Content and Activity Overview

LEVEL III:
USING AND IMPROVING MONITORING DATA

ACTIVITY 1:
Solutions

Part A: Act Out  
Summary: Students role-play interactions needed to support solutions to watershed problems. The volunteer water quality monitoring group wants to solve a selected watershed problem. Key people affected by and/or involved with regulations pertaining to this watershed problem are represented.

Part B: Strategies  
Summary: Students identify solutions for solving watershed problems. Strategies cover who might have authority to solve this problem; what possible management practices might be implemented; and what additional data is needed to support the need for a solution. They then post their strategies to the listserve for discussion.

ACTIVITY 2:
Accuracy Counts

Part A: Expanding the Sampling Plan  
Summary: Students identify what changes are needed in the sampling plan to assure the level of credibility and completeness required to support the need for the suggested changes. They identify what additional resources they may need to implement this new sampling plan.

Part B: Writing A QAPP  
Summary: Students learn about the different components of a Quality Assurance Project Plan. They work in groups to write the proposed expansions to the sampling plan. They identify any resources from the community they need prior to implementing the plan.

ACTIVITY 3:
Implementing the QAPP Plan

Part A:  
Summary: Students implement their revised sampling plan.
Level Three

Part B: page 129
Summary: Students review data to validate and verify their findings.

ACTIVITY 4: BMPs

Part A: Action Plans page 131
Summary: Students prepare action plans using Best Management Practices and other pollution control measures that support solutions to their watershed problem. Students submit their action plans to their watershed coordinator, NERRS manager, and CZM manager for review.

Part B: Remediation page 131
Summary: The class presents an action plan to a community planner.
ACTIVITY 1

Solutions

PART A:
ACT OUT

Activity Objective: Students discover through role play information needs and solutions associated with watershed problems.

Estuary-Net Outcome Connection: High schools form a partnership with their local officials, state Coastal Zone Management programs, and National Estuarine Research Reserves to work collaboratively in solving non-point source pollution problems in estuaries and watersheds.

Students learn how to play a meaningful role in solving local water quality problems.

Students understand the importance of gathering long-term accurate data; learn how to display the data; and learn methods of analyzing the data to determine relationships.

Students are able to use the scientific process to test a hypothesis, and will understand how science and the process of science contributes to decision-making.

Time needed: 1 class period.

Materials: Background information on NERR and CZM.

Background:

The local volunteer water quality monitoring group has discovered a high level of fecal coliform bacteria consistently present at a sampling site downstream from the Sea-View Campground. Fecal coliform bacteria are a group of bacteria that normally reside in the intestinal tract of warm-blooded animals, including humans. They can enter an estuary in three ways: 1. direct discharge from animals; 2. runoff of waters carrying animal wastes; and 3. human sewage discharged into the water. Fecal coliform themselves are not pathogenic, but rather are used as an indicator of sewage pollution.

The acceptable level of fecal coliform depends on the specified use of a waterbody. They are described in state water quality standards and in limits set by the United States Department of Agriculture through their shellfish sanitation program. For example, in Maine coastal waters, a geometric mean of less than 14 colonies per 100 ml is considered acceptable for harvesting shellfish, while a geometric mean of 14 or more colonies per 100 ml is considered contaminated, requiring closure of the shellfish bed.
The volunteer water quality monitoring group wants to solve this watershed problem. The following are key people who are affected by and/or involved with regulations pertaining to this watershed problem:

1. Property Owners
2. Community Regulator
3. NERR Manager
4. CZM Manager
5. Volunteer Water Quality Monitoring Group

**Procedure:**

1. Use the scenario above or create your own. Divide the class into five groups representing the above roles (or roles of your choice).
2. Ask each group to role-play strategies that convey data/information they would use to solve this problem, and identify data or information they need to obtain.
3. Be sure each group interacts with all the other groups.
4. Present the play.

**PART B: STRATEGIES**

**Activity Objective:** Students identify solutions for solving watershed problems and post those strategies to the listserv.

**Estuary-Net Outcome Connection:** High schools form a partnership with their local officials, state Coastal Zone Management programs, and National Estuarine Research Reserves to work collaboratively in solving non-point source pollution problems in estuaries and watersheds.

Students learn how to play a meaningful role in solving local water quality problems.

Students understand the importance of gathering long-term accurate data; learn how to display the data; and learn methods of analyzing the data to determine relationships.

Students are able to use the scientific process to test a hypothesis, and will understand how science and the process of science contributes to decision-making.

Students understand how to use and the benefit of telecommunications networking to collaborate in problem-solving.

**Time needed:** 1 class period
**Materials:** Computer.

**Procedure:**

1. As a class, list each of the groups identified as role players in Part A.
2. Next, ask each group to list the strategies and information they used and information they found to solve the campground problem.

<table>
<thead>
<tr>
<th><strong>Group</strong></th>
<th><strong>Information Need/Problem</strong></th>
<th><strong>Information Source/Solution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Owner</td>
<td>1. Is the data reliable?</td>
<td>1. Testing done by certified state agency.</td>
</tr>
<tr>
<td></td>
<td>2. What is an economic solution?</td>
<td>2. Ask help from NRSC, research BMP’s.</td>
</tr>
<tr>
<td></td>
<td>3. Where can I receive the technical help to implement a solution?</td>
<td>3. Technical help available from state &amp; local agencies.</td>
</tr>
<tr>
<td></td>
<td>4. Are other property owners treated the same?</td>
<td>4. Contact state &amp; local agencies.</td>
</tr>
<tr>
<td>Local Regulator</td>
<td>1. Is the data reliable?</td>
<td>1. Verify data through state certified agencies.</td>
</tr>
<tr>
<td>VWQM</td>
<td>1. Is the data reliable?</td>
<td>1. Contact certified state testing agency.</td>
</tr>
<tr>
<td></td>
<td>2. What process is used to insure steps are taken to investigate and/or solve the problem?</td>
<td>2. Contact local regulatory agency.</td>
</tr>
<tr>
<td>CZM Manager</td>
<td>1. Is the data reliable?</td>
<td>1. Verify data through state agency.</td>
</tr>
<tr>
<td></td>
<td>2. How can the solution be implemented in a way that insures local support?</td>
<td>2. Use as a case study (eg., case study for keeping clam flats open).</td>
</tr>
<tr>
<td>Level Three NERR Manager</td>
<td>1. Is the data reliable?</td>
<td>1. Verify data through state agency.</td>
</tr>
<tr>
<td>--------------------------</td>
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<td>----------------------------------</td>
</tr>
<tr>
<td></td>
<td>3. How can the water quality in the estuary be improved?</td>
<td>3. Support volunteers and state/local agencies in non-point source pollution programs.</td>
</tr>
</tbody>
</table>

3. Students will post their solutions to this scenario and the data/information they feel is needed to improve the situation on the listserv for discussion, and review the information posted by collaborative sites.
ACTIVITY 2

Accuracy Counts

PART A:
EXPANDING THE SAMPLING PLAN

Activity Objective: Students learn the importance of accuracy when collecting data.

Estuary-Net Outcome Connection: Students understand water quality and the variables that contribute to water quality.

Students understand the importance of gathering long-term accurate data; learn how to display the data; and learn methods of analyzing the data to determine relationships.

Students are able to use the scientific process to test a hypothesis, and will understand how science and the process of science contributes to decision-making.

Time Needed: 2 class periods.

Materials: Chart pad, markers.

Procedure:

1. Teacher and students review their sampling plan in light of their decision to assure that their identification of the cause of a local water quality problem is accurate. They list the types of data they collected. They then list any new data they need in order to validate their findings.
2. For each type of data they list, the class brainstorms methods to assure the accuracy and dependability of the information collected.
3. They select those methods they feel are accomplishable given their restrictions. They then identify what additional resources they need to get in order to implement this new sampling plan. In some instances, they may need to write a Quality Assurance Project Plan (QAPP) which may later be submitted to EPA for approval.
PART B: WRITING A QAPP

Activity Objective: Students learn about the different components of a Quality Assurance Project Plan.

Estuary-Net Outcome Connection:
Students understand water quality and the variables that contribute to water quality.

Students understand the importance of gathering long-term accurate data; learn how to display the data; and learn methods of analyzing the data to determine relationships.

Students are able to use the scientific process to test a hypothesis, and understand how science and the process of science contributes to decision-making.

Students understand how to use telecommunications and the benefit of telecommunications networking to collaborate in problem solving.

Time Needed: 3 class periods.

Materials: Computer, modem, and software.

Procedure:

1. Students work in groups to write the proposed expansions to their sampling plan including efforts towards creating a Quality Assurance Project Plan.
2. In particular, students should address the following elements (see Appendix II - Quality assurance/Quality control):

   Project Organization:
   - Problem Definition/ Background
   - Project Description
   - Sampling Process Design
   - Sampling Process Procedures
   - Sample Handling & Custody
   - Analytical Methods
   - Quality Control Requirements
   - Record Storage
   - Assessments & Response Actions
   - Reports to Management
   - Data Review, Validation & Verification Requirements
   - Reconciliation with Data Quality Objectives
Level Three

3. When all sections of the plan are completed, have the class review the plan to identify any resources from the community needed prior to implementing the plan.

4. Mail the final plan including the classes strategy and time line for plan implementation to the listserve.
Level Three
ACTIVITY 3

Implementing The QAPP Plan

PART A:

Activity Objective: Students begin the implementation of their revised sampling plan.

Estuary-Net Outcome Connection: Students understand water quality and the variables that contribute to water quality.

Students are able to use the scientific process to test a hypothesis, and understand how science and the process of science contributes to decision-making.

Time Needed: Variable.

Materials: As determined by the plan.

Procedure:

1. Students begin by implementing their instrument calibration plan.
2. Prior to field work, assure that all participants are familiar with new protocols. Lab checks for each participant will be conducted. These checks begin the process of participant certification.
3. Follow protocols for field sampling and lab analysis.

PART B:

Activity Objective: Students review data to validate and verify their findings.

Estuary-Net Outcome Connection: Students understand water quality and the variables that contribute to water quality.

Students are able to use the scientific process to test a hypothesis and understand how science and the process of science contributes to decision-making.

Time Needed: 1-2 class periods.

Materials: Computer and modem, spreadsheet software or spreadsheets and graph paper.
Procedure:

1. The individual assigned the role of water quality specialist for each sampling team reviews the data for inaccuracies including data from replicates, splits, spikes, and blanks. He/she also reviews sample holding times, sample conditions and equipment calibration procedures.

2. Once the data are verified and the metadata updated, it can be entered into the database. Use your own data table.

3. Data is analyzed to meet data objectives. Send data and associated metadata to the listserv.
PART A: ACTION PLANS

Activity Objective: Students learn how action plans using Best Management Practices and other pollution control measures support solutions to their possible watershed problem.

Estuary-Net Outcome Connection: High schools form a partnership with their local officials, state Coastal Zone Management programs and National Estuarine Research Reserves to work collaboratively in solving non-point source pollution problems in estuaries and watersheds.

Students learn how to play a meaningful role in solving local water quality problems.

Students are able to use the scientific process to test a hypothesis, and understand how science and the process of science contributes to decision-making.

Students understand their connection to and the importance of estuaries, and the impact upland activities have on these systems.

Time Needed: 2 class periods, plus homework.

Materials: EPA, Coastal Non-point Pollution Management Measures Guidance (See Guidance Specifying Management Measures For Sources Of Non-point Pollution In Coastal Waters.)

Procedure:

1. Ask pairs of students to research Best Management Practices and other pollution control measures that support a solution to their watershed problem.
2. Each pair prepares an action plan keeping in mind:
   a) What is their goal?
   b) What makes sense ecologically?
   c) What makes sense socially (community relations)?
   d) What education measures are needed?
   e) How will they measure goal achievement?
PART B: REMEDIATION

Activity Objective: The class presents an action plan to a community planner.

Estuary-Net Outcome Connection: High schools form a partnership with their local officials, state Coastal Zone Management programs, and National Estuarine Research Reserves to work collaboratively in solving non-point source pollution problems in estuaries and watersheds.

Students learn how to play a meaningful role in solving local water quality problems.

Students understand the importance of gathering long-term accurate data; learn how to display the data; and learn methods of analyzing the data to determine relationships.

Time Needed: 3 class periods, plus homework and presentation time.

Materials: Action plans developed in Part A.

Procedure:

1. Students present their action plans to the class.
2. The class synthesizes the presented plans, including review comments, and creates by consensus one action plan.
3. The class brainstorms whom to present the action plan to, how to contact that person/group, and the form the presentation takes.
4. Students then create that presentation.
   eg. written report
      media presentation
      skit
      educational materials
5. Present Action Plan!