Enhancing Credibility in Volunteer Monitoring Programs

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Volunteer Monitors Are Community Educators
Volunteer Monitors Are Citizen Scientists

Characteristics of Successful Volunteer Water Quality Monitoring Programs . . .

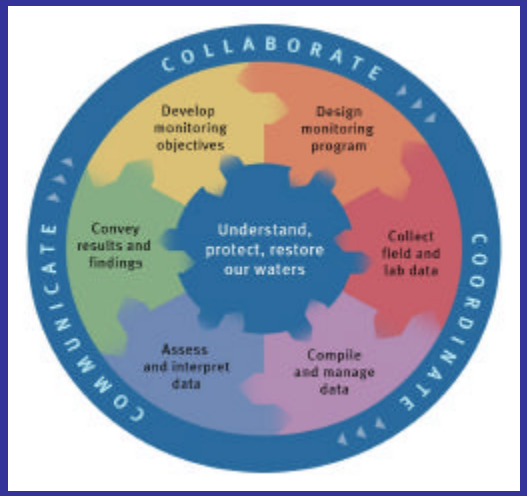
- Well-organized
- Sound scientific basis
- Report results
- Strong institutional support
- Make a difference

Successful Programs Have a Sound Scientific Basis

- Clear monitoring goals and questions
- Written study design
- Clear documentation of instructions for all monitoring activities
- Monitoring scope and complexity is appropriate to their capabilities
- QA appropriate for data use

National Facilitation Project factsheet: *Designing Your Monitoring Strategy*

Important Questions to Consider



- **Why** do you want to monitor?
- **Who** will use the data?
- **How** will the data be used?
- **How good** do the data need to be?
- **What resources** are available?
- **What type of monitoring** will you do?
- **Where** will you monitor?
- **When** will you monitor?

Modified from EPA Volunteer Stream Monitoring Methods

Why are you monitoring?

- Who will use the data?
- What will the data be used for?

The Continuum of Monitoring Data Use

Education/ Awareness → **Baseline, Problem ID, Assess Impairment, Local Decisions** → **Legal & Regulatory**

Increasing Time - Rigor - QA - Expense $$

Nat'l Dir. of Envir. Mon. Progs - 5th Ed.
Geoff Dates, River Network

World Water Monitoring Day

www.worldwatermonitoringday.org

Water Temperature pH

Turbidity/Clarity Dissolved Oxygen

Monitoring for Assessing Baseline Conditions

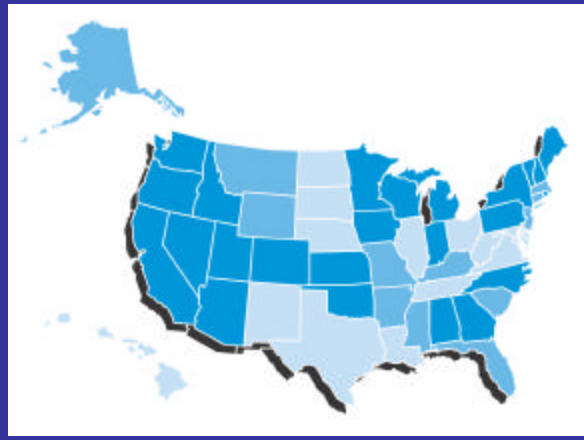
Volunteers typically use kits or send samples to professional laboratories.

Sampling and analytical methods used are generally comparable to those used by professionals.

Alabama Water Watch

IOWATER
Volunteer Water Quality Monitoring

Maine SHORE STEWARDS



GREAT BAY COAST WATCH
UNH COOPERATIVE EXTENSION / SEA GRANT

Cooperative Extension
URI
Watershed Watch
Natural Resources Science

VOLUNTEER WATER QUALITY MONITORING
National Facilitation Project

New England Regional Water Program

VOLUNTEER WATER QUALITY MONITORING
National Facilitation Project

www.usawaterquality.org/volunteer

Monitoring for Legal and Regulatory Purposes

Getting Started - Effectively

Having a well-defined purpose is critical to program success!

- Brainstorming
- Compiling information
- Assessing what is possible
- Developing a vision stateme
- Setting goals and objectives

Resources to Get You Started

How to Use the Guide to Growing CSREES Volunteer Monitoring Programs

Each section of the Guide to Growing CSREES Volunteer Monitoring Programs will contain numerous links to available resources. Listed here are a number of manuals that provide a framework for developing programs that should be part a monitoring coordinator's basic library.

Volunteer monitoring resources available from United States Environmental Protection Agency (USEPA):

Starting Out in Volunteer Water Monitoring, Factsheet http://www.epa.gov/owow/monitoring/volunteer/startmon.html (available in PDF 837 KB)

Volunteer Water Monitoring: A Guide for State Managers. EPA 440-4-090-010, August 1990.

Volunteer Lake Monitoring: A Methods Manual. EPA 440/4-91-002, December 1991. http://www.epa.gov/owow/monitoring/lakevm.html (available in PDF, 868 Kb)

Volunteer Estuary Monitoring: A Methods Manual. EPA 842-B-93-004, December 1993. http://www.epa.gov/owow/estuaries/monitor/ (available in PDF)

Volunteer Monitor's Guide to Quality Assurance Project Plans. EPA 841-B-96-003, September 1996. http://www.epa.gov/owow/monitoring/volunteer/qapjcover.htm (available in PDF, 147 Kb).

Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003, November 1997. http://www.epa.gov/owow/monitoring/volunteer/stream/ (available in PDF 4 Mb)

Volunteer Wetland Monitoring: An Introduction and Resource Guide. EPA 843-B-00-001, December 2001. http://www.epa.gov/owow/wetlands/monitor/volmonitor.html (available in PDF 1.5Mb and 256 Kb versions).

The Volunteer Monitor, published twice yearly, is the national newsletter of volunteer water monitoring. The newsletter facilitates the exchange of ideas, monitoring methods, and practical advice among volunteer monitoring groups across the country. Subscriptions are free, and issues since 1993 are available online as PDFs at http://www.epa.gov/owow/monitoring/volunteer/issues.htm

Regional and state programs guides:

Environmental Stewardship in the Gulf of Maine: A Coordinator's Manual for Volunteer Monitoring (2002) Available for $20 through the University of Maine Cooperative Extension. To order contact the UMCE by phone (1-800-287-0274 (in Maine) or (207) 581-3269) or by mail at: UMCE Communications Office, 5741 Libby Hall, Room 110, Orono, ME 04469-5741.

Field Manual for Global Low-Coast Water Quality Monitoring, 12th edition (2000) Stapp, William B., Mitchell, Mark K. To obtain a copy contact: Kendall/Hunt Publishing Company, 4050 Westmark Drive, PO Box 1840, Dubuque, Iowa 52004-1840. 1-800-228-0810.

Massachusetts Water Watch Partnership Lake Volunteer Water Quality Manual. (2003) Available in PDF at: http://www.umass.edu/tei/mwwp/acrobat/lake%20manual.pdf

Pennsylvania Citizens' Volunteer Monitoring Program *Designing Your Monitoring Program: A Technical Handbook for Community-Based Monitoring in Pennsylvania*. (2001) Dates, Geoff. River Network. Available in PDF at: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/cvmp/initiatives/cvmp_HdBook.htm

Program Organizing Guide (1995) and *River Monitoring Study Design Workbook* (1995). Available for $10 each through the River Network: http://www.rivernetwork.org/marketplace/category.cfm?Category=6

Riparian and Aquatic Ecosystem Monitoring: A Manual of Field and Lab Procedures, 4th edition (2003). Available for $30 + shipping and handling through Student Watershed Research Project: http://www.swrp.org/Publications/Manual/manual_main.htm.

VEMN Guide to Volunteer Watershed Monitoring Options in the Merrimack River Watershed (1996). Available in PDF at: http://www.umass.edu/tei/mwwp/library/bytopic.html#ecology, select VEMN under the 'By Source' section at the top of the page for access to the PDF files.

A search of the World Wide Web will result in many more similar references; but these will get you started!

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USDA National Facilitation of CSREES Volunteer Monitoring Efforts Website http://www.usawaterquality.org/volunteer/

Getting Started: finding Resources in the *CSREES Guide*...

Useful Sources to Locate Methods

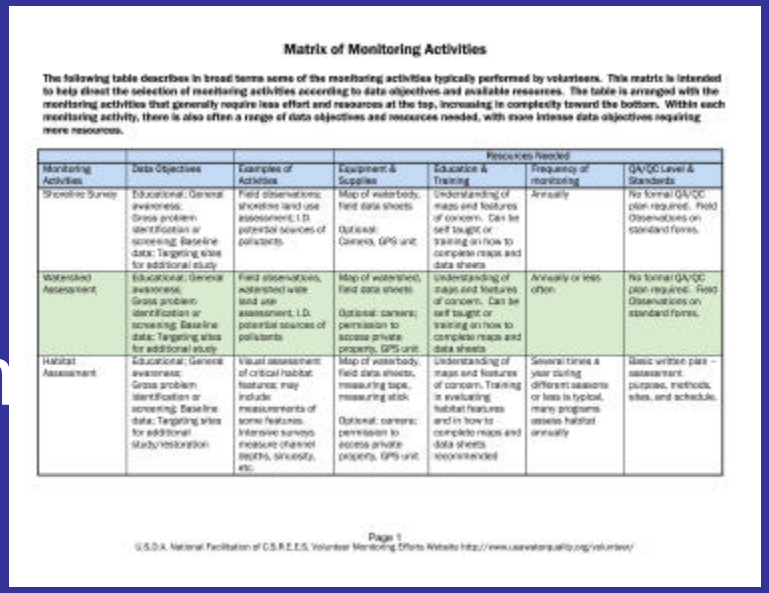
- EPA Guidance Manuals
- The *Volunteer Monitor* newsletter
- LaMotte/Hach kits and catalog
- Volunteer Program websites
- Volunteer monitoring listservs
- Secchi Dip-In website (http://dipin.kent.edu/)
- Standard Methods for the Examination of Water and Wastewater

Don't re-invent the monitoring method!

Assessing What is Possible

Consider

- Skills and knowledge
- Financial resources
- Potential data uses an
- Level of commitment



Matrix of Monitoring Activities

The following table describes in broad terms some of the monitoring activities typically performed by volunteers. This matrix is intended to help direct the selection of monitoring activities according to data objectives and available resources. The table is arranged with the monitoring activities that generally require less effort and resources at the top, increasing in complexity toward the bottom. Within each monitoring activity, there is also often a range of data objectives and resources needed, with more intense data objectives requiring more resources.

			Resources Needed			
Monitoring Activities	Data Objectives	Examples of Activities	Equipment & Supplies	Education & Training	Frequency of monitoring	QA/QC Level & Standards
Shoreline Survey	Educational; General awareness; Gross problem identification or screening; Baseline data; Targeting sites for additional study	Field observations; shoreline land use assessment; I.D. potential sources of pollutants	Map of waterbody; field data sheets Optional: Camera, GPS unit	Understanding of maps and features of concern. Can be self taught or training on how to complete maps and data sheets	Annually	No formal QA/QC plan required. Field Observations on standard forms.
Watershed Assessment	Educational; General awareness; Gross problem identification or screening; Baseline data; Targeting sites for additional study	Field observations, watershed wide land use assessment, I.D. potential sources of pollutants	Map of watershed; field data sheets Optional: camera; permission to access private property, GPS unit	Understanding of maps and features of concern. Can be self taught or training on how to complete maps and data sheets	Annually or less often	No formal QA/QC plan required. Field Observations on standard forms.
Habitat Assessment	Educational; General awareness; Gross problem identification or screening; Baseline data; Targeting sites for additional study/restoration	Visual assessment of critical habitat features; may include measurements of some features. Intensive surveys measure channel depths, sinuosity, etc.	Map of waterbody; field data sheets, measuring tape, measuring stick Optional: camera; permission to access private property, GPS unit	Understanding of maps and features of concern. Training in evaluating habitat features and in how to complete maps and data sheets recommended	Several times a year during different seasons or less is typical, many programs assess habitat annually	Basic written plan – assessment purpose, methods, sites, and schedule.

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U.S.D.A. National Facilitation of C.S.R.E.E.S. Volunteer Monitoring Efforts Website http://www.uaswaterquality.org/volunteer/

National Facilitation Project matrix;
EPA Stream Monitoring Methods, p. 42

Credibility doesn't mean having the most exacting techniques. It means delivering on your promises, no matter how small or large they are.

-Meg Kerr
RI River Rescue

QA/QC:
The Monitoring Conundrum

"Any conclusions reached as a result of tests or analytical determinations are charged with uncertainty. No test or analytical method is so perfect, so unaffected by the environment or other external contributing factors, that it will always produce exactly the same test or measurement result or value."

VARIABILITY HAPPENS

Data Quality System

- **Before: Plan your Quality Assurance**
  "the broad plan for maintaining overall quality"
  (study design, QAPP, training materials)

- **During: Implement your Quality Control**
  "mechanisms to control errors & increase accuracy"
  (training, follow procedures,proficiency testing)

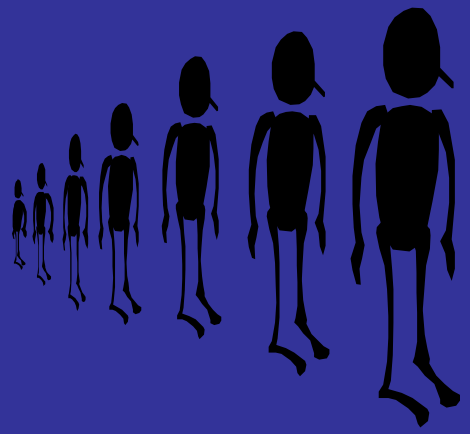
- **After: Conduct your Quality Assessment**
  "review , evaluate, correct, reconcile"

Managing Variability

National Facilitation Project factsheet: *Building Credibility: QA/QC for Volunteer Monitoring Programs*

Quality Is Assured Through:

- Training and more training
- Written monitoring procedures
- Repetition (replicate and duplicate sampling)
- Routine sampling
- Monitoring multiple indicators
- QA/QC field and laboratory testing
- Adhering to established procedures
- Addressing your volunteers' questions



QA/QC:
Data Quality Objectives (DQO)

- What level of quality do your data need to be?
  - ✓ Sensitivity
  - ✓ Detection Limits
  - ✓ Precision
  - ✓ Accuracy (bias)
  - ✓ Representativeness
  - ✓ Comparability
  - ✓ Completeness

Sensitivity

- Ability to differentiate between different measurement levels, also referred to as **resolution**
- Example: pH
  - Litmus paper (acid or base)
  - Test strips (single units to 0.2 units)
  - Color comparators (wide range-units, narrow 0.1unit)
  - Pocket pH testers (0.1 unit)
  - Laboratory instruments (0.02 units, may read to 0.001 units)

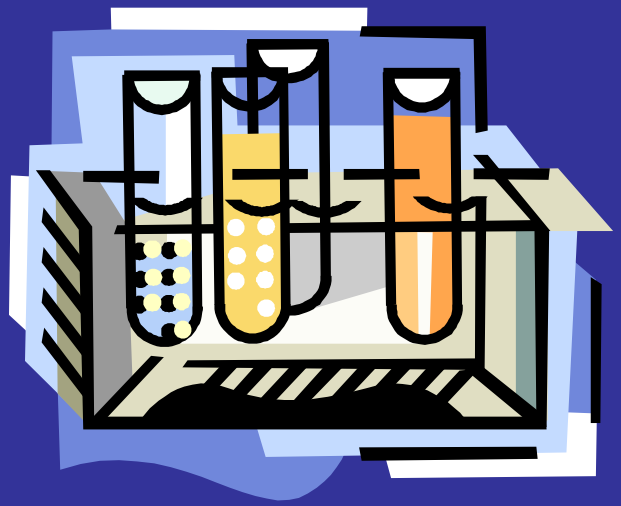
Detection Limit

- The lowest concentration of a given constituent that can be detected and reported as > 0.
- Example: measuring phosphorus
  - “TesTabs” 0,1,2,3,4 ppm –whole numbers
  - Color comparator 0 0.2, 0.4, 0.6 ppm
  - Spectrophotometer – > 3 ppb (0.003 ppm)

P in NE lakes is <0.003 – 0.1 ppm, High P is > 0.026 ppm P

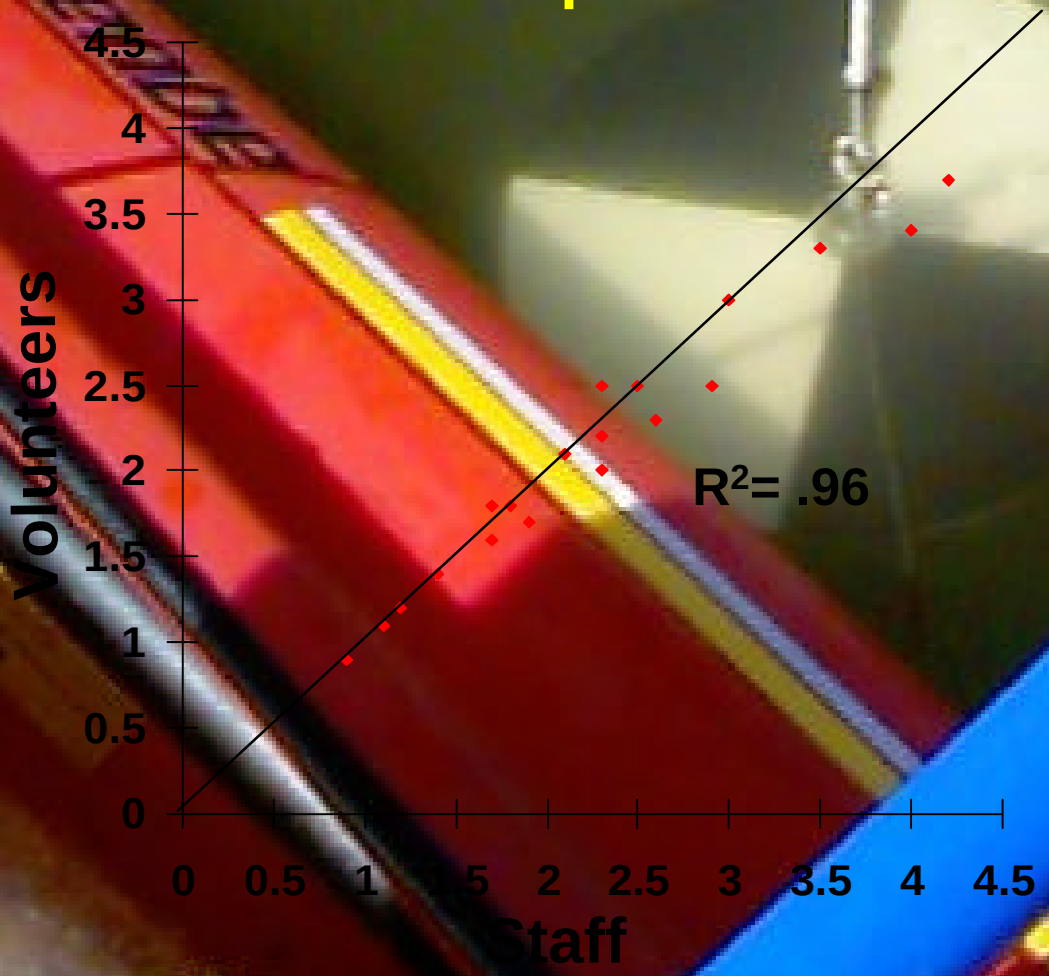
QA/QC:
Minimizing Bias (aka Improving Accuracy)

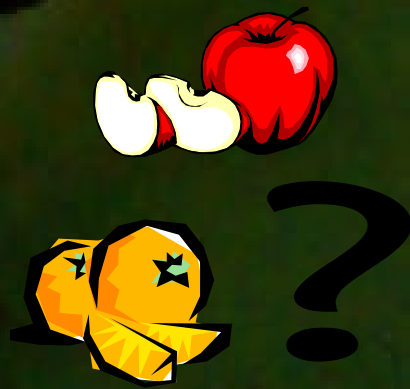
- Analyze blanks (field and lab)
- Analyze samples of known concentrations (standards)
- Participate in performance audits (from outside source)
- Collect & analyze duplicates
- Replicate 10-20% of samples
- New analysis >= 7 times
- Check against other methods



Extent of Comparability

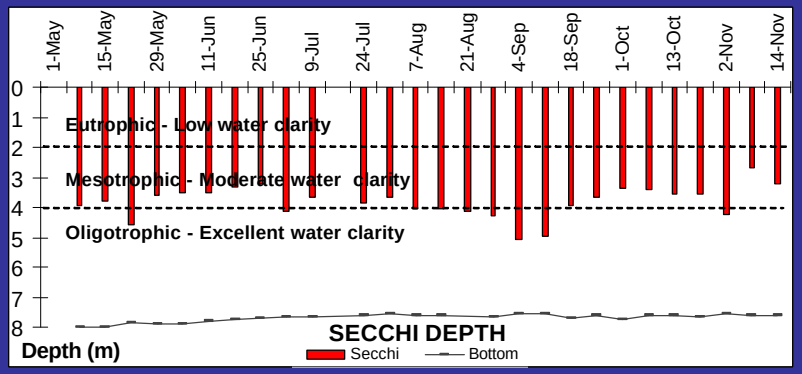
- methods, results, past studies, professionals

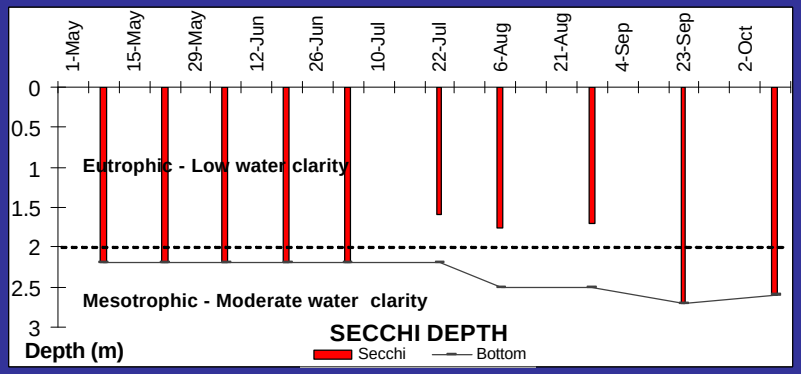


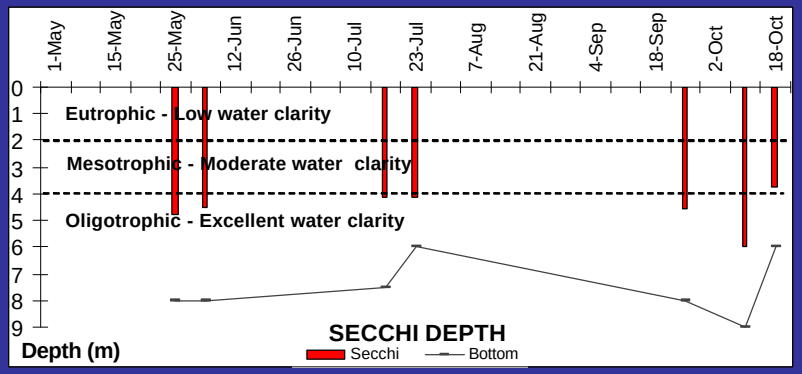


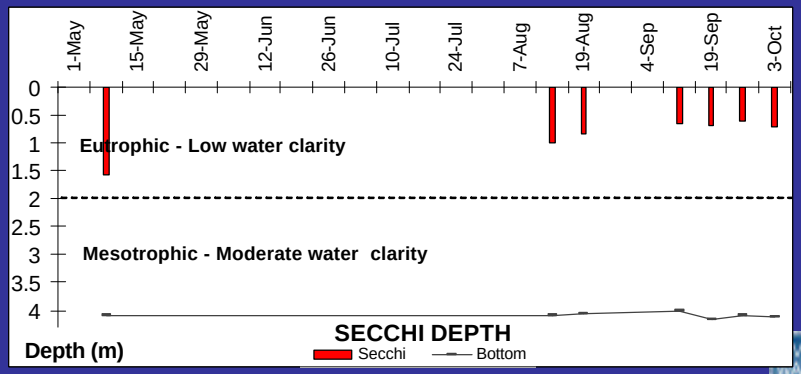
Completeness

comparison between the amount of data you planned to collect versus how much usable data you collected



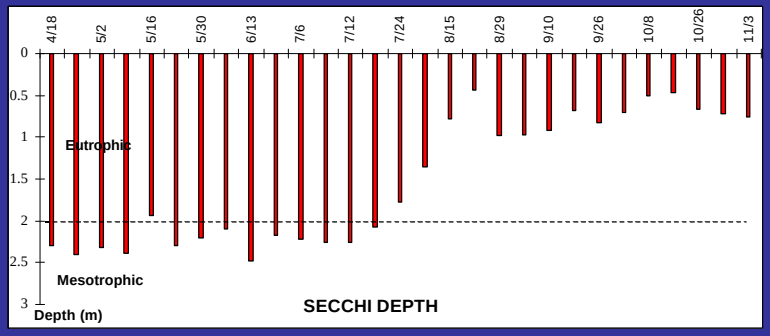


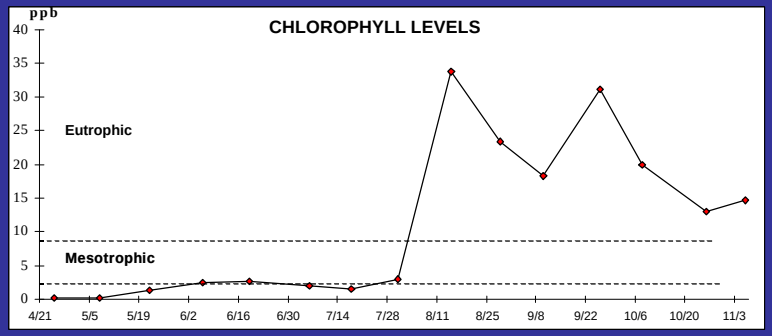




Representativeness

- The extent to which measurements actually depict the true environmental condition or population being evaluated
  - data collected at a site just downstream of an outfall may not be representative of an entire stream, but it may be representative of sites just below outfalls





The most important factor determining the level of quality is the cost of being wrong.

The most important factors determining the level of quality are *the benefits of being correct!*

THANKS!