SSFRP Projects in Piermont Marsh

Robert Newton[1], Susan Vincent[2], Katherine Allen[1], Kuheli Dutt[1]

Corresponding author: bnewton@ldeo.columbia, 1: Lamont-Doherty Earth Observatory, 2: Young Women's Leadership Network

LAMONT-DOHERTY EARTH OBSERVATORY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

Piermont Marsh:

- 20 km North of NYC.
- NOAA-managed research wetland.
- At least 14 meters of peat.
- Sedimentation dates to Laurentide deglaciation.
- 19th Century: mainly spartina patens.
- Now dominated by phragmites australis (invasive).
- Remnant spartina meadows and mixed-vegetation patches.
- Main nekton: mummichogs (fundulus heteroclitus).
- Tidal hydrology. Inundation dependent on spring/neap cycle.
- Nutrient sources: runoff (Tallman Mt.), sewer overflow, suburban runoff (via Sparkill Creek), waste processing main Hudson channel via tidal inundation.
- Land animals: muskrat, birds, bats, some rare insects.
- Industrial history (incinerator, cardboard, railroad, salt hay)
- Sample sites accessible by canoe or other small boat.
- Shuttle from Manhattan to nearby Lamont-Doherty campus.

The 2011 Crew:

- High school teachers: 4
- Schools: 3.
- HS students: 20.
- Grad students: 2 (part time).
- Scientists: 3 (part time).
- Technicians: 1 (part time).
- Started in 2006 with: 1 teacher, 1 scientist, 6 students.

Phragmites:

- Stem counts in .5X.5 meter quadrats.
- Succession plots along transects.
- GPS-marking of vegetation boundaries.
- Experimental remediation.

Plankton tows:

Fish:

- 6-hour sample: half-high to half-low.
- Minnow traps.
- Fish sedated, euthanized, ID'd, weighed.
- Subsample analyzed for gut contents.
- A few analyzed for carbon and nitrogen isotopes in lipids.
- Abundance and diversity analyzed as functions of:
  flow type (rivulet, stream, tidal stream, interior pool),
  year,
  hydrology (temperature, salinity, dissolved oxygen),
  setting (depositional/erosional, edge/interior).
- All collection, measurement, data analysis performed HS students working under teacher supervision.

Sediment Accretion:

A finely ground feldspar marker is used to track sediment accretion over time.

Nutrients concentrations:

Water samples are collected from canoes or wading from shore. They are filtered and frozen for later lab analysis. Sample sites and times have been chosen to catch the in- and out-flowing tide in order to estimate nutrient fluxes and the strength of the nutrient sink in the Marsh. Nitrate, nitrite, phosphate and silicate are measured. Temperature, salinity and dissolved oxygen levels are measured in the field with a hand-held YSI probe.

Soil carbon:

Soil and leaf litter samples are collected along transects and weighed, dried, weighed, combusted. Soil carbon content and moisture are mapped to establish 2-D patterns.
A peat corer is used to collect 1-meter cores from which samples are taken for similar analysis down-core.
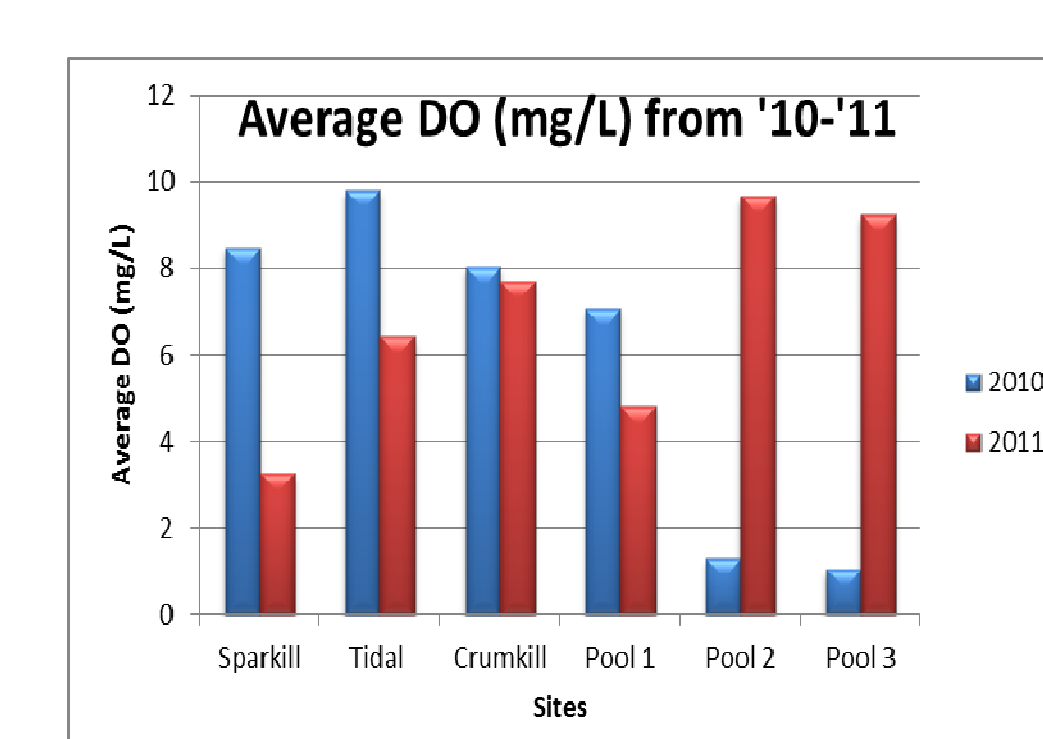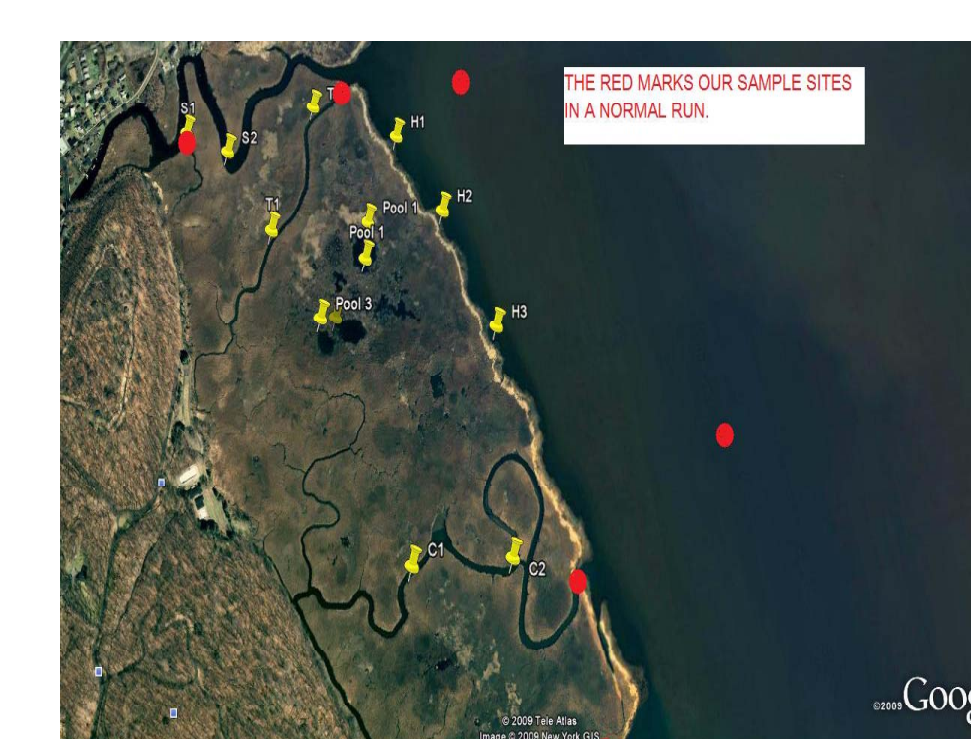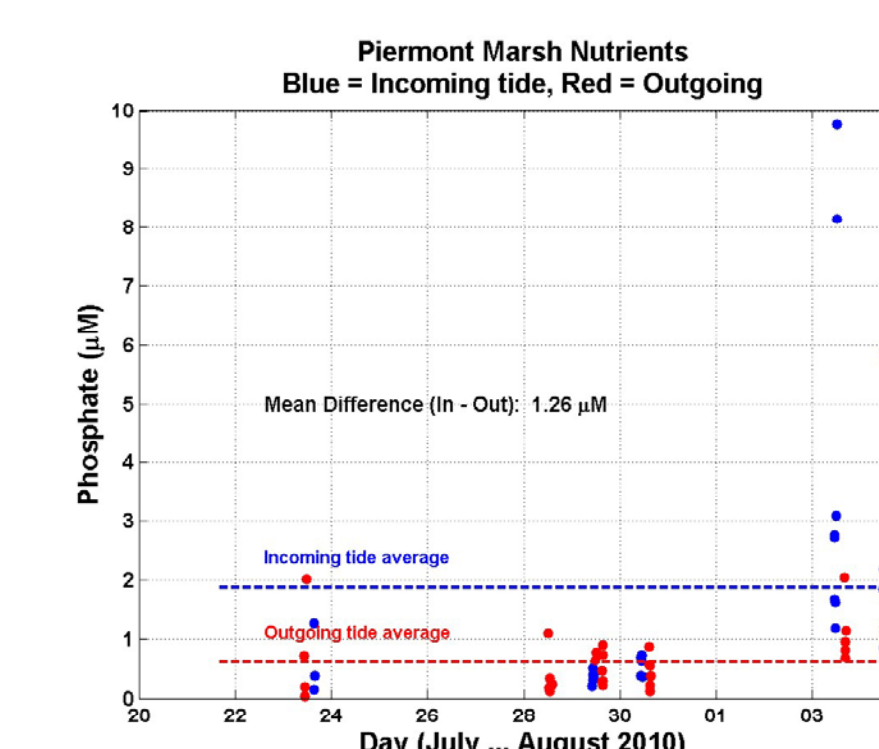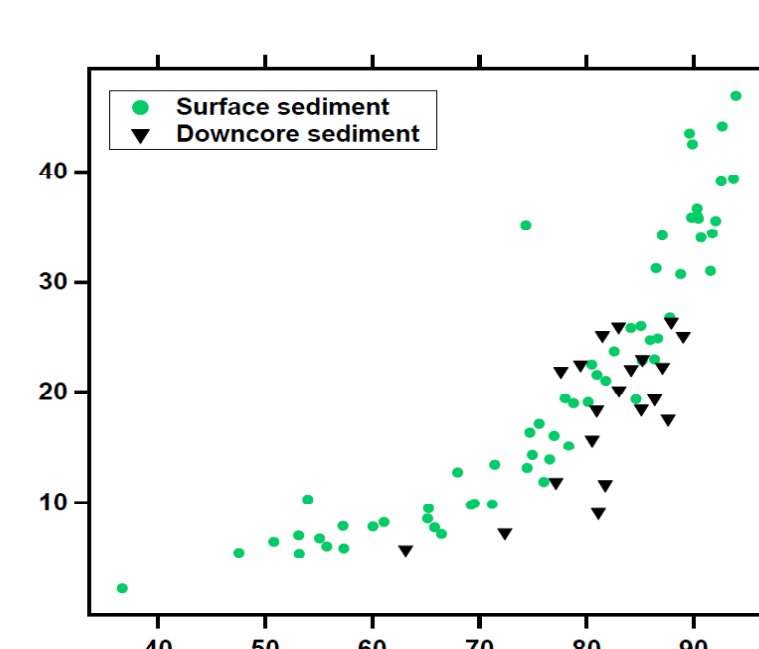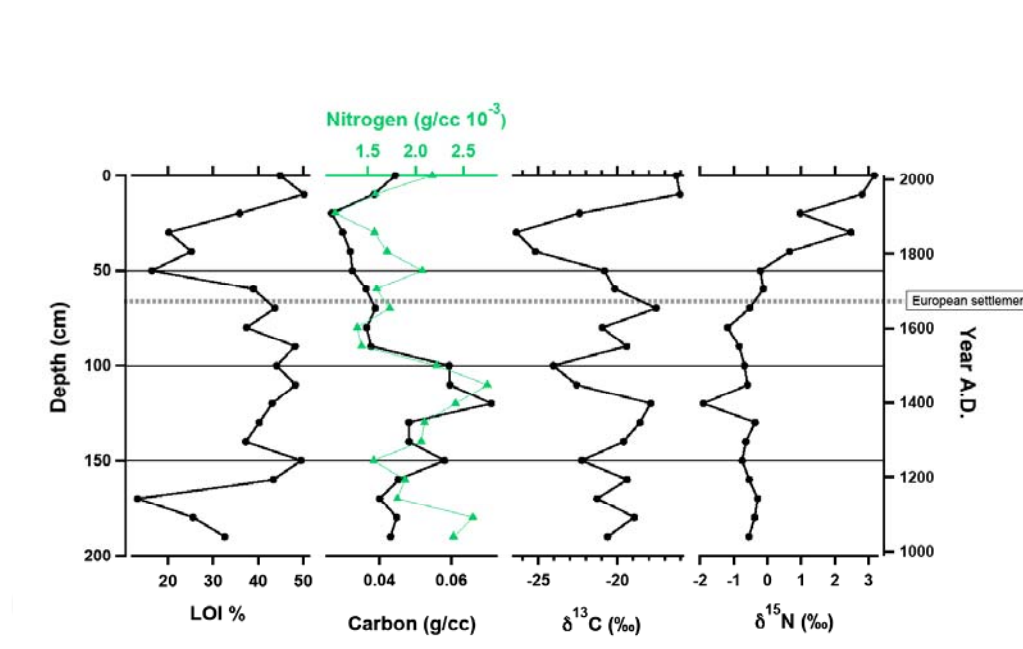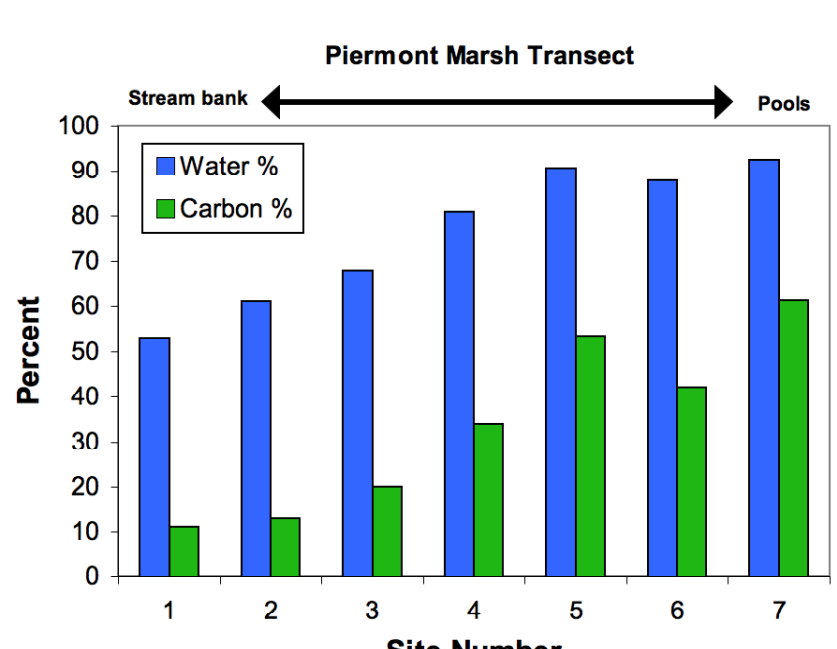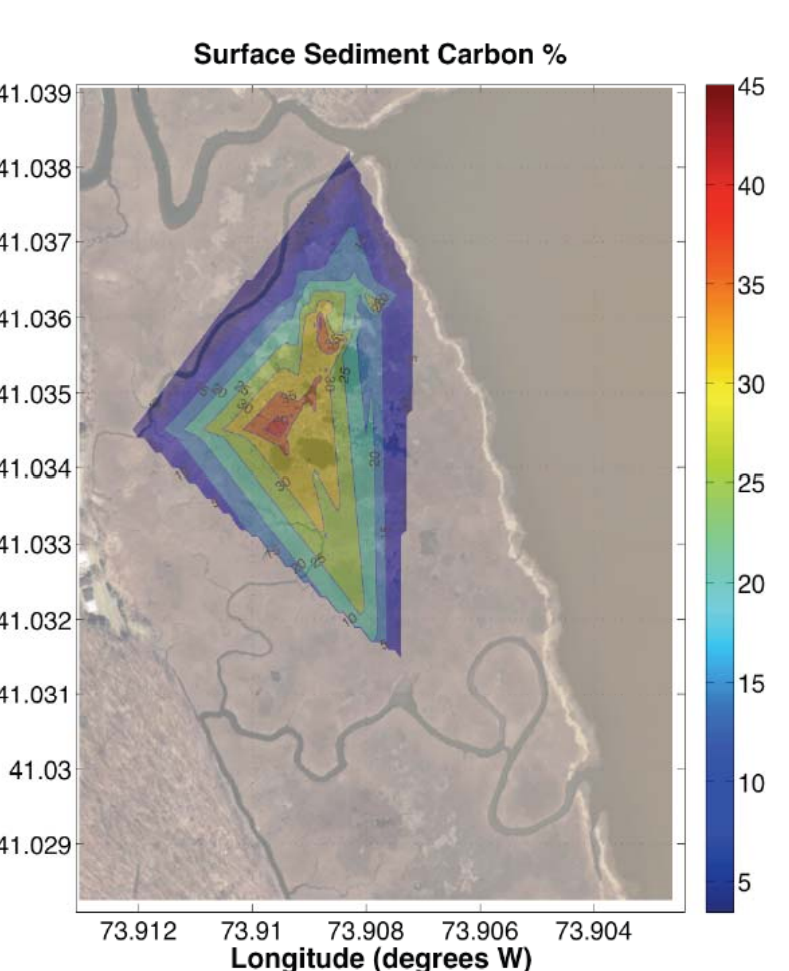
Hydrology

Monitoring stations have been installed in the interior pools in the Marsh and at the Piermont Pier, nearby in the main channel of the Hudson River estuary. Data is collected and transmitted via the GOES satellite in near-real-time. The data is being used both to monitor the marsh interior and to estimate the hydraulic connectivity between the Hudson and the Marsh interior. HS students maintain the equipment year-round.