Laurel View River Study Plan

1. Start identifying model boundaries and cross-sections
2. Determine sampling sites (mid-channel)
3. Determine the drainage area for each segment
    a. Open Water area
    b. Marsh area
    c. Upland area - undeveloped
4. Assemble team and emphasize the critical importance of the recon and recording time during all field work

Recon done at least 30 days prior to the field study

1. Yard Stick Survey done to determine the tidal amplitudes and excursion at several locations in the system throughout the day.
    a. Attach yard sticks or survey tapes to several docks (3-5) throughout the system
    b. Record the water level are various times throughout the tidal cycle to determine high and low tides
    c. The timing of the high and low tides at each site will help to determine segment mid-tide volumes and the speed the tide moves up and down the system
2. Bathymetery measure at the identified cross sections with a fathometer
    a. Record the time at which the bathymetery measurements are made
    b. Make sure the boat moves straight across the channel by looking choosing a fixed point on both sides of the channel
    c. Motor across the channel at a constant speed and swing the rear of the boat around at the end
    d. Cross-section will have to be adjusted to mid tide based on time measurements were made and the yard stick data
3. Depth Profiles taken throughout the system to determine that the system is completely mixed vertically.
    a. At the wide portions of the Medway River, take measurements at quarter points 25% LEW, 50% LEW, 75% LEW
    b. In the narrow portions of the system, take measurements at the centerline
    c. Record time each depth profile is made to help determine where on the tide cycle you are
4. Slack Tide centerline run
    a. Measure DO, Temperature, Conductivity, and pH at high slack tide and low slack tide at the sampling locations
    b. Yard Stick Survey information will be used to determine the approximate time that can be spent at each sampling time and the approximate time at which time you need to be at each sampling location
    c. Centerline runs need to be done from downstream to upstream
5. Raingage installed in the watershed at the Liberty County Reuse Facility Site
    a. Collect daily rainfall data for at least 30 days
    b. This information along with the drainage areas will be used to estimate the headwater flow and the segment inflow based on Q=CIA
    c. Model residence time calculated should be the same as the antecedent rainfall averaging period

Field Study

1. Continuous Monitors installed at boundaries to collect data for at least 2 days
    a. Downstream location – possible island in channel
    b. Upstream locations
        i. Jerico River – I-95 or near by dock
        ii. Jones Creek – I-95 or near by dock
    c. Monitors will collect
        i. DO
        ii. Temperature
        iii. Conductivity
        iv. pH
        v. Depth
    d. This information will be used to determine the boundary conditions in the model and will provide mid-tide information
2. Slack Tide centerline run
    a. Depth Profiles measure DO, Temperature, Conductivity, and pH during high slack tide and low slack tide at the sampling locations for 2 days (Yard Stick Survey information will be used to determine the approximate time that can be spent at each sampling time and the approximate time at which time you need to be at each sampling location)
    b. Chemical samples collect water (mid-depth grab or depth composite) for chemical analysis to include
        i. BOD5
        ii. TKN
        iii. NH3
        iv. NO2NO3
        v. Total P
        vi. Ortho-P
3. Long-Term BODs
    a. Collect at the boundary conditions - water needs to be collected at locations that coincide with the mid-tide boundary conditions. Use the slack tide runs to determine these locations
    b. Collect one sample in middle of model
    c. Data will be used to determine
        i. CBOD k rate
        ii. NBOD k rate
        iii. f ratio
4. Dye Study
    a. Continuous Rhodamine dye release during incoming tide and, if needed, outgoing tide. The dye release will be at the proposed discharge location and will be through a make-shift diffuser made of PVC pipe with holes drilled in it facing alternating directions
    b. Flow-through fluorometer will be used to measure the dye concentrations using a bilge pump that is lowered through the water column. Depth profiles will be made at various cross-sections and measurement will be made at several points in the cross section. Belfast River will be included in the study area.
    c. Measurements will to determine the spatial extent and mixing characteristics of the dye release during the high and low tides

Equipment needed

Vehicle with trailer hitch
Boats with motors
Trailer
Floatation devices
Fire extinguisher
Spare battery
Fathometers
Chart paper
Stylus
Tape
Hydrolabs
Surveyors
Hydrolab cable
Batteries
Yard sticks or survey tape
Electric screwdriver
Wood screws
Raingage
Four MiniSondes for continuous monitoring
PVC pipes with holes drill in
PVC glue
Fence posts
Cable
Cable clamps
Sledgehammer
Tools
Sample bottles for BOD, nutrients, ortho-P
Coolers
Carboys for Long-Term BOD samples
Garbage bags
Dregs
Isco Sampler
Isco Sampler Bottles
Tubing
Battery
Rhodamine dye
Gloves
Peristaltic pump
Tubing
Fluorometer
Bilge pump

Model Inputs and Calibration

1. Model segment geometric inputs from field data and maps
    a. segment lengths
    b. volume
    c. depths
    d. mid-tidal cross sectional area
    e. temperature
2. Boundary Conditions from continuous monitoring data, chemical data, long-term BOD data and rainfall data
    a. Water Quality
        i. CBOD
        ii. NBOD
        iii. DO Deficit (Salinity corrected DO)
        iv. Salinity
    b. Flows (from raingage study)
        i. Headwater
        ii. Marsh
3. Kinetic inputs from long-term BOD data
    a. k-rates
        i. CBOD
        ii. NBOD
4. Salinity Calibration - (Dispersion)
    a. Use high tide and low tide conductivity data to determine high and low tide salinity and then calculate mid-tide salinity
    b. Have upstream and downstream boundary conductivity which will be used to calculate salinity
    c. Use Dispersion to calibrate model to mid-tide salinity data
5. CBOD Calibration – (Marsh Load)
    a. Use high tide and low tide BOD and long-term BOD f ratio to determine mid-tide CBODu
    b. Have upstream and downstream boundary BOD
    c. Backfill the measured CBOD with CBOD loads from marsh
6. NBOD Calibration – (Marsh Load)
    a. Use high tide and low tide NH3 and ratio to determine mid-tide CBODu
    b. Have upstream and downstream boundary NH3
    c. Backfill the measured NBOD with NBOD loads from marsh
7. DO Calibration – (k rates, SOD, Marsh Load, reaeration,)
    a. Have k rates from long-term BOD study
    b. Assume an SOD of ~1 g/m2/day
    c. Use an SOD of 0.5 g/m2/day to calculate the DO deficit from the marsh by determining the area and volume of the flooded marsh
    d. Start with reaeration rate similar to what was calibrated in the Brunswick and Savannah
    e. Calibrate the DO by adjusting the marsh DO deficit and the reaeration.
    f. Can do sensitivity analysis on these parameters