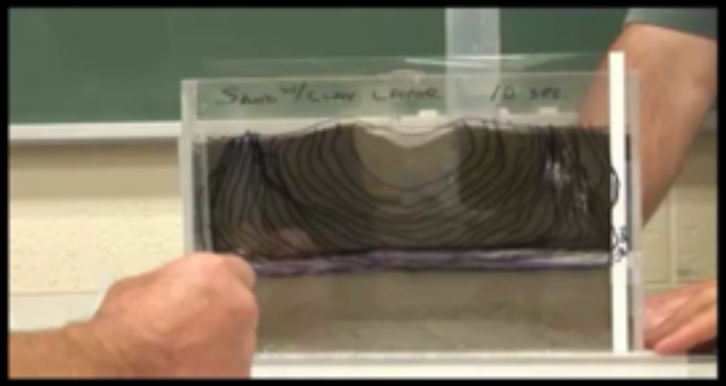
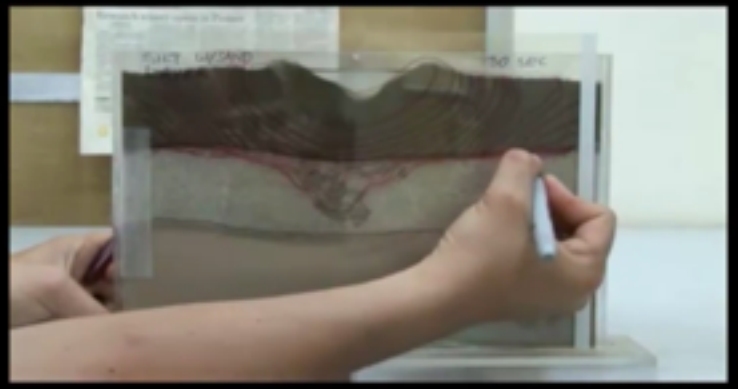

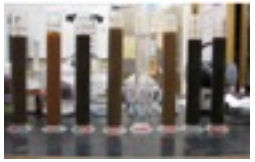

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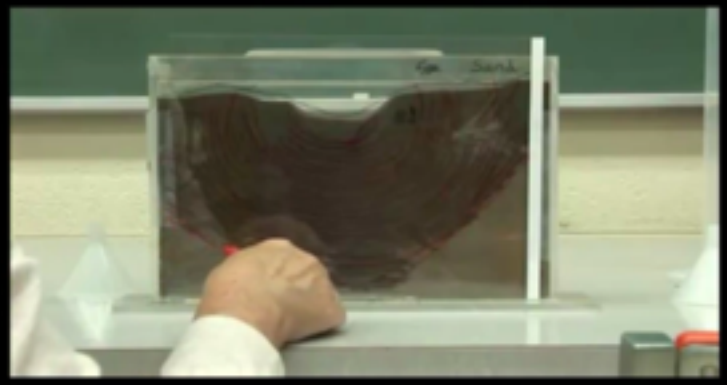


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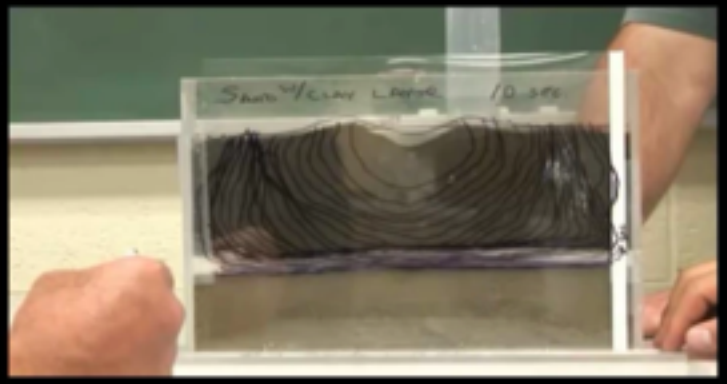
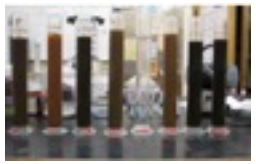


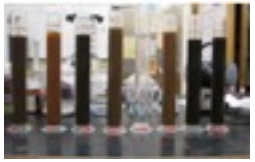

Soil Moisture and Water Management

- 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?