Citizens’ Environmental Monitoring Program
Water Quality Monitor Training
Training Objectives

Day 1
What
Why

Days 2 & 3
How
The concept of a “waterkeeper”

Waterkeeper Alliance

Cook Inletkeeper began in 1995

Vision:

Cook Inletkeeper works to guarantee clean water for:

- Abundant Fish and Wildlife
- Strong Communities
- Lasting Jobs
- Renewable Energy
- Public Property Rights

Mission:

To protect Alaska’s Cook Inlet watershed and the life it sustains
Watersheds

A watershed is the area of land from which runoff (from rain, snow, and springs) drains to a stream, river, lake, or other body of water. Its boundaries can be identified by locating the highest points of lands around the water body.

Cross section of a watershed
The Cook Inlet watershed covers over 39,000 square miles of Southcentral Alaska. Melting snow and ice from Mount McKinley, the Chugach Mountains and the Aleutian Range drains into rivers such as the Susitna, Matanuska and Kenai, which feed the productive waters of Cook Inlet.
CEMP: Citizens’ Environmental Monitoring Program

• Goals and Objectives:
  – Inventory baseline water quality in the waters of Cook Inlet Basin
  – Detect and report significant changes and track water quality trends
  – Raise public awareness of the importance of water quality through hands on involvement
Citizen Involvement

Over 500 citizens trained
CEMP Partnership

CEMP Monitoring Partners:
Resurrection Bay Conservation Alliance, Anchorage Waterways Council, Mat-Su Lake Monitoring, Wasilla SWCD, Upper Susitna SWCD

CEMP Outreach Partners:
Homer SWCD, Kenai Watershed Forum

CEMP Technical Partners:
UAA Environment and Natural Resources Institute (ENRI)
Baseline Data: A long term success story!

Baseline Reports

Filling in the gaps:
- Water quality monitoring
- Bioassessments
- Habitat Assessments
- GIS Analysis
- Invasive plant surveys
- Temperature monitoring
Bioassessment = BUGS!

We monitor 5 sites twice a year – once in June and again in August!
The Living Stream Environment

Components of the stream system

A healthy stream is a busy place.

- Wildlife and birds
- Vegetation
- Fish
- Insects and other macro invertebrates

Human activities shape and alter many of these stream characteristics:

- Homes, farms, other developments
  - Septic systems/outhouses, rural runoff, increase in impervious surfaces
- Towns and cities – urban runoff
- Logging, mining, gravel extraction activities
CEMP Monitoring Sites

Anchor River watershed:
Beaver Creek    Ruby Creek
Two Moose       Bridge Creek

Kachemak Bay watershed:
Woodard Creek   Bidarka Creek
Mariner Creek   Palmer Creek/ Beluga Slough
Fritz Creek     McNeil Canyon
Rice Creek      Miller Creek
Diamond Creek   

Legend
△ Active Sites
● Historic Sites
Site Selection

- Representative
- Safely and reasonably accessible
- Prioritization based on uses, database needs, and potential threats
Ruby Creek
“No Name” Creek
Beaver Creek
Bridge Creek
Lower and Upper Diamond Creek
Bidarka Creek
Upper and Lower Woodard Creek
Miller Creek
Upper and Lower Fritz Creek
Rice Creek
McNeil Creek
What is Water Quality?

Pollution is broadly divided into two classes according to its source:
- **Point source**
- **Nonpoint**

**Common sources of pollution to streams include:**
- Agricultural
- Municipal dischargers
- Urban runoff
- Mining
- Industrial dischargers (factories)
- Forestry activities
- Modifications to stream habitat and hydrology.
What We Monitor

• Chemical
• Biological
• Physical
WHY DO WE MONITOR WATER QUALITY?

The Need for Monitoring

• The federal Clean Water Act of 1972

• The single largest factor limiting our ability to make intelligent policy decisions is not having sufficient information (i.e. hard data).

• Growth in population and its associated pressures on water quality and natural resources

• The federal and state agencies charged with monitoring and protecting water quality have found it increasingly difficult to fulfill their mandates.
Water quality monitoring can be used for many purposes:

To identify whether waters are meeting designated uses.
To identify specific pollutants and sources of pollution.
To determine trends.
To screen for impairment.

<table>
<thead>
<tr>
<th>Source</th>
<th>Common Associated Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland</td>
<td><strong>Turbidity</strong>, phosphorus, nitrates, <strong>temperature</strong>, <strong>conductivity</strong></td>
</tr>
<tr>
<td>Forestry harvest</td>
<td><strong>Turbidity</strong>, <strong>temperature</strong>, <strong>conductivity</strong></td>
</tr>
<tr>
<td>Grazing land</td>
<td><strong>Fecal bacteria</strong>, <strong>turbidity</strong>, phosphorus, nitrates, <strong>temperature</strong></td>
</tr>
<tr>
<td>Industrial discharge</td>
<td><strong>Temperature</strong>, <strong>conductivity</strong>, toxics, <strong>pH</strong></td>
</tr>
<tr>
<td>Mining</td>
<td><strong>pH</strong>, alkalinity, <strong>conductivity</strong></td>
</tr>
<tr>
<td>Septic systems</td>
<td><strong>Fecal bacteria</strong>, nitrates, phosphorus, <strong>dissolved oxygen</strong>/ biochemical oxygen demand, <strong>conductivity</strong>, <strong>temperature</strong></td>
</tr>
<tr>
<td>Sewage treatment plants</td>
<td><strong>Dissolved oxygen</strong> and biochemical oxygen demand, <strong>turbidity</strong>, <strong>conductivity</strong>, phosphorus, nitrates, <strong>fecal bacteria</strong>, <strong>temperature</strong>, <strong>pH</strong></td>
</tr>
<tr>
<td>Construction</td>
<td><strong>Turbidity</strong>, <strong>temperature</strong>, <strong>dissolved oxygen</strong> and biochemical oxygen demand, <strong>conductivity</strong>, and toxics</td>
</tr>
<tr>
<td>Urban runoff</td>
<td><strong>Turbidity</strong>, phosphorus, nitrates, <strong>temperature</strong>, <strong>conductivity</strong>, <strong>dissolved oxygen</strong> and biochemical oxygen demand</td>
</tr>
</tbody>
</table>
Some Types of Water Quality Monitoring

• Baseline Monitoring

• Compliance and Enforcement Monitoring

Sampling Schedule

• Samples are to be taken on the second and last Sundays May - August and on the last Sunday September - April for a total of 16 x per year.

• 2:00 PM.

• The quality of the data collected by our program depends on regular and consistent monitoring.
Safety

The following are some basic common sense safety rules. At the site:

Always let someone else know where you are, when you intend to return

Complete a volunteer form.

If you drive, park in a safe location. Be sure your car doesn't pose a hazard to other drivers.

Never cross private property without the permission of the landowner.

Watch for wildlife and insects. Know what to do if you get bitten or stung.

Never drink the water in a stream. After monitoring, wash your hands with antibacterial soap.

If the water appears to be severely polluted, contact the Monitoring Coordinator.

Disturb streamside vegetation as little as possible.

If at any time you feel uncomfortable about the condition of the stream or your surroundings, stop monitoring and leave the site at once. Your safety is more important than the data!
Quality Control & Assurance

- Precision & Accuracy
- Training & Recertification  
  – DQO
- Site visits & Split samples
- Data Management

(www.mathworks.com)
Quality Assurance Plans

• Quality Management Plan
  – Guiding Umbrella Document for CEMP Partnership
  • Standard Operating Procedures (SOPs)
• Quality Assurance Project Plan(s) (QAPP)
  – Field Procedures Manual
  – Standard Operating Procedures (SOPs)
• Data Management
  – Access Database
  – Quarterly newsletters & Annual report
## What and Why

### Field Observations
- Air Temperature
- Wind & Weather
- Water Surface & Substrate
- Comments & Observations
- Photos & Sketches

### Water Quality Parameters
- Color
- Turbidity (Clarity)
- Water Temperature
- pH
- Conductivity
- Dissolved Oxygen
- Coliform Bacteria
Recording your data
Field Observations

- Air Temperature
- Wind & Weather
- Water Surface & Substrate
Comments:

STREAM LOW

Sketch:

SAMPLE → X

EASY

ST

Comments:

3 FEET OF SNOW ON FROZEN CREEK CAN'T HEAR RUNNING WATER

Sketch:

HA HA
Site Photos

• New system this year – quarterly photos
• Inletkeeper has a Flickr site for storage
Water Quality Parameters

- Color
- Turbidity (Clarity)
- Water Temperature
- pH
- Conductivity
- Dissolved Oxygen
- Coliform Bacteria
Color

• Apparent color results from dissolved substances and suspended matter
• General but useful!
• CEMP utilizes your descriptive observations of apparent color as well as the BCS#(s)
Turbidity (clarity)

• Turbidity is a measure of how much material suspended in the water decreases the passage of light through it
• Many affects on overall stream health
Water Temperature

- Many factors influence water temperature
  - Air temperature
  - Stream flow
  - Riparian vegetation
  - Human inputs
- Affects
  - Rate of photosynthesis
  - Organisms metabolic processes
  - Distribution of aquatic life
  - Dissolved oxygen
pH

- A measure of how acidic or basic/alkaline a solution is
- pH ranges from 0 (acidic) to 14 (basic) and is on a logarithmic scale
- 6 – 8 is the pH range of most streams
- Changes in pH may be from:
  - Leaching of bedrock/soils
  - Human discharges
  - Aerosols, dusts, gasses from the air
  - Plant photosynthesis
Conductivity

• The conductance of water (µS/cm) = total dissolved solids
• Chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron, aluminum
• Geology & human inputs will change conductivity
Dissolved Oxygen

• One of the most important indicators!
• Concentration (mg/l) of oxygen dissolved in the water
• Saturation & biological oxygen demand
• Influences on DO:
  – Temperature
  – Wind & waves
  – Aquatic plants
  – Urban, agricultural, organic waste discharges
  – Dams
Coliform Bacteria

- *Indicator* bacteria of sewage pollution
  - Fecal coliform
  - *E. coli*
- Easier & far cheaper to monitor than pathogenic bacteria
- Urbanization, development, and increased population can all increase bacteria levels
Volunteer Monitor Responsibilities

TRAINING

SAFETY

MONITORING SCHEDULE

FIELD PROCEDURES

DATA MANAGEMENT
Volunteer Monitor Responsibilities (Cont.)

RESPONSE

KIT MANAGEMENT

CHEMICAL WASTE MANAGEMENT

PERFORMANCE STANDARD

REPLICATE ANALYSIS
Monitoring Kits
When using chemicals:

Know your equipment, sampling instructions, and procedures before going out into the field.

Prepare labels and clean equipment before you get started.

Keep all equipment and chemicals away from small children. Many of the chemicals used in monitoring are poisonous.

Avoid contact between chemical reagents and skin, eye, nose, and mouth.

Never use your fingers to stopper a sample bottle (e.g., when you are shaking a solution).

Wear safety goggles when performing any chemical test or handling preservatives.

Know chemical cleanup and disposal procedures.

Wipe up all spills when they occur.

Return all unused chemicals to your program coordinator for safe disposal.

Close all containers tightly after use. Do not switch caps.

Know how to use and store chemicals.

Do not expose chemicals or equipment to temperature extremes or longterm direct sunshine.
Basic Equipment for Field Sampling

Listed below is some basic equipment appropriate for any volunteer field activity.

• Boots or waders
• “Field Clothes” - long sleeves and pants are best
• Rubber gloves
• Insect repellent/sunscreen
• Drinking water
• Clipboard
• Several pencils
• Tape measure
• Thermometer
• Field data sheet
• Camera and film, to document particular conditions
Questions?