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LA12 Fall 2022:
Environmental Science for Sustainable Development

Lab Week 8: Urban Gardens and Soils

Land Acknowledgement

We acknowledge that UC Berkeley sits on the territory of xučyun (Huichin), the ancestral and unceded land of the Chochenyo speaking Ohlone people, the successors of the sovereign Verona Band of Alameda County.

We recognize that every member of the Berkeley community has, and continues to benefit from, the use and occupation of this land, since the institution's founding in 1868. Consistent with our values of community, inclusion, and diversity, we have a responsibility to acknowledge and make visible the university's relationship to Native peoples. As members of the Berkeley community, it is vitally important that we not only recognize the history of the land on which we stand but also, we recognize that the Muwekma Ohlone people are alive and flourishing members of the Berkeley and broader Bay Area communities today. (Excerpt from GSPDP 320, Syllabus, Soracco 2021 and Ohlone Land website)

Learning Objectives

- Discuss concepts from *Braiding Sweetgrass* and *Symphony of Soil*
- Learn about UC Berkeley's Student Farms and Organic Gardening Association, its urban location and layout, purpose and resources.
- Consider how and why the student organic garden applies agroecological principles of biodiversity, mutualism and self-regeneration.
- Understand how soil characteristics influence infiltration, water retention, and plant growth. Compare soil texture and infiltration from two contrasting soil samples, Compare soil organic matter and available nitrogen between a garden bed and an urban soil from the Oxford tract.
- Explore a national soil survey database.

Part A. Braiding Sweetgrass and Symphony of the Soil discussion.

Discuss the questions on the following page from "the Three Sisters" in *Braiding Sweetgrass* and the film *Symphony of the Soil*. Discuss 2-3 of the following questions relating to each work (and anything else you found interesting). Write down your notes from the discussion and submit your answers in your assignment report. Provide written answers for 3 questions relating to each work (6 questions total) **(6 pts)**.

Braiding Sweetgrass **Discussion Questions (Answer 3 questions, 3pts)**

1. What are the "three sisters" and what role do each of them play in the farming method Kimmerer describes.

   The "three sisters" are corn, squash, and beans. These three plants grow close together and enhance each other's growth. Corn is the vertical growth, and it creates the frame that the squad and beans fill. The squad is the horizontal growth, it fills out the rest space, and the beans interweave through all of this and create a perfect symphony.

2. Which plants fix nitrogen, and how do they do it?

   Beans, or legumes, fix nitrogen for the benefit of corn and squash. The nitrogen in the atmosphere is not usable because the oxygen makes the molecule very stable. The beans actually interact with a bacteria that creates an environment without oxygen so nitrogen can react properly and plants can use it for growth.

3. What is a polyculture? How does the indigenous "three sisters" farming system differ from modern industrial corn production? What is the polyculture approach to agricultural pests?

4. Kimmerer is an accomplished scientist and professor of botany yet in her writing she draws on folklore and describes plants as having intention and agency in a way that is often discouraged in scientific settings. Why do you think she chose to do this? How do you think it helps her communicate her message?

5. What does Kimmerer mean by the following quote? What could it look like to approach Indigenous knowledge as part of a "polyculture" complementary to science?

   "I envision a time when the intellectual monoculture of science will be replaced with a polyculture of complementary knowledges. And so all may be fed."

   Our current system of knowledge production is very much a monoculture, with a small group of thinkers and scientists at the very top deeming what is valuable to be studied. This method is equivalent to how a monoculture of agriculture exploits the natural resources of the land in an unsustainable manner. Through a polyculture of complementary knowledges, we would be able to have a broader sense of what's important and work together with our environment rather than exploit it and drain it.

Symphony of the Soil **discussion questions (Answer 3 questions, 3pts)**

1. How does mineral soil transform into organic soil?

2. How do bacteria and fungi provide essential nutrients to plants? (name one nutrient, and describe the mechanism by which the bacteria or fungus supplies the nutrient to the plant)

Although there is lots of nitrogen in our atmosphere plants are not able to directly use it because it is in a stable form. Bacteria and fungi surround plant roots underground to create an interface that performs a reaction on nitrogen that makes it usable for plants. Bacteria, in particular, form modules that create an environment that is absent of oxygen so that reaction can be performed.

3. How are nutrients supplied to plants in modern industrial agriculture (especially post WWII)? What role do fossil fuels play?

4. What is the "green revolution" and how did it transform global agriculture? (describe the green revolution and name a potential positive impact and a negative impact.)

The Green Revolution happened during the 1950-1960s that used new agricultural technology like pesticides, and synthetic nitrogen fertilizer to scale up agriculture to an industrial scale. On one hand, the increase of crop production increased the throughput of food and decreased hunger and poverty. On the other hand, these technologies were not sustainable long-term solutions because the methods drained the soil of nutrients and crippled long term hunger eradication and dependence on money to alleviate hunger.

5. How would you test the claims made by the various sustainable farming advocates and assess the efficacy of the practices promoted in the film? (name one sustainable practice advocated in the film, and briefly describe how you would assess its efficacy compared to conventional agricultural practices)

Through the use of compost and mulch, the soil contained more organic matter and required less water for a healthier final crop. You could test this by growing a control crop with conventional soil and the same crop with organic soil with compost and cover crop. Then, after some time, you could take a slice of each site and create a soil profile and compare the soil health of each method of farming.

Part B. Student Organic Gardening Association: Agroecology in action

The Student Organic Gardening Association (SOGA) grows food in the pursuit of food justice, sustainable organic agriculture, and experiential learning for UC Berkeley students. Located on the Oxford Tract adjacent to UC Berkeley campus, the garden grows on an urban lot and has been managed by undergraduate students since its founding in 1971. The northern half of the garden is the perennial garden with fruit trees, an herb spiral, compost bins, and a small shed. Annual vegetables grow in beds on the southside. See SOGA's full garden inventory for a list of all crops.

Berkeley Student Farms, including SOGA, are open to students. See their websites for hours, volunteer information, and project ideas.

B. Describe practices we observed at the Student organic garden that apply the following principles of agroecology: **biodiversity, mutualism, and self-regeneration** (see definitions below). For each principle, identify at least one practice, explain how the practice applies the principle, mention where these practices relate to the reading and film where appropriate. **(4pts)**

1. Biodiversity / Polyculture

   As you walk through the garden, different plants grow right next to each other. This practice of polyculture, advocated for in *Braiding Sweetgrass*, increasing biodiversity. According to SOGA's garden inventory, there are about 72 different species of plants grown.

2. Mutualism

   Like the system described in *Braiding Sweetgrass*, where the exudates from corn, beans, and squash strengthen the soil and increase the nutrition of the growing environment, the polyculture of SOGA benefits from the effects of mutualism.

3. Self-regeneration

   SOGA reuses extra products and waste produced from

4. What differences do you notice between the styles of farming at SOGA and at the Oxford Tract Research Farm across the fence?

   The biggest difference between these two locations is that SOGA is structured as a polyculture of growth, while Oxford Tract Research Farm is mostly composed of monoculture crop growths. In the same way, SOGA grows at a smaller scale than Oxford, but the soil is less nutrient rich.

Agroecology Definitions:

biodiversity & polyculture: the genetic, taxonomic and functional variety of all life forms on Earth with consideration of the interactions and processes that maintain them. Polyculture refers to growing multiple types of crops in the same field or space.

mutualism: an interspecies interaction that confers benefits (e.g. reproductive, survival, productivity) to all partners.

self-regeneration: a natural process of renewal and restoration of system attributes in ways that promote a system's sustainability without inputs from outside the system.

Part C. Soils at SOGA

Soil plays a vital role in the cycling of nutrients, carbon and water across terrestrial landscapes on Earth. Soil has been called "the biologically excited layer of the Earth's crust".[1] Soils contain mineral particles, organic matter, gasses, water, nutrients and microbiota. Soils form over time as influenced by climate, biota, topography, and parent materials. Because of this, any sample of soil will have a unique layering, texture, structure, chemistry, color, and porosity.[2]

Soil PH is a measure of the acidity or basicity of the soil. Soil PH is affected by the presence of acidic or alkaline minerals and other chemical compounds. PH directly affects the ability of plants to uptake nutrients from the soil and thus is key to the success of agricultural crops (See figure 2). Calcium Carbonate (called "Lime" as in limestone) can be added to raise the PH of acidic soils.

Soil texture refers to the relative proportions of sand, silt and clay in a soil sample (Figure 3). Particles of sand are largest, followed by silt, then clay. A soil's texture has a direct impact on the retention of nutrients and water in the soil. Specifically, clays and organic soils tend to hold nutrients while sandy soils quickly drain water and leach nutrients. Soil texture affects water holding capacity, clay soils hold onto water due to small particle size, while sandy soils drain very quickly. "Loam" refers to soils with a balance of sand, silt and clay. These soils are the best suited to agriculture.

Soil Structure refers to the natural shape of aggregates of soil particles, called peds, in the soil. A large percentage of soil volume is actually pore space filled with air or water. The soil structure provides information about the size and shape of pore spaces in the soil through which water, heat, and air flow, and in which plant roots grow. We won't be examining soil structure today but it is also very important for soil health and crop production.

Infiltration is the movement of water into a soil profile. The **soil infiltration rate** is controlled by the chemical and physical properties of the soil, the saturation of the soil, and impacts on the soil such as compaction or tillage that have altered the soil structure. Infiltration rates, in turn, control runoff rates and soil erosion. Infiltration rates have major impacts on the success of crops in agricultural fields, soils that drain too slowly may starve plant roots of oxygen or leave them vulnerable to disease, soils that drain too quickly may cause water stress. Runoff and erosion in agricultural fields also results in soil loss, and pollution of waterways with fertilizers and agricultural chemicals. Soil infiltration can be encouraged by reducing compaction and amending soils with organic matter to improve soil structure.

Soil Nutrients and Organic Matter Productive organic soils that are the most suitable for agriculture are characterized by the presence of organic matter and soil macronutrients. The three most important nutrients for plant growth are Nitrogen (N), Phosphorus (P), and Potassium (K), Nitrogen in particular is a major determinant of crop growth and yield and supplied to plants through concentrated fertilizers in industrial agriculture. In natural ecosystems nitrogen is supplied biologically, through the decomposition of plant material and nitrogen fixation by legumes and associated microbes. Soil organic matter (SOM) is the material left by the decomposition of plant, animal, fungal, and microbe tissues in the soil. It is essential to the complex ecological networks occurring in soils, and can be used as an index of how "alive" a soil is. SOM has effects on all of the above features of soil and soils with higher SOM are typically more agriculturally productive.

[1] Richter and Markewitz. 1995. How deep is soil? Bioscience.
[2] Schaetzel and Thompson. 2005. Soils: Genesis and Geomorphology, 2nd edition. Cambridge Univ Press.

C.1 Soil pH – Using the TRUOG SOIL REACTION KIT AND LIME CHART, you will take two soil samples: one in the garden bed and one on the walkway. **Detailed instructions are located** in each kit

1. Add 2-3 drops of the liquid Reagent to one of the cavities in your tray.
2. Take a small sample of soil from the garden bed or the walkway. Rub soil between fingers to break up the large pieces, and try to avoid mulch or other organic material.
3. Mix the soil and reagent together and smooth the surface.
4. Immediately cover the soil surface with a light dusting of the powder reagent. Do not dump large amounts of powder onto your sample.
5. Start a timer for two minutes.
6. Compare the color of the powder to the color chart and read the corresponding pH.
7. Record your measurements in table 1.
8. Repeat for both locations.
9. Discuss how the soil pH you tested affects nutrient uptake using the image below

7., 8.
Table 1. pH sampling, record your results **(2 pts)**

Testing Site	**PH**	**Notes**
Site 1	**6.8**	Blue green, Site 1 very slightly acidic or close to neutral
Site 2	**6.5**	Lighter blue green, Site 2 was slightly acidic or very slightly acidic

9.

Both Site 1 and Site 2 have a large concentration of nitrogen, potassium, and sulfur. They both have a small concentration of iron as available nutrients. Site 1 has slightly less phosphorus and magnesium, and Site 1 has a lot less calcium and a lot more boron.

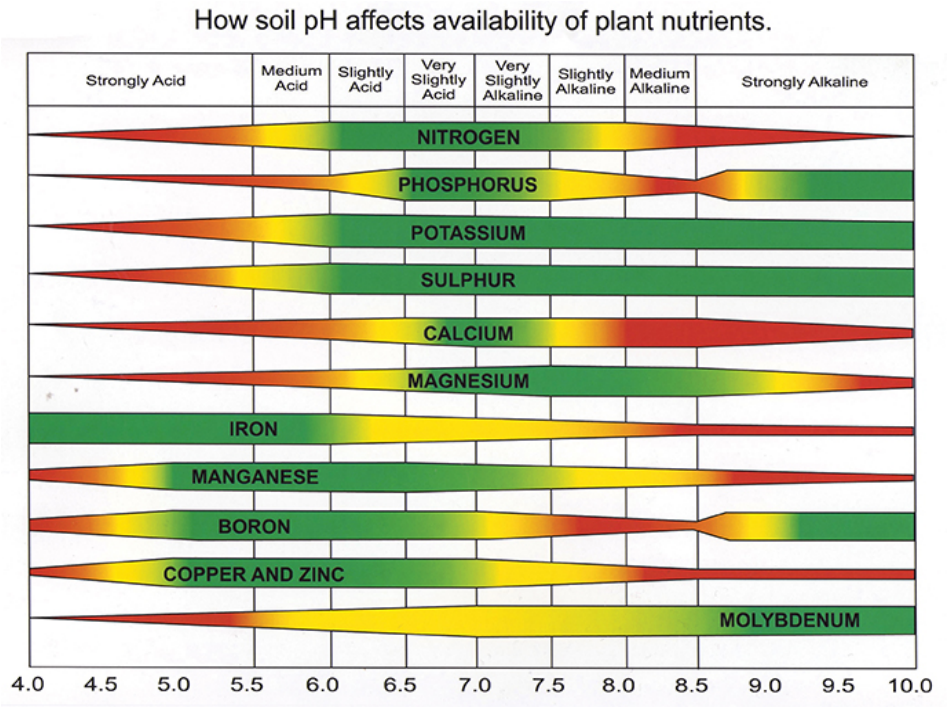


Figure 2. Soil PH relationship with nutrients

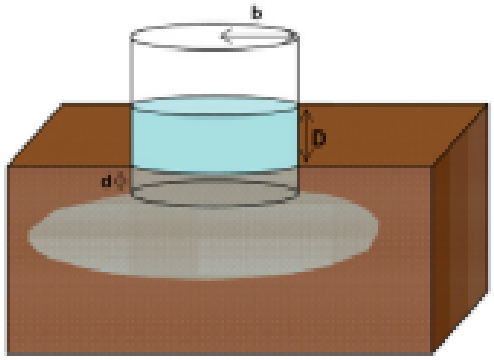
C.2: Soil Infiltration Rate – Ring Infiltrometer Method

A soil's infiltration potential affects surface runoff, soil erosion, and groundwater recharge. Infiltration rate is important when estimates of runoff are necessary. An infiltrometer is the device used to measure the rate of water infiltration into soil. Before beginning your experiment, you may want to practice driving the ring infiltrometer into the soil without disturbing the soil surface. Using the graduated cylinder, pour water into the infiltrometer and note that the water "ponds" within the ring. You will need to select a penetration depth (d) and ponding level (D) to maintain for each experiment.

Data Collection Steps

To measure infiltration rate,

Steps to measure infiltration rate:



b – Radius
d – penetration depth
D – Ponding Depth

1. Penetrate the infiltrometer (a measuring tube or column) into the soil so that water will not leak out the sides. In this experiment, the penetration depth of the cylinder was 3 inches in the garden bed and one inch in the walkway.
2. Use a reference band to mark the initial water column height.
3. Pour water into the infiltrometer up to your initial height mark (in Table 4, this is the "Initial Height of Water Column").
4. After precisely two minutes, measure the final height of the water column.
5. $Rate\ of\ infiltration\ = \frac{(Initial\ Height\ of\ Water\ Column - Final\ Height\ of\ Water\ Column)}{Time\ Elapsed}$

Table 4. Soil infiltration record your results **(2pts)**

SOGA Site	Initial Height of Water Column (in)	Final Height of Water Column (in)	Elapsed Time (min)	Infiltration rate (in/min)	Notes
Site 1	11.5	7.5	2	4.83975 in/min	The water height quickly fell to the height of the second rubber band much before the 2 min. mark. It took 46.49s.
Site 2	4.5	1.5	2	1.51 in/min	The soil was

					much more nutritious and took the entire 2 minutes to penetrate the soil.

C.3: Soil Texture

The USDA classifies soil types according to a soil texture triangle chart (figure 3) according to the percentage of clay, sand, and silt. To use the chart below, find the percentage of each constituent on the sides of the triangle and follow the grid lines to the node where they each intersect. The colored area is the Soil Type.

The Soil Triangle

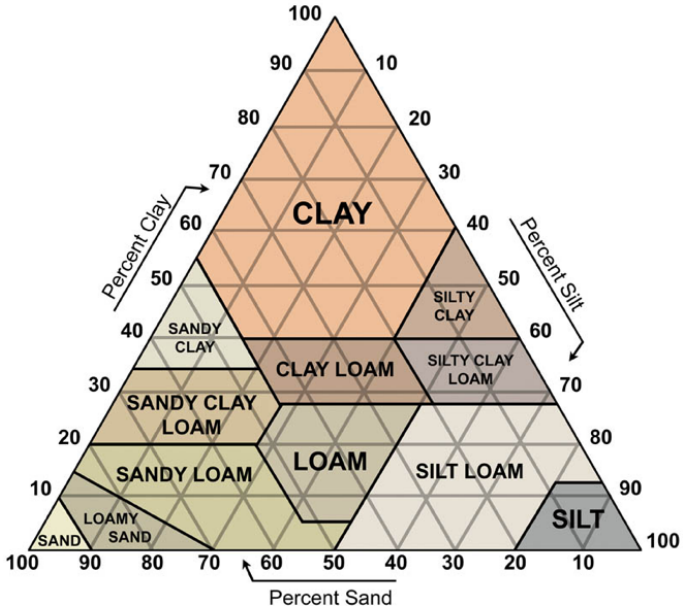


Figure 3. Soil Texture Triangle (USDA)

Feel Flow Chart

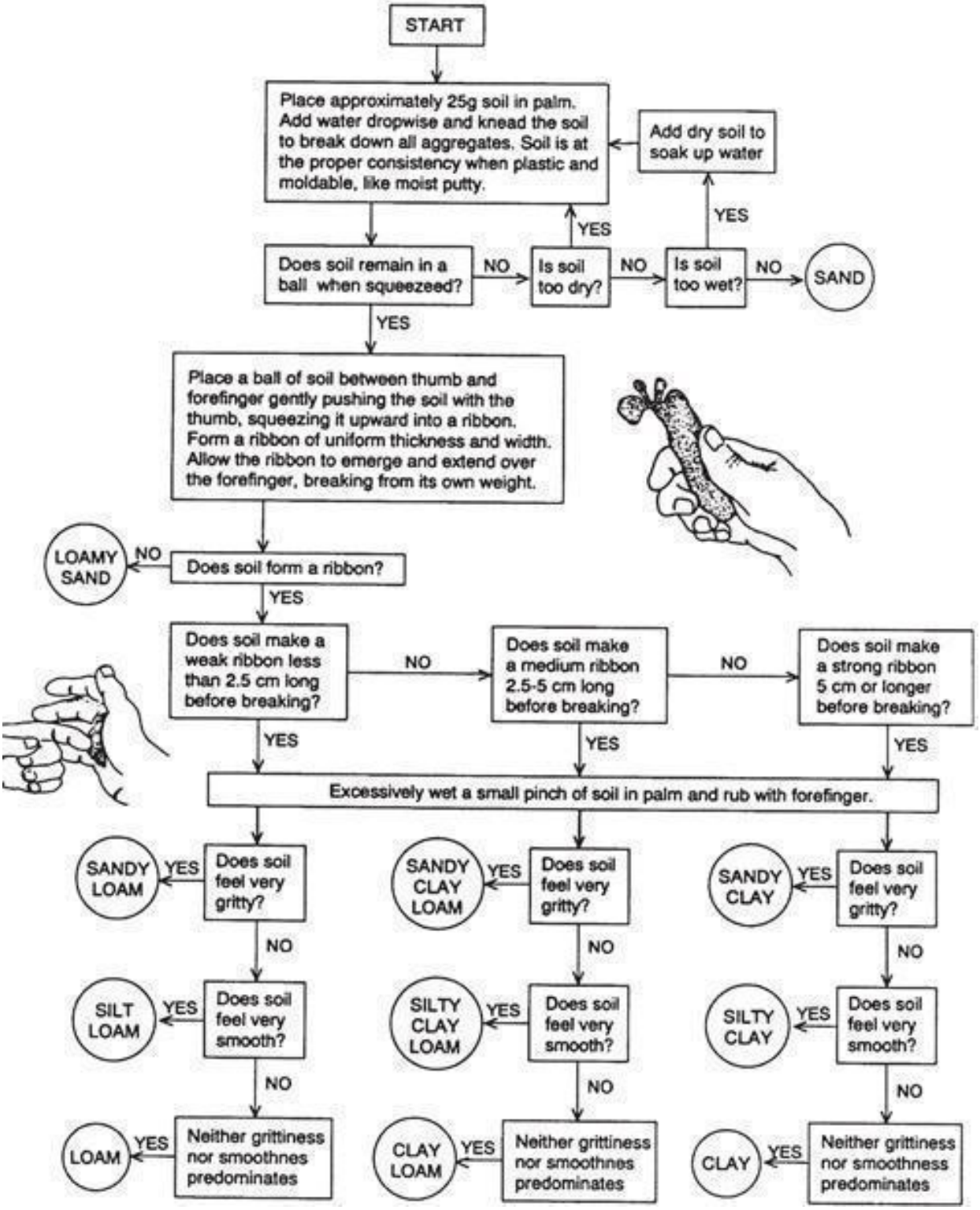
Human hands are sensitive to the difference in size of soil particles. Sand is the largest particle size group, and feels gritty. Silt is the next particle size group, and feels smooth or floury. Clay is the smallest particle size group and feels sticky and is hard to squeeze.

Use the flow chart provided on the next page to determine the soil texture of your sample of soil. Use the USDA soil triangle to estimate the approximate percentage of Clay, Sand, and

Silt particles corresponding to your results from the hand feel test. Record your results and observations in the table below.

1. soil texture experiments record your results **(2 pts)**

	Site 1	**Site 2**
Hand feel method result	Sandy clay loam	Silty clay loam
% Sand, Silt & Clay	70% sand, 10% silt, 30% clay	0% sand, 70% silt, 30% clay
Observations (color, use, compaction etc.)	rich brown color, medium dense	lighter medium brown color, slightly gritty and mostly smooth: sparse areas of abrasive texture


START
Place approximately 25g soil in palm. Add water dropwise and knead the soil to break down all aggregates. Soil is at the proper consistency when plastic and moldable, like moist putty.
Add dry soil to soak up water
YES
YES
Does soil remain in a ball when squeezeed?
NO
Is soil too dry?
NO
Is soil too wet?
NO
SAND
YES
Place a ball of soil between thumb and forefinger gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight.
LOAMY SAND
NO
Does soil form a ribbon?
YES
Does soil make a weak ribbon less than 2.5 cm long before breaking?
NO
Does soil make a medium ribbon 2.5-5 cm long before breaking?
NO
Does soil make a strong ribbon 5 cm or longer before breaking?
YES
YES
YES
Excessively wet a small pinch of soil in palm and rub with forefinger.
SANDY LOAM
YES
Does soil feel very gritty?
NO
SILT LOAM
YES
Does soil feel very smooth?
NO
LOAM
YES
Neither grittiness nor smoothnes predominates
SANDY CLAY LOAM
YES
Does soil feel very gritty?
NO
SILTY CLAY LOAM
YES
Does soil feel very smooth?
NO
CLAY LOAM
YES
Neither grittiness nor smoothnes predominates
SANDY CLAY
YES
Does soil feel very gritty?
NO
SILTY CLAY
YES
Does soil feel very smooth?
NO
CLAY
YES
Neither grittiness nor smoothness predominates

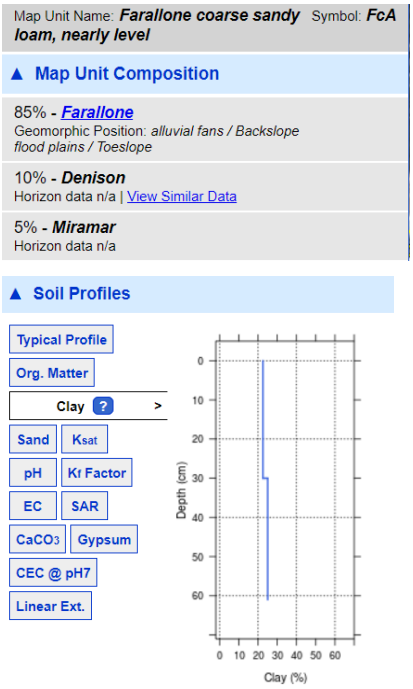
Part D. Comparing site-based measurements, lab soil analysis and online soils data

D.1: SSURGO and SOILWEB

The Natural Resources Conservation Service (NRCS) publishes a soil survey geographic database (SSURGO) for the U.S. via online maps at https://casoilresource.lawr.ucdavis.edu/gmap/.

- Open the map and locate the SOGA garden at Walnut and Virginia St in Berkeley. Note the area of the delineated "150" soils. Double-click for soil info.
- A box on the left will pop up that shows the Map Unit Composition. Click on the primary map unit composition (see the percentages).

  See the example at right. The SOGA data should be based on the *Tierra* soil series under "Map Unit Composition".



- A pop-up window will appear at the left. Open "Soil Profiles" and click on parameters of interest to see how values change vertically along the soil profile for *Tierra* soils.

  The values at the top of the profile, within the upper 30 cm represent the root zone for most vegetables. These represent parameter values at the surface of the soil profile, which is where we tested the soil in the SOGA garden.

- Under profiles click "Org. Matter" look at the chart to the right, the blue line will show the soil organic matter % at various depths in the soil profile, record the "Organic Matter %" value for the depths between 0 and 20 cm. in the table below
- In the top gray area of the pop-up box, click "description". How is this soil described? Note the soil texture of the upper "A" soil horizons.
- Read the descriptions of the top two soil horizons. Note the description of acidity and record the PH value of the uppermost horizon "Ap".
- Return to the main pop-up for *Tierra*. Scroll down to find the "Hydrologic Soil Group" under *Hydraulic and Erosion Rating*.

1. Record the following NRCS SSURGO soils data for the primary map unit at SOGA in the table below. You will use this information to answer questions at the end. **(3 pts)**

Tierra Soil NRCS SSURGO Data	
Map Unit Soil Series name + the 3-sentence Series Description	Fine, smectitic, thermic Mollic Palexeralfs: The Tierra series consists of deep, moderately well drained soils that formed in alluvial materials from sedimentary rocks. Tierra soils are on dissected terraces and low hills and have slopes of 2 to 50 percent. The mean annual precipitation is about 18 inches and the mean annual air temperature is about 58 degrees F.
"Organic Matter %" between 0-20cm (see profiles -> "Org. Matter")	3%
Soil Texture (see "Typical Pedon" or A Horizon listing in the series Description)	Tierra loam, annual grasses, formerly cultivated.
Acidity description and PH value of "Ap" horizon from the series Description	0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine interstitial and common very fine and medium tubular pores; strongly acid (pH 5.5); gradual smooth boundary. (5 to 10 inches thick)
Hydrologic Soil Group (under "Hydraulic and Erosion Rating")	Group D

Table 5. NRCS Hydrologic Soils Group reflects the relative infiltration rate for *saturated* soils.

Soil Group	**Infiltration Rate (in/hr) for saturated soils**	**Infiltration Description**	**Relative Runoff Potential**
A	> 0.30	High infiltration rate even when wetted due to well-draining texture.	*Low*

B	0.15 - 0.30	Moderate infiltration rate even when wetted due to deep, well-drained soils of moderate fine to coarse texture.	*Moderate*
C	0.05 - 0.15	Slow infiltration rate when wetted because fine soil texture impedes downward movement of water.	*High*
D	0 - 0.05	Very slow infiltration rate when wetted due to clay texture, high water table or shallow soils over impervious material.	*Very High*

D.2: Laboratory Soil Analysis

The laboratory soil analysis report in table 6 is typical of the kinds of soil tests used by farmers to assess the health of soils and make decisions around soi fertility and field management practices. The test was performed by A&L Western Agricultural Laboratories in September 2022.

Two soil samples were collected from the Oxford tract, sampling the top 6-9 inches of soil using a shovel. Sample "SW BLOCK" was collected from the raised garden beds at SOGA and represents garden soil from the student farm that has been managed and cared for since 1971. Sample "OXFORD" was collected along the fenceline on the north side of the Oxford tract, along Oxford street and represents what the urban soils in the area would look like without the care of the SOGA volunteers.

Read the soil analysis report and note your observations of the differences between the results for percent organic matter "OM%" , and "Total Nitrogen" in the table below

A & L WESTERN AGRICULTURAL LABORATORIES, INC.
1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Report No: 22-269-093 **Account No:** 91783

Send to: GRAYSON CURTIS
RM 200 WURSTER HALL
BERKELEY, CA 94720

Grower: UC BERKELEY STUDENT ORGANIC GARDEN **Submitted by**: GRAYSON CURTIS

Date Received: 09/26/2022
Date Reported: 10/03/2022

SOIL ANALYSIS REPORT

Analyte:		OM %	Total Nitrogen mg/kg	Organic C %	C:N Ratio	CaCO3 %
Sample ID:	**Lab Number:**					
SW BLOCK	51706	11.29	4580	6.55	14.3	0.26
OXFORD	51707	3.78	1651	2.19	13.3	0.50

Table 6. Soil Analysis, SOGA and Oxford Tract,, A&L Western Agricultural Laboratories September, 2022.

1. Record the results from the Soil analysis report in the table below **(2 pts)**

ANALYTE:	SW BLOCK (SOGA)	OXFORD (Urban soil)
OM% (percent organic matter)	11.29%	3.78%
Total Nitrogen mg/kg	4580	1651

D.3 Questions

Use information you collected from SSURGO for the Tierra soil series, the provided laboratory soil analysis, your results from Part C, and the information provided in the readings and lab handout to answer the questions below:

1. Compare the pH results from part C1 with the soil series description from SSURGO.
    a. How would the different pH levels affect the availability of soil nutrients for crop plants, especially the macronutrients N, P, and K? (Use the chart provided in C1 figure 2) **(1 pt)**

The soil series describes the pH as strongly acidic, around 5.5 pH. At this pH level, nitrogen, phosphorus, and potassium are not largely available. From our field recordings, the pH was closer to pH neutral and was very nutrient dense in N, P, and K. This could just be because there is a large variance in soil pH and the student farms are probably on the nutritious side.

2. Compare the infiltration rates from SSURGO and our on-site soil infiltration tests.

a. What might explain the differences between the two locations we tested at SOGA and the Oxford Tract? **(1 pt)**

Site 1 and 2 have large infiltration rates but Site 1's is much larger. It's important for a sufficient amount of water to infiltrate the soil for effective crop growth. Site 1 is 70% of sand and has a much higher infiltration rate because the water moves quickly through the larger pores of sand.

b. What differences do you notice between our on site infiltration results and the Hydrologic Soil group classification from SSURGO? (See description of the infiltration rates per soil group in Table 5). What might account for these differences? **(1 pt)**

Our reported infiltration rate was much larger than the Hydrologic Soil group rate. The students farms and gardens are typically very hydrated and disperse and maintain water well. Depending on the plant, each could draw more water from the surrounding soil like vegetables and other typically grown plants.

c. Provide one example of how these different infiltration rates could affect runoff, erosion or the growth of agricultural crops. **(1 pt)**

Agricultural crops are still able to drown and die if they take in too much water. If the soil had a very low infiltration rate, it would be very easy for runoff to flood the crops and kill them. This would greatly affect the growth.

3. Compare the soil description from SSURGO, our on site test by soil feel, and the laboratory soil analysis in table 6.

a. What differences were observed between the soil texture by feel test and the description provided by SSURGO? Among the different samples which would you expect to be best suited to growing crops and why? **(1 pt)**

SSURGO reported the soil texture as a loam, and we verified this by finding sandy clay loam and silty clay loam textures at the two sites. I would say the sandy clay loam is better because it has a higher infiltration rate and it able to efficiently get water to the crops.

b. What similarities or differences do you notice between the OM % for SWBLOCK and OXFORD in the laboratory soil analysis and the Organic Matter % value from SSURGO? What practices employed by SOGA might explain the differences? **(1 pt)**

At SWBLOCK and OXFORD the OM% was found to be 11.29% and 3.78% and SSURGO found the value to be 3%. SWBLOCK had way more organic matter and this could be due to polyculture and mutualism practices that enhance the soil.

c. Comparing the two samples from the laboratory soil analysis, which area would you expect crop plants to grow best in and why? **(1 pt)**

a large amount of organic matter percentage and is a sandy clay loam texture. These two factors create a healthy soil environment and can efficiently disperse nutrients over the right amount of time. It resists soil compaction, improves soil aeration, and improves water drainage.

4. Use SSURGO to investigate the soil type in a place you care about, perhaps your home community, or someplace you have visited, or always wanted to go (unfortunately U.S. locations only). Take a screenshot of the website showing the soil series description of the area you looked at. Explore the description and look at an aerial image of the site. Write a short (1-3 sentence) description of what you learned about that soil **(2 pts)**

LOCATION SAUGUS CA

Established Series
Rev. GAW/RCH/LCL/ET
03/2003

SAUGUS SERIES

The Saugus series consists of deep, well drained soils that formed from weakly consolidated sediments. Saugus soils are on dissected terraces and foothills and have slopes of 9 to 50 percent. The mean annual precipitation is about 16 inches and the mean annual air temperature is about 63 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, nonacid, thermic Typic Xerorthents

TYPICAL PEDON: Saugus loam, brush and grass. (Colors are for dry soil unless otherwise stated.)

A1--0 to 15 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine medium and coarse roots; common very fine, few fine tubular and common very fine interstitial pores; about 5 percent grave by volume; neutral (pH 6.8); gradual smooth boundary. (8 to 17 inches thick)

C1--15 to 25 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, common coarse roots; few very fine tubular, common very fine interstitial pores; about 15 percent gravel by volume; slightly acid (pH 6.5); gradual smooth boundary. (10 to 14 inches thick)

I chose my home community's soil in southern california because I wanted to understand the difference between here in northern california and my home in southern california. The soil is part of the Saugus series which is a coare-loam. What stands out is that this soil only has an organic matter % of 0.6% for the 0-20cm of soil which is very low.

Post-Lab Final Submission

Submit answers from A, B, D, and your data from C as one typed PDF, attach a copy of your written field notes