

Title: Water Quality Monitoring

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Guiding Question: Why are more dead marine birds and mammals found on Marina State Beach than any other beach in Monterey Bay?

Background information:

For the past two years (since September of 1997), volunteer beach combers, in association with research in the Monterey Bay National Marine Sanctuary, have been monitoring the health of the Sanctuary indirectly by collecting data on the number of live-strandings and beach-cast marine birds and mammals and their apparent cause of death/stranding. Recently deceased birds are collected for necropsy, and mammals, dead or alive, are reported to appropriate agencies.

Collected field data includes the species of the organism, the sex and age (if determinable), and if oiled or not. Other data about beach conditions when counts are taken are recorded. If present, oil balls are collected for lab analysis.

Preliminary results have indicated that there are more marine birds and mammals deposited/retained in the southern end of the Bay (Monterey County), and particularly at Marina State Beach, than in the other nine beaches sampled. (See appendix 1, map and description of sampled beaches). A database has been established and is updated monthly as beach monitoring surveys continue. (Data base available on request.)

There is a multitude of possible reasons for the preliminary results. Among them include:

- Natural life-cycle phenomena
- Topography
- Geological processes
- Currents
- Tides
- Seasons
- Pollution sources
 - Runoff: storm drains, agriculture fields, rivers/streams
 - Oil
 - Marine debris
 - Human activity, recreational and commercial
 - Outfalls

Incorporation of SCANS:

- Interpersonal skills as a team member
- Problem solving
- Reading, writing, thinking skills
- Applies technology to a task
- Organize and evaluate information
- Acquires and interprets and communicates information
- Uses computers to process information

Incorporation of Technical Knowledge from the Skill and Knowledge Guidelines for Marine Occupations:

Marine Technicians:

- Electronics
- Collects physical data
- Utilizes software programs; computer skills
- Sensors
- Maintain safety procedures
- Writes reports and recommendations
- Scientific Sampling methods

Aquatic Science Technician

- Water chemistry
- Computer skills
- Sensors/electronics
- GPS
- Scientific sampling methods

Environmental Technician

- Computer skills
- GPS
- Reading and creating charts and maps
- Scientific sampling methods

Goals:

Using a local real-world problem as motivation, students will be

- Introduced to water quality monitoring using CBL (probes and graphing calculators)
- Introduced to monitoring site selection, sample collection techniques, data analysis and interpretation
- Introduced to Marine Technician Occupations that use water quality monitoring
- Introduced to GPS technology to locate sampling site

Learning Objectives:

Given environmental and topographic parameters (in the field), students will

- Locate a site that is representative, accessible, safe, and non-disruptive
- Work in teams of three or more
- Decide which tests will be done in the field and which will be done in the lab
- Prepare a checklist of materials and gather all necessary equipment for the field trip
- Devise sample collection tools
- Establish long-term monitoring protocol
- Learn instrumentation
 - CBL with probes to perform the following monitoring:
 - Temperature, pH, turbidity, DO, BOD, phosphates, nitrates, total dissolved solids, salinity
 - Graphical analysis interface
- Locate sampling site using GPS, transfer to a computer to prepare a detailed map for analysis

Grade Levels: 10-12

Materials Needed: see appendix 2

- TI 3 graphing calculators
- Appropriate probes
- Computer
- Appropriate software
- GPS
- Appropriate chemicals and consumables
- Appropriate glassware
- AC adapters
- Water Quality with CBL curriculum

Websites:

EPA
USGS
Dept. of Ag water quality
National Institute for water resources
Environmental literacy council
GLOBE
Project WET
Mo. Co. Flood Control Distt.
Universities water information network

Time Required:

One quarter

Procedure and Discussion Questions:

Refer to Vernier Software's Water Quality with CBL

Assessment Strategy:

Observing students using equipment properly
Successful completion of lab report

Lessons Extensions:

Investigate other possible causes of mortalities as indicated in introduction.