Activity #7: Using SWMP Data
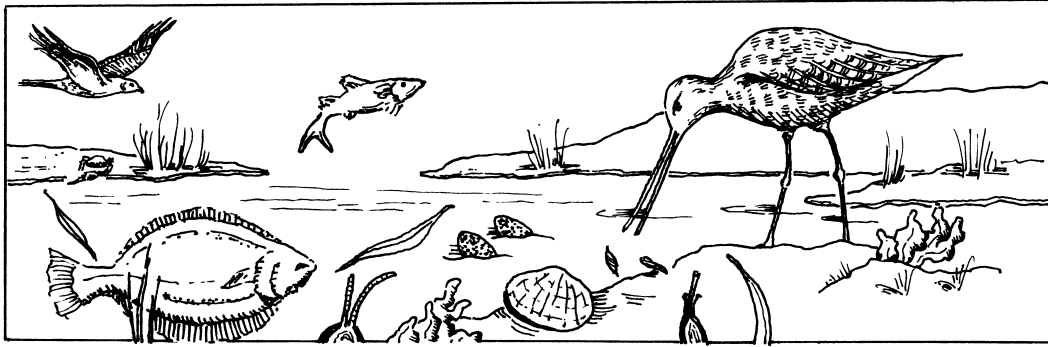
Adapted from "Exercises Using System Wide Monitoring Program Data," Waquoit Bay National Estuarine Research Reserve,

OBJECTIVES:

To plot and interpret actual water quality data.

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TIME:

This activity requires two - three 55-minute class period to begin. It may be used as a long-term project.

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BACKGROUND:

The National Estuarine Research Reserve System-Wide Monitoring Program (SWMP, pronounced like *swamp*) tracks short-term variability and long term changes in estuarine waters to understand how human activities and natural events can change ecosystems. It provides valuable long-term data on water quality and weather at frequent time intervals

Coastal managers use this monitoring data to make informed decisions on local and regional issues, such as   no-discharge   zones for boats and measuring the success of restoration projects.

The reserve system currently measures physical and chemical water quality indicators, nutrients and the impacts of weather on estuaries.

This water quality data is posted on the National Estuarine Research Reserve's SWMP website. The data on this website can be downloaded or copied into an Excel spreadsheet, plotted, and interpreted by the students. The first part of this activity uses only the data from the Tijuana River Estuary website. During the last section at the end of this Activity, students will access data from another estuary. This data show how oxygen is affected by a mouth closure event, and how opening the mouth led to recovery of the system. Overall, this activity will give students an opportunity to become familiar with actual research data, plot the data, find patterns within the data, and report on their findings.

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MATERIALS:

Students will need a computer with internet access and a spreadsheet application program such as Microsoft Excel. Previous familiarity with Excel is strongle encouraged. **You will want to go through the lesson yourself first to make sure you think the students are familiar enough with Excel to be able to complete the lesson. You may want to modify the instructions based on their familiarity.**

*** The specifics of the following procedure could depend on the version of Excel of the operating system*

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Procedure:

You can use this activity as a long-term project to be completed either in class or at home. Students can work singly or in pairs.
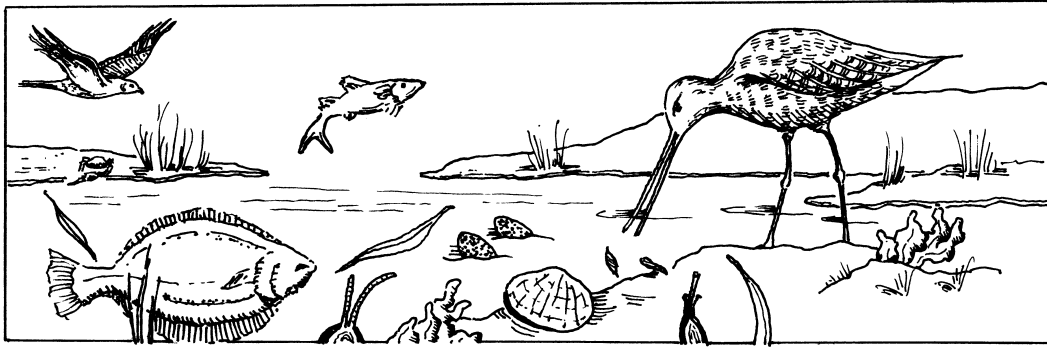
Activity #7: Using SWMP Data

PURPOSE:

The goals of this project are to:
- have you learn about estuarine ecosystems and the System-Wide Monitoring Program
- to get some experience manipulating datasets,
- and to plot and interpret some real data.

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INTRODUCTION:

The National Estuarine Research Reserve System (NERRS) routinely monitors water quality and meteorological conditions at a number of estuaries around the United States in order to, as their website says "... identify and track short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds for the purpose of contributing to effective national, regional, and site specific coastal zone management." In other words, the NERRS gathers water quality and meteorological data so they can monitor changes in an estuary in order to identify and, possibly, correct problems as quickly as possible. This program is called the System-Wide Monitoring Program or SWMP (pronounced like _swamp_)

The collected data is posted to their website and available to the general public. The measured variables include temperature, conductivity (used to calculate salinity), salinity, dissolved oxygen (in % and mg/l), water depth (equals tidal height), pH, and turbidity (the opposite of water clarity).

Your goal is to take this mass of data, make some plots, and look for some interesting pat-

terns using a computer spreadsheet program.

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PROCEDURE:

I. Graphing Temporal Cycles
1.   Open an Excel workbook containing your SWMP data. Some values may be missing; this is real data, and you have what the scientist has to work with!

2.   Note the column headings, which represent site information, date and time of data collection, and parameters measured. The water quality parameters are: temperature (Temp); specific conductivity (SpCond); salinity (Sal); percent dissolved oxygen (DO_pct); dissolved oxygen in mg/l (DO_mgl); water depth (Depth); pH; and turbidity (Turb).

        From these, select a parameter to work with. Temperature, salinity, dissolved oxygen (mg/l), and depth are the most interesting in our local systems. (For the purpose of the lesson, we will assume Temperature was chosen).

3.   Split the workbook so that the top row does not move.

4.   In order to work most effectively with the data, it is good to have date and time in the same column. To do this, Insert a new column after time. Make that column the Sum of the Date and Time   columns, and label the Column   Date and Time .

5.   Click on the Chart Wizard.

6.   In Step 1, choose XY (Scatter), with data points connected by lines.

7.   In Step 2, choose Series. Name the series Temperature (or whatever parameter you are working with). For the X-values, select all the data in the   Date and Time   column. For the Y-Values. select all the data in the   Temperature   column.

8.   In Step 3, Name the X-axis   Date   and the Y-axis   Temperature.

9.   In Step 4, create a new sheet called   Date vs. Temperature

10.   Work with the graph options to create a simple, visually appealing, and informative presentation.

11.   Look at the graph. What is the maximum temperature? What is the minimum? What sort of patterns do you see over time?

12.   Try plotting different parameters. You might also try two parameters on the same graph.

II. A Look at Oxygen

1. Open your Excel data file for Los Penasquitos Lagoon, a smaller estuary to the north.

2. Make a graph of the Dissolved Oxygen (DO) values over time.

3. What are the general patterns? What might cause these patterns? (To further investigate factors at work, try plotting   depth.   ).

4. How might the variations in DO affect organisms living in the estuary?

5. What are some management actions that might be taken to address the observed situation.