Standard Operating Procedures (2.2): Soil Grain Size and Organic Content

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Prepared for the United States Environmental Protection Agency

The Bay Foundation
8334 Lincoln Blvd. #310, Los Angeles, CA 90045
(888) 301-2527
www.santamonicabay.org

Standard Operating Procedures:
Soil Grain Size and Organic Content

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Prepared by: Loyola Marymount University | The Bay Foundation | California State University, Long Beach | Tijuana River National Estuarine Research Reserve
Protocols reviewed by:
John Dorsey, Loyola Marymount University Coastal Research Institute
Jeff Crooks, Tijuana River National Estuarine Research Reserve
Christine Whitcraft, California State University Long Beach
Ivan Medel, Integral Ecology Research Center
Chris Enyart, The Bay Foundation
Karina Johnston, The Bay Foundation
Rodney Abbott, April Sandifer, Vincent Graves, Courtney McCammon

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Protocol Suitability Evaluation

A habitat suitability table containing appropriate estuarine wetland habitat types (of those evaluated) to implement soil grain size protocols is displayed in Table 1. A comparative assessment of cost, effort, and data quality are shown in Table 2. A matrix of additional detailed categorical evaluations of soil grain size protocols can be found in Appendix 2.2A. The two protocols evaluated for soil particle grain size include a hydrometer and LISST particle analyzer.

Table 1. Appropriate habitat types to implement soil particle survey protocols.

	Habitat Types					
Survey Protocol	**Tidal Channel**	**Mud/sand flat**	**Emergent salt marsh**	**Non-tidal salt marsh**	**Salt pan**	**'Degraded' / fill**
LISST	X	X	X	X	X	X
Hydrometer	X	X	X	X	X	X

Table 2. Categorical assessment of cost/effort and data quality for soil particle grain size survey protocols.

	Evaluation Metric	Soil Particle Grain Size (LISST)	Soil Particle Grain Size (hydrometer)	Notes
Time / Effort	Office Preparation Time	0-10 minutes	0-10 minutes	Print data sheets
	Equipment Construction Time (one time)	10-20 minutes	10-20 minutes	Assemble equipment
	Field Time (per transect)	30-60 minutes	30-60 minutes	Collect soil samples, need larger samples for hydrometer than for LISST
	Laboratory Time (per sample)	> 280 minutes	Day 1 approx. 1 hour; Day 2 approx. 3 hours	Drying field samples (May take up to 10 days depending on soil moisture content); SOP processing time (approximately 280 min.)
	Post-Survey Processing / QAQC Time	> 30 minutes	> 30 minutes	Download LISST data; enter data sheet results (both protocols)
	Minimum Repetition (site-dependent)	Once	Once	----
	Relative Cost (equipment and supplies)	> $15,000	$25	LISST Particle Analyzer, drying oven, furnace, supplies
Survey / Data Quality	Accuracy (at a survey area level)	High	Medium	----
	Precision (at a survey area level)	High	Medium	----
	Qualitative-Quantitative Score	Quantitative	Quantitative	----
	Subjectivity-Objectivity Score	Objective	Objective	----

Eshel et al. (2004) state that there is no method for particle size distribution (PSD) determination of soil materials that can serve as a universal yardstick. All available methods whether classic (e.g., pipette) or newer (e.g., laser diffraction), suffer from some inherent flaws. The choice between methods depends, therefore, on the balance between the pros and the cons of each (Eshel et al. 2004). The advantages with the sieve/hydrometer method include limited cost investment and relative ease of the analysis. The disadvantages of the sieve/hydrometer method include the time involved per analysis, dependency

on lab technique and operator skill for accuracy, and the large amount of sediment needed for the analysis, approximately 10 g (Beuselinck et al. 1998). The sieve/hydrometer method is therefore not suitable for the rapid analysis of many small volume samples. However, given that this method has been the standard in grain size analysis, it can be used as a control against which the accuracy and precision of other methods can be statistically tested. The LISST particle analyzer is not recommended based on its cost and high variations in accuracy among samples.

Resulting Data Types

The application of soil particle size survey protocols will yield qualitative data displayed in percentage of sand and fines (silt and clay), which can also be turned into a mean phi. These data are useful to identify edaphic conditions which may be analyzed in conjunction with additional soil or biotic parameters (e.g., vegetation, inundation) to better inform physical processes influencing the distribution of habitat types.

Objective

Soil grain size and associated organic content of the soil are important parameters when measuring the health of an ecosystem, particularly for restored wetland habitats. Because soil grain size affects most other soil properties such as drainage rate, aerobic capacity, and contaminant transport, regular monitoring is necessary for restoration planning, long-term monitoring, and implementation of Best Management Practices (BMPs) (Alletson et al. 2005; Brown et al. 2013). For recommendations on a quick soil texture analysis, refer to SOP 2.1 (soil salinity and characteristics).

The objective of this Standard Operating Procedure (SOP) is to describe the equipment and protocols for analyzing soil grain size and the percentage of organic matter in the sample. With some modifications, organic content analyses can be modified to assess “blue carbon” stored in soils, which is critical for understanding the role of wetlands in the context of climate change (see Howard et al. 2014).

Field Collection and Lab Equipment

Equipment should be rinsed or washed for multiple soil samples. Equipment and supplies needed for this survey include:

1. LISST-Portable Laser Diffraction Particle Size Analyzer (Figure 1) (if doing in field LISST measurements)
2. Mortar and pestle
3. 1000 mL beakers
4. 500 mL beaker
5. 2 – 100 mL beakers
6. 25 mL beaker
7. 5-liter rectangular basin
8. 5-gallon bucket
9. 62-micron mesh screen (#230)

Figure 1. LISST-Portable Laser Diffraction Par (courtesy Sequoia Scientific).

10. DI water (~300 mL)
11. Soil sample (30 mL)
12. Scoopula, eye dropper, pen or marker, aluminum foil, turkey baster, DI squirt bottle
13. Drying oven
14. Duct or lab tape for labeling

Field Preparation

Equipment described above should be collected prior to the field shift. Batteries for all electronic devices should be checked and replaced as needed, and relevant data sheets should be printed and attached to the clipboards.

Field Methods

For details on transect or site selection, refer to SOP 3.2 (vegetation cover). These protocols are recommended to be conducted in conjunction with biological survey parameters. Field methods are the same for all protocols in this SOP.

Figure 2. Soil collection in the field.

Once the sample locations have been chosen, begin the collection process. Start by clearing the desired patch of soil of any debris or above-ground vegetation, using a gardening trawl, knife, or core. Make a square on the soil surface with each side measuring approximately 15 cm in length (Figure 2). *Helpful hint*: *using the gardening trawl to measure the length of your soil square reduces equipment needed in the field*. Collect all soil within the square to a depth of 1 cm and place soil into a labeled and sealable plastic bag. Any noticeable vegetation (roots, runners, etc.) or subsurface debris should be removed to ease subsequent processing. This should provide approximately 200 mL of soil (SOP 2.1 2015). Transfer soil sample information from bag to data sheet (Appendix 2.2C). Be sure to adhere to the Health and Safety Precautions as outlined by the US EPA.

Laboratory Methods

Steps 1-11 are for sample preparation for both organic matter and grain size (either LISST or hydrometer).

1. Start with a raw soil sample (Figure 3).
2. Place soil sample into 400 or 600 mL glass beaker and place into drying oven to a minimum of 60° Celsius for two or more days until sample is fully dry. With a piece of lab tape, label the

Figure 3. Raw soil sample with organic matter (pre-sorted).

beakers with the FID number and sample process date.

3. Once sample is completely dry, pour soil onto paper towel and pick out large pieces of organic matter / debris using tweezers or sieve through a 2 mm sieve. This debris can be discarded.
4. Measure approximately 60 mL of soil. Homogenize the sample by grinding the soil with a mortar and pestle. Continue until all clumps or large aggregates have been broken down (Figure 4).

Figure 4. Homogenized sediment sample with mortar and pestle.

5. Weigh empty crucible and record weight on data sheet (Appendix 2.2C). Note: if multiple crucibles are being used simultaneously, it helps to provide a unique identifier for each crucible (e.g., "#5" or "large crucible"). Tape cannot be applied to crucible because of intense heat, but pencil notation can be applied directly to the rough bottom of the mortar.
6. Measure 30 mL of homogenized sample and pour into crucible. Place excess sample in a labelled plastic bag if future testing is desired.
7. Weigh crucible with the sample and record weight on data sheet.
8. Subtract the crucible weight from the crucible plus raw bulk soil weight to determine the raw bulk soil weight.
9. With tongs and asbestos glove(s), place the crucible into muffle furnace at 500-550° Celsius for two or more hours to burn off any remaining organic matter (Figure 5). Sediments with more organic materials may need to be burned for up to 24 hours or until the sample is at a constant weight (American Society for Testing and Materials, ASTM, 2974-87).
10. With tongs and asbestos glove(s), carefully remove crucible and place on crucible stand and let cool until safe to touch, approximately 15-20 minutes (Figure 6). Crucibles can also be left overnight to cool and weigh in the morning.

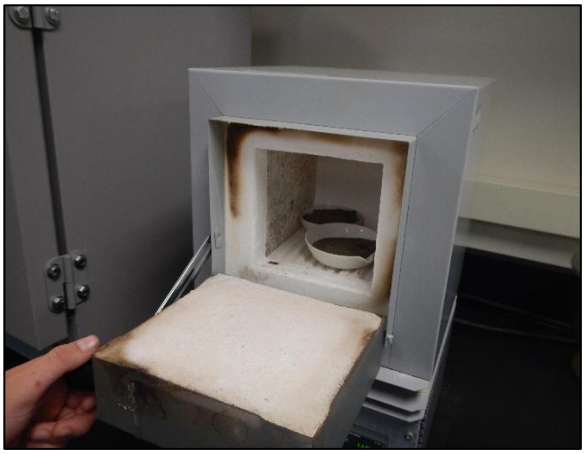

Figure 5. Place crucible carefully in furnace.

Figure 6. Hot crucibles placed on crucible stand.

11. Weigh crucible with ash-soil and record weight on data sheet. Subtract this weight from crucible weight (see Step 5) to determine ash-soil weight.
12. Subtract the ash-soil weight from the raw bulk soil weight and then divide by the raw bulk soil weight to calculate the percent organic matter and enter on data sheet (for equation, see Data Analysis section below). This will conclude the organic matter portion of the analysis.

SOP – LISST Portable Diffraction Particle Size Analyzer

This SOP is based specifically on methods related to the LISST-Portable Diffraction Particle Size Analyzer, which is not recommended as the preferred grain size analysis. See Appendix 2.2B for a summary procedural flow chart. Steps 1 – 12 could be preparation for any grain size analyzer.

1. Label an empty beaker (400 mL is preferred) using a piece of tape with FID number and processing date. Weigh the empty beaker and record the weight on data sheet.
2. Transfer the soil from the crucible into the empty beaker using a wash bottle to wet the sample to minimize suspension into the air (because of their small mass, fines (silt and clay) are easily suspended into the air).
3. Fill beaker (minimum 150 mL) with water. Pour water from 1000 mL beaker into 400 mL sample beaker until approximately ½ to ⅔ full. Homogenize sample by stirring with metal scoopula to re-suspend settled soils. Let sit for 1-2 minutes.
4. Wet 62 micron mesh sieve with water.
5. Pour soil from beaker slowly through the 63 micron sieve into a large clean plastic tub. This allows suspended fine particles to be transferred from the beaker and through the sieve, but heavier sand particles remain in the bottom of the beaker and on the sieve screen. Tilt the sieve to keep contents in one side. Pour only until all water has passed through the sieve, leaving any sand that had settled in the bottom of the beaker. Use wash bottle to clean sieve and push all sand into one concentrated area. Do not use fingers to push soil through the sieve as this may cause sand particles to clog the screen or pass through the sieve. Soils remaining in beaker and on the sieve constitutes the sand sample (sand-size by definition is 62 microns and greater).
6. Use wash bottle to rinse off sides of beaker, add more water until beaker is about ½ to ⅔ full again, stir, and repeat process from Step 17. Continue to repeat the entire process until water is generally clear on top and sand is settled in the bottom of beaker. As the process is repeated multiple times, gradually allow more time for the sand to settle at the bottom of the beaker before pouring through the sieve (up to about 4-8 minutes). The number of required rinses (typically 6 – 10) increases for samples with higher proportions of fines.
7. Once water on top of beaker appears generally clear, pour through screen again and then use wash bottle to transfer sand that had collected on the sieve back into the beaker. At

this point, the clarity of the water does should be closer to a clear/grey color rather than brown, indicating most of the fines have passed through the sieve into the tub.

8. Once fines have been removed from the beaker sample, transfer any remaining sand left on the sieve back into the beaker using the wash bottle and scoopula. Be sure to remove all particles from the sieve (Figure 7). Squirt water around the sides of the beaker using the wash bottle to remove any sand from the sides and collect sample in the bottom of beaker.

Figure 7. Rinsing sediment from sieve.

9. Record time and date on the beaker's label and place into drying oven at 80° Celsius for two or more days. After sample is dry, weigh the beaker and record the weight as the beaker + sand weight. Subtract the beaker weight from this number to determine the sand weight. Divide the sand weight by the raw bulk soil weight to determine the sand percentage (for equation, see Data Analysis section below).
10. The soils remaining in the plastic tub are composed of fine-grained particles (silt and clay). Pour the contents of the entire tub into the 2-gallon plastic bucket (large enough to accommodate sample). Use wash bottle and scoopula to ensure all soil is transferred and none is left on bottom of tub.
11. Place round magnetic stirring bar (cross PTFE-coded magnetic stirring bar is recommended) into bottom of tall bucket and place entire bucket onto stirrer/hotplate. Turn on the hot plate stirrer to about the 7-9 level setting to stir the sample (only turn on stir setting, no heat). Allow sample to continue stirring for about 2-3 minutes.
12. With the stirrer still on, mix the sample with turkey baster by swirling in a circle a few times and repeatedly suctioning and then expelling the liquid. When sample is well mixed, use turkey baster to transfer a portion of the sample into a 100 mL beaker.

Steps 13-24 are specific to the LISST Particle Size Analyzer:

13. Set the 100 mL beaker aside. Plug in and turn on the LISST Laser Diffraction Particle Size Analyzer and attach yellow drainage hose. Make sure that the end of yellow hose is placed in a large bucket on the floor to allow water to drain. Remove the plain circular insert in the mixing chamber lid and replace with ultrasonic probe insert.
14. From the main menu on the LISST, tap the "Measure" button.
15. Remove the mixing chamber lid and make sure the drain lever is in the 'closed' position. Fill the chamber until water just spills over internal ring. Replace the lid back on tightly.
16. Set mixer speed to 50 to 75% using the on-screen slider and press "Sonics On" button. Let the water circulate for approximately 5 seconds. Press the "Sonics Off" button and set the mixer speed to 0%. Open the drain lever and make sure water drains completely. Repeat steps 28-29 two more times for a total of three rinses.

17. Before the LISST Particle Size Analyzer is used for sample analysis, fill the chamber with deionized water and press the "Next" button in the bottom right corner of the screen (do not run the mixer or sonics). Press the "Update" button on the next screen and make sure that the LISST Particle Size Analyzer reads "PASS." Note: the use of deionized water is only necessary during the calibration process, and regular water can be used for subsequent rinses. Press "Next" a total of 2 times to reach the "Step 3b: Prepare Sample" screen, skipping the "Step 3a: Add Sample" screen.
18. In the menu screen comment box, add FID number and necessary comments. This information will display in the data report.
19. Use an eyedropper to mix up the sample in the 100 mL beaker thoroughly until sample is uniform and all soils are suspended off the bottom. Place several drops of the sample into the chamber, thoroughly agitating the sample before each drop is taken. Continue adding sample until the concentration range percentage shows the sample is within the green section (75-95% transparency). Turn on the mixer and ultrasonic sliders to about 50% and make sure that the sample still reads from 75-95% transparent. If the sample is too concentrated, dilute until levels fall between 75-95%.
20. Press the "Next" button. The LISST Particle Size Analyzer will now analyze the sample for approximately 20 seconds and provide a read out of the results.
21. Press the "Return" button to start the process again two more times (steps 30-32). Between each sample analysis, rinse chamber three times with regular water. From the "Step 1: Rinse Chamber" screen, press "Next" a total of three times to reach the "Step 3b: Prepare Sample" screen, skipping the "Step 2: Get Background" and "Step 3a: Add Sample" screens.
22. Store the LISST Particle Size Analyzer with the drain open to allow ventilation of the chamber.
23. When rinsing all materials used throughout the process, use a wet paper towel to ensure all small particles are removed.
24. Download data to computer using LISST software or to an excel file.

SOP – Hydrometer method (grain size)

This method quantitatively determines the proportions of three sizes of soil particles as determined by their settling rates in an aqueous solution using a hydrometer. Proportions are represented by stated class sizes: sand ranging from 2000 – 63µm; silt ranging from 50 – 2.0 µm and clay < 2.0 µm, and those stated by the USDA Soil Survey and Canadian Soil Survey Committee.
Up to 20 samples can be done at once.

Estimated time: allow prep time for grinding and sieving samples; Day 1 - approximately 1 hour; Day 2 - approximately 3 hours.

Laboratory Supplies

Note: Hydrometers are used to determine the specific gravity of soil in the range of 0.995 to 1.038 or -5 to 60g/L (using a weight by volume scale)

Laboratory supplies needed:

- 2 mm sieve
- 600 ml beakers (one for each sample)
- Sodium metaphosphate (5g per sample + 5g extra)
- 1 L graduated cylinder
- 1 L cylinders (1 per sample + 1 extra)
- Stir bar, timer
- DI water, squirt bottle
- Shaker table
- Thermometer
- Hydrometer (Figure 8)
- Parafilm

Figure 8. Fisherbrand™ Soil Analysis ASTM Hydrometers.

Prior to Day 1:

1. Follow steps as outlined earlier to dry and homogenize the soils.

Day 1:

1. Sieve dried, ground soil sample through 2 mm sieve.
2. Put 30-50 g (50 g preferable) of the sample into numbered beaker. Record beaker number next to sample number on data sheet. Be consistent with sample weights (i.e., 50 g for all).
3. Prepare sodium metaphosphate solution. Each sample gets 5g of dissolved sodium metaphosphate solution. To make solution for 10 samples; Slowly add 50 g of sodium metaphosphate to 1 L DI water while stirring vigorously until it has dissolved completely. This is best done on a stir plate. Decant 100 ml of this solution to each beaker.
4. Add DI water to bring the volume in each beaker to approximately 300 ml and use a spatula to briefly stir each beaker ensuring that the solution comes into contact with all of the sample.
5. Place the beaker on the shaker table for approx. 24 hours at 125 rotations/minute. Samples should be stirred until all clumps are broken up (less time with sandy samples).

Day 2:

1. After stirring, transfer contents of beaker to a 1 L cylinder with same number as beaker, using DI water to wash the remaining soil and residue into the cylinder. Add DI water to bring the volume of the cylinder to the 1 L mark.
2. Make a blank by adding 5 g of sodium metaphosphate to 1 L of DI water. Mix thoroughly on a stir plate.
3. Samples must be between 15.6 and 24.4 C.
4. Seal the top of the cylinder with parafilm and invert the cylinder several times until all the soil is suspended.
5. Immediately after completing mixing, start time and lower the hydrometer gently into the cylinder. Take the hydrometer reading and temperature after 40 seconds (Figure 9).

6. Rinse the hydrometer with DI water and continue to next sample. Do not forget to record the temperature and hydrometer reading for the blank also.
7. Record the temperature and hydrometer reading again two hours after the start time. (Do NOT shake the samples again!). Record the temperature and hydrometer reading for the blank also.

Figure 9. Hydrometer floating in a 1000 ml cylinder (left), diagram of how to read hydrometer (top right) from Amazon.com), and 1000 ml cylinders with sediment and sodium hydroxide (bottom right).

If you miss the 2-hour start time for the second reading or disturb the samples between the two readings, then you must start again from Step 4.

To wash cylinders:

1. Decant liquid into sink and dump remaining sediment and liquid into a bucket.
2. Wash all cylinders with soapy water and rinse into distilled water.
3. Empty bucket into dumpster on a regular basis.

Data sheets

GRAIN SIZE ANALYSIS														Temp Adjusted		% silt + clay	% sand	% clay	% silt
								subtract blank						Hydro Readings		corr. read *vol(L)/gms	100-(%silt ar	read *vol(L)/ilt+clay)-%	
Marsh	trans	elev	rep	beaker#	soil wt	40s	2hr	40s	2hr		T initial	T final		40s	2hours	at 40 sec.		at 2 hrs.	
					50	23	22	19		18	22.4			19.86328	10.806	39.7	60.3	21.6	18.1

Figure 10. Example of data entry sheet for grain size analysis via hydrometer method. Headings explained below.

Formulas

Soil wt = dry soil weight (g or mg)
40s = 40 second reading of hydrometer
2 hr = 2 hour reading of the hydrometer
Subtract blank (blank-corrected readings) – These two readings are the corrected readings with the hydrometer reading from the blank subtracted from the 40s and 2 hour readings, respectively.
T initial, T final = temperature reading of the suspended sediment mixture at 40s and 2 hours, respectively
Temp-adjusted hydro readings (40s) = ((temp initial – 20)*0.3597) + blank-corrected reading
Temp-adjusted hydro readings (20hr) = ((temp 2 hr – 20)*0.3597) + blank-corrected reading
% silt and clay = (corrected reading 40s / soil weight)*100
% sand = 100 – (%silt and clay)
% clay = (corrected reading 2hr / soil weight)*100
% silt = (%silt and clay) = (% clay)

Data Entry and QAQC Procedures

Data output from the LISST is downloaded to proprietary software and/or as an excel spreadsheet. Quality Assurance and Quality Control (QAQC) procedures should be conducted on all data. QAQC procedures should be conducted by the QA Officer and include a thorough review of all entries, including the following:

1. Data should be removed for any operations that did not meet calibration standards.
2. Data should be removed if the processing was not conducted in specific accordance with manufacturer operating instructions.

Data Analyses

After the data have been entered, corrections made, and QAQC procedures completed, they can be used in multiple analyses. The LISST categorizes soil grain size in "bins" or size-classes from 0 to 500 µm. Clay is registered in bins 1-15 (~0.37 to 3.78 µm), silt in bins 16-32 (~4.46 to 63 µm), and residual sand in bins 33-44 (~74.5 to 500 µm). Sand percentage is determined through Steps 17 through 21 in Laboratory Methods above. LISST data output will automate bins summation, but equations are listed below to calculate percentages of organic matter, sand, fines, clay, and silt.

To determine organic matter (Step 12):

$$\%\ Organic\ Matter = \frac{Ash - soil_{weight}}{Raw - bulk\ soil_{weight}}$$

Note: raw-bulk soil includes sand and fines.

To determine sand percentage (Step 21):

$$\% \, Sand = \frac{Sand_{weight}}{Total \; Sample_{weight}}$$

To determine fines (silt + clay) percentage (Step 32):

$$\% \, Fines = 1.0 - \% \, Sand$$

To determine clay and silt percentage (Step 32):

$$\% \, Clay = \frac{\%Clay_{(\sum bins \; 1-15)}}{\%Total_{(silt+clay)}}$$

$$\% \, Silt = \frac{\%Silt_{(\sum bins \; 16-32)}}{\%Total_{(silt+clay)}}$$

Use the USGS soil texture classification chart (Figure 11) to identify the soil texture of the sample by identifying the intersection of all three grain size percentages. For example, a sample consisting of 45% clay, 45% silt, and 10% sand would be classified as 'silty clay'. These broad categorizations are the same as the soil texture analyses from SOP 2.1.

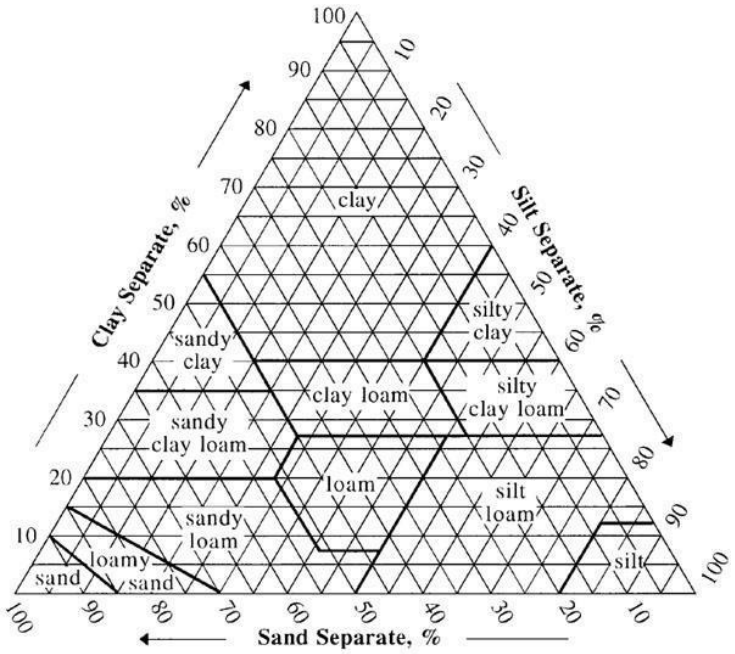

Figure 11. USGS Soil Texture Chart.

Health and Safety Precautions

The furnace used to dry soil samples must be set at high temperatures and can result in extreme burns. Asbestos gloves and tongs should always be used when placing into or removing from the furnace. Following removal from the furnace, crucibles will remain extremely hot for approximately 15 – 20 minutes and caution should be exercised whenever working in the immediate vicinity.

References and Applicable Literature

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(ASTM) American Society for Testing and Materials. A5TM D 2974-87 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils 1916 Race St., Philadelphia, PA 19103. Reprinted from the Annual Book of ASTM Standards, Copyright ASTM.

Contact Information

Christine Whitcraft, CSULB
Christine.Whitcraft@csulb.edu

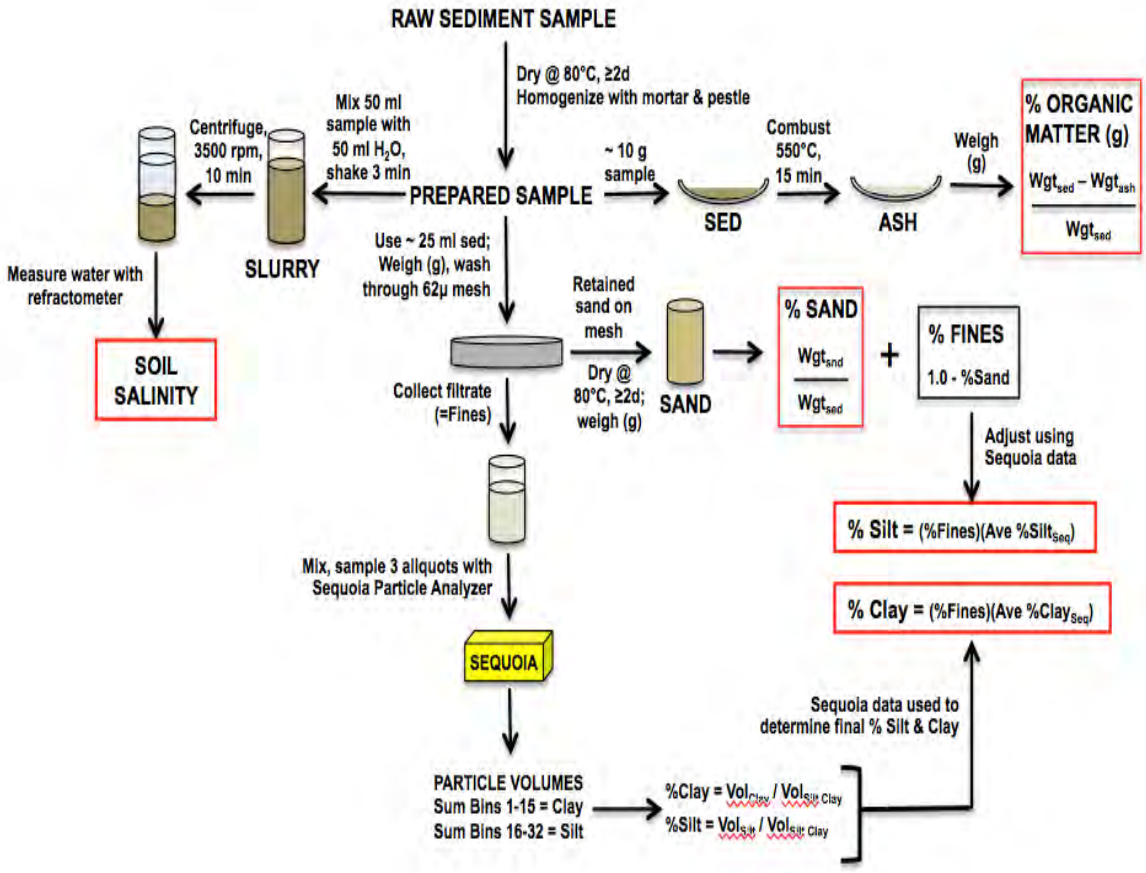
Appendix 2.2A

	Evaluation Metric	Soil Particle Grain Size	Notes
	Correlation to L2 CRAM	Not Applicable	----
Personnel Requirements	Specialty Equipment or Clothing Required	Few Specialty Items	LISST, drying oven, furnace, beakers, hotplate/stirrer
	Ease of Transport (amount or weight of supplies)	Some Items / Moderate	All items will be used in laboratory setting
	Ease of Implementation	Difficult	Time intensive; requires significant attention to detail
	Expertise / Skill Level	Some Technical Knowledge	Familiarity with LISST; adept with complex, multiple step process
	Number of Personnel	> 2	Teams of two personnel per sample
	Training Requirements	Required	Familiarity with LISST; complex, multiple step process
	Seasonality of Survey Time	Year round	
	Suggested Frequency	Annual	---
Survey / Data Quality	Type of Output	Numerical	Percentage of sand, silt, and clay
	Active or Passive Monitoring Style	Active	---
	Specialty Computer Software Required	Yes	Excel download of LISST data
	Availability of Online / External Resources	Yes	LISST manual online and with product
Potential Limitations	Wetland Type Applicability	All	---
	Images or Multi-Media Required	None required	---
	Degree of Impact / Disturbance	Low Disturbance	---
	Vegetation Height Limitation	No Limitations	---
	Appropriate for Tidal / Wet Habitats	Yes	---
	Tide Height	N/A	---
	Regional or Broad Implementation **	Infrequently Used	---
	Potential for Hazards / Risk	Low to No Risk	---
	Restrictions	Special Status Species; Cultural	Soil disturbance

** based on monitoring literature review*

Appendix 2.2B

Procedural Flow Chart



Appendix 2.2C

Grain Size Data Sheet

Date Tested: _____

Tested By: _____

Sample #: _____

Site Location: _____

Visual Classification of Soil: _____

Weight of Beaker: _____ g
Weight Beaker + Dry Soil: _____ g
Weight of Dry Sample: _____ g

Particle Size Distribution:

Sand _____ %
Silt _____ %
Clay _____ %

Soil Texture Class:

_____