

Sediment Pin Standard Operating Procedures

USGS Western Ecological Research Station SFBE

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Purpose/Objective:

We use sediment pins to track sediment changes at discreet locations over time. Sediment accumulation is monitored through time by measuring the distance from the top of the sediment pin to the surface of the sediment below. We typically take measurements semiannually. This method can be used along with bathymetry and terrestrial LiDAR, which provide a larger spatial coverage of elevation data. Sediment pin data can be used to provide a 'spot check' on these larger and more complicated data sets.

Installation

Installation Equipment Needed:

2-inch gray, UV-resistant PVC pipe
Post pounder/mallet
Level
Hacksaw or PVC pipe cutter
Paint pens
Sediment measuring pole (flat bottom)
Sediment Pin Datasheet
GPS
Pen/pencil

Installation Methods:

1. Installation considerations:
 - Sediment pins are constructed from 2-inch gray, UV-resistant PVC pipe.
 - The pipe is cut to an appropriate length for the anticipated water depth and substrate conditions. The pipe must be visible above the water line at high tide if you plan to access via boat. Sediment pins that will be accessed during low tide on the marsh plain may be shorter to create a lower profile.
 - Sediment pins may be placed in conjunction with other biological or physical measurements such as channel cross sections and/or permanent vegetation transects.
 - Spatial distribution of sediment pins should be representative of the topography, expected/planned environmental development, and water flow dynamics of a project site.
 - Do not place the pins in channels or areas with anticipated strong currents that may cause artificial scour around the pin. If possible, PVC pipes should be placed prior to dike removal.



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2. Drive 2" PVC pipe into the ground. Pipes are driven into the ground at least 3 feet with a pipe/post driver or auger. If necessary, two pieces of PVC may be connected using couplers to increase sediment pin length.
3. Label Sediment Pin with paint pin
4. Take baseline Sediment Pin Reading (see Measurement)
5. Record GPS coordinates of Sediment Pin
6. Survey elevation of Sediment Pin. Upon placement, the **top** of each sediment pin should be surveyed for accurate elevation of the pin height. Future "as built" surveys of topography at project sites should include re-surveying of sediment pin tops (or every 2-3 years). Comparison of pin elevations over time will allow determination of vertical pin movement and accurate representation of sediment loss or gain. In the absence of "as built" surveys conducted by landholders, staff should use Real Time Kinematic GPS (RTK GPS) or professionally surveyed benchmarks to survey sediment pins using differential leveling and 'slack tide' methods described in Zedler (2000).

Measurement

Measurement Equipment:

Study site map	Paint pens to rewrite numbers on sed pins
List of sediment pin UTM coordinates	Pen/pencil
Sediment measuring pole (flat bottom)	GPS
Sediment Pin Datasheet	Kayak or boat (if needed)

Measurement Methods:

1. Set measuring device gently on the top of the sediment (almost hovering), not pushed down or allowed to settle into the mud.
2. Measure the distance from the top of the sediment pin to the surface of the sediment below.
3. Take four measurements at each pin (e.g. north, east, south & west) to derive an average estimate of sediment gain or loss.
4. Take note of any scour holes around sediment pin and take additional readings outside scour holes if necessary.

Data Entry and Analysis

1. Data to record (see Sediment Pin Datasheet): project, date, observer, sedpin #, UTM coordinates, sediment measurements
2. When entering data into the database, keep the UTM coordinates constant for each pin. Do not use variable UTM's recorded in the field (these are only used to validate the identification of a specific pin).
3. It is also helpful to take note of ideal boating conditions (i.e. best time/tide to avoid mudflats or to capture sediment pins barely above water level).

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4. Sediment accumulation or loss is determined by comparing measurements at sediment pins through time. For example, reading 1 shows the distance from the top of the pin down to the sediment as 63 cm. The second reading shows the distance as 61 cm revealing sediment accumulation of 2 cm (Figure 1).

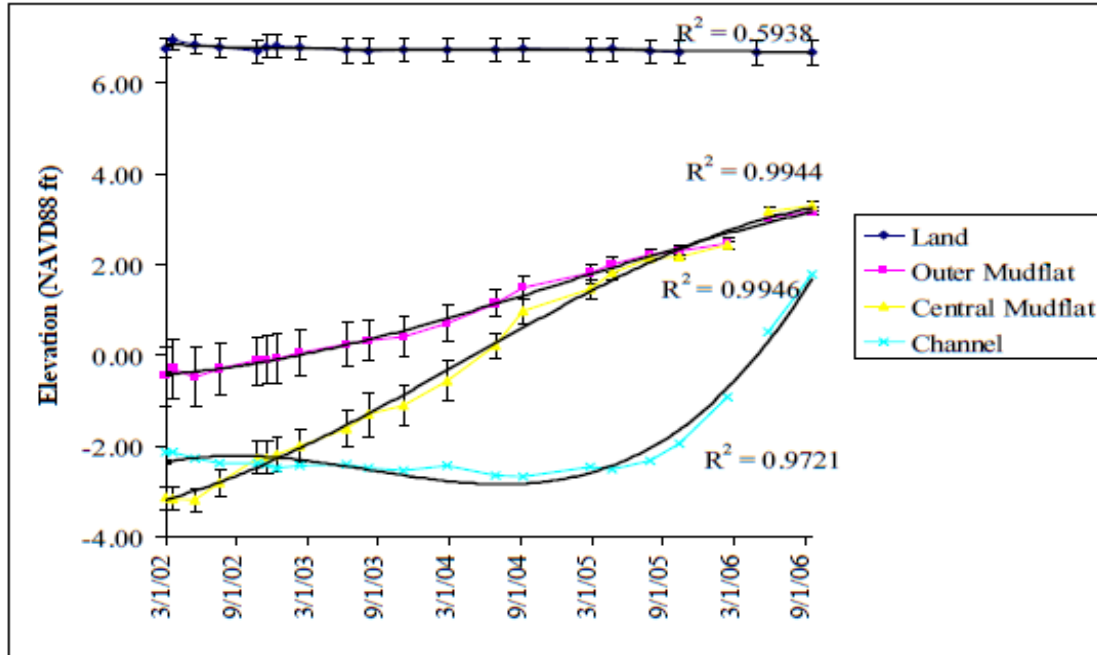


Figure 1. Example graphical representation of sediment pin data from Tubbs Setback Restoration Project, CA (Woo et al 2007). Sediment elevation (NAVD88 ft) at 24 sediment pin locations from March 2002 to September 2006. After 3.5 years, the central and outer mudflat areas reached an intersection point despite an almost 3 ft difference in average initial elevation. The channel has shown an almost 3 ft increase in elevation since 2005.

References

Woo, I., J. Y. Takekawa, A. Rowan, R. Gardiner, O. Bernstein, and G. T. Block. 2007. The Tubbs Setback Restoration Project: Final Report. U. S. Geological Survey, Unpubl. Progress Rep. Vallejo, CA

