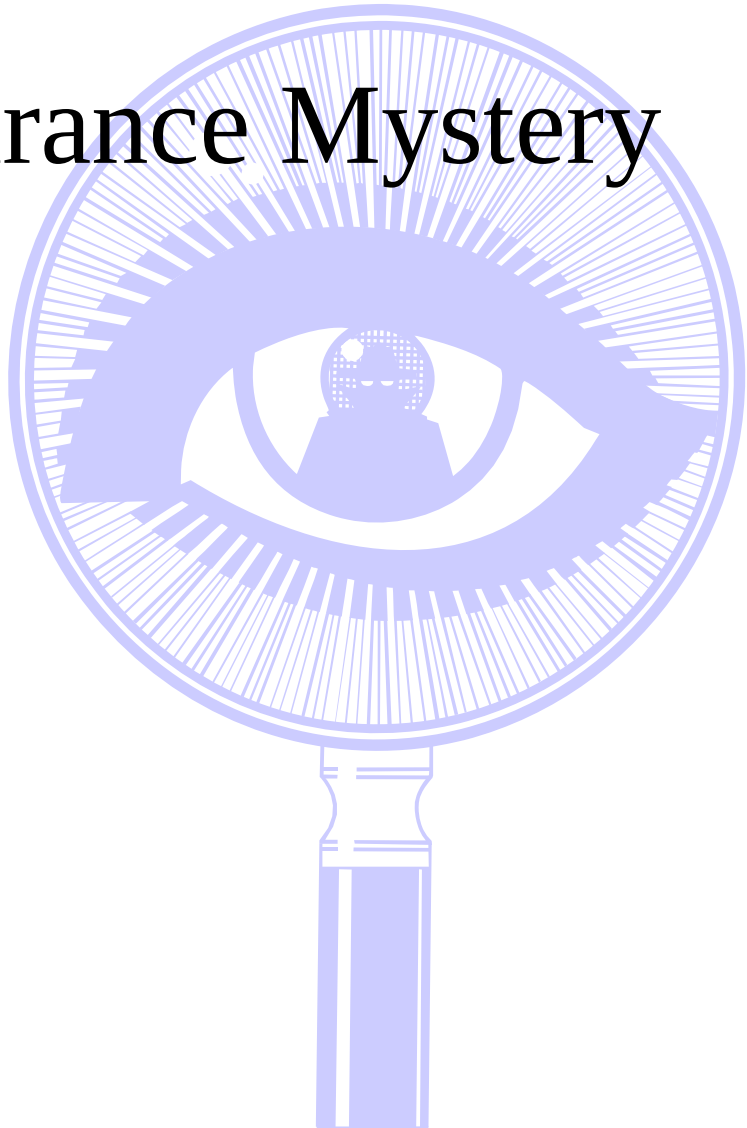
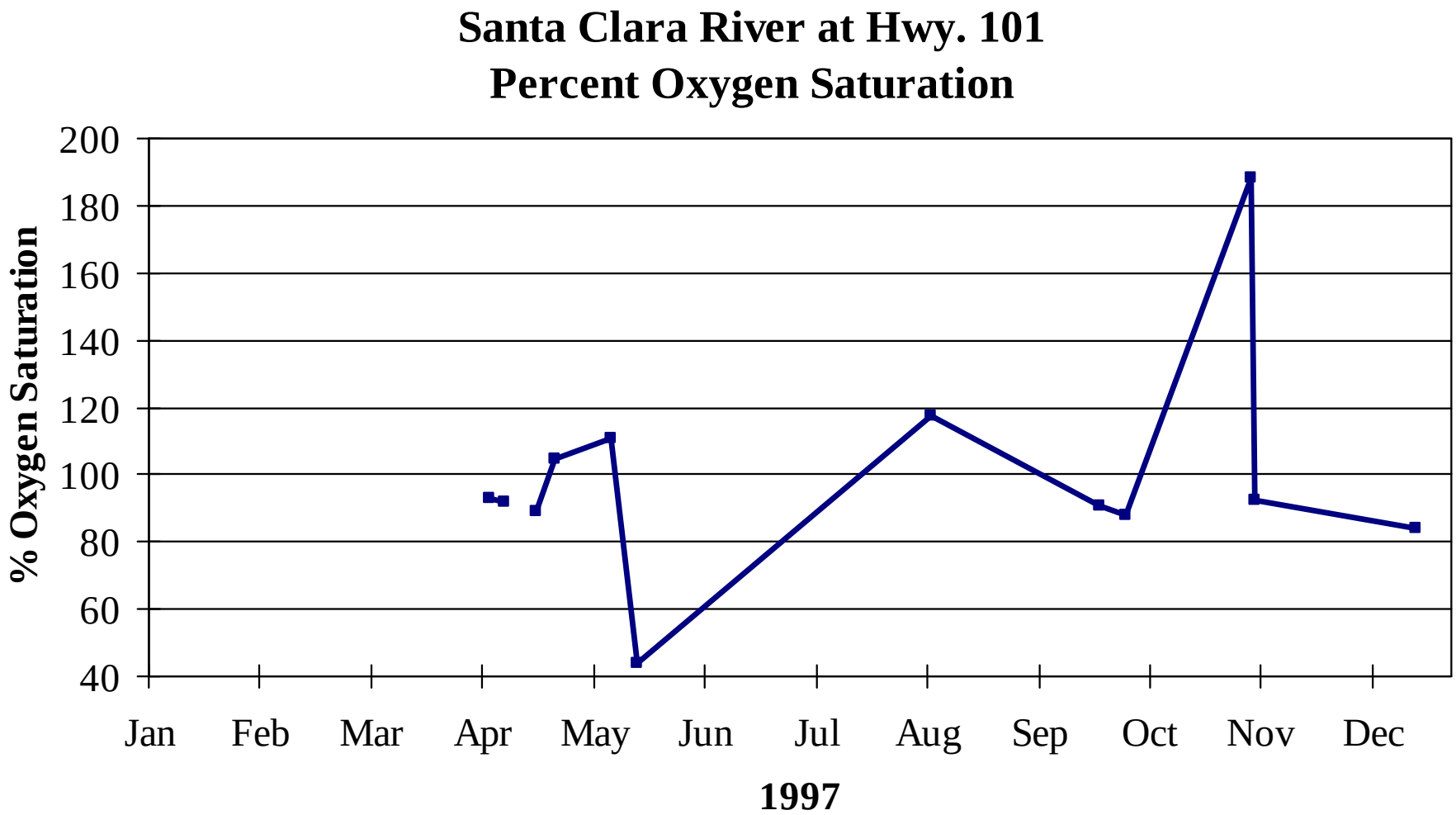
The Quality Assurance Mystery



The Plot

- You sample your creek, estuary, or ocean
- You measure bacteria, chemistry, bugs
- You write down your results, then plot them

The Facts?


Santa Clara River at Hwy. 101
Percent Oxygen Saturation
% Oxygen Saturation
200
180
160
140
120
100
80
60
40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1997

Detective QA

Should I believe the evidence in front of me?

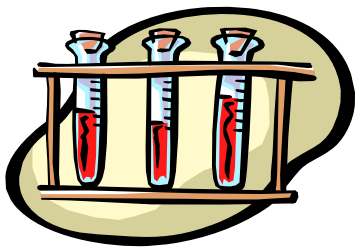
- Is the D.O. really that low?
- Are the nitrate levels really that high?
- Do these total coliform values mean there is a risk to swimmers?

Sleuthing for the Truth

- Did we follow the procedures?
- Did we calibrate the equipment?
- Did we sample the correct site?
- Did we take replicate samples?
- Did we compare to chemical standards?

The Usual Suspects

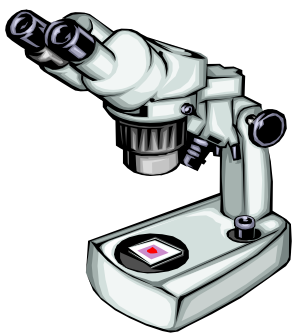
Sample



Reagents

Indicator/Chemical

Volunteer / Analyst

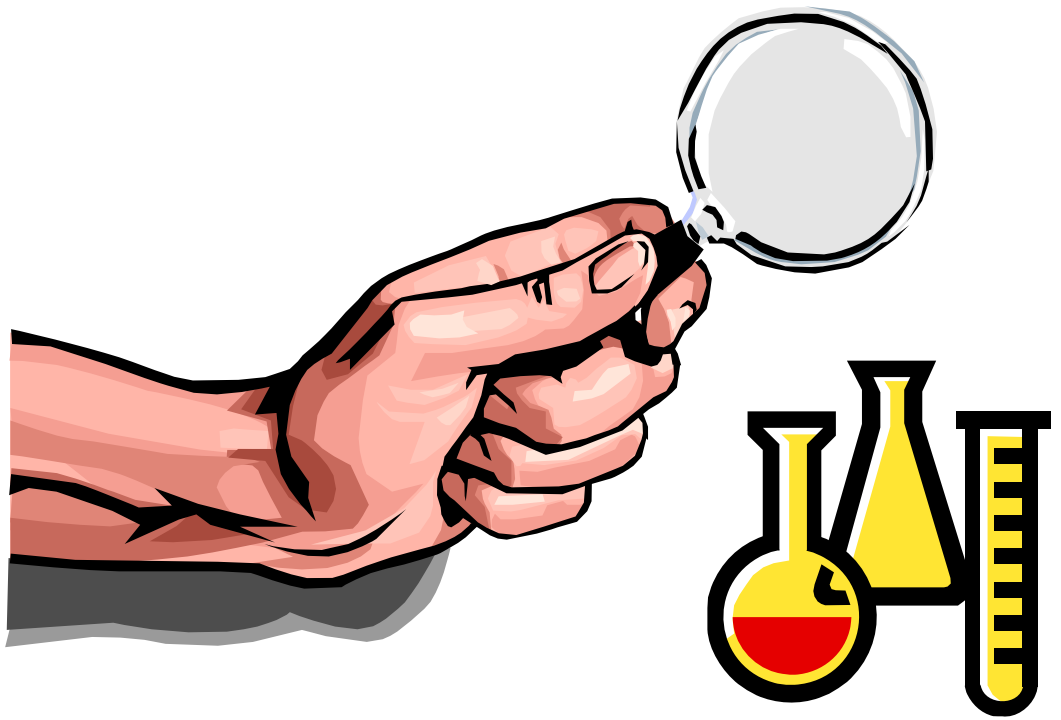


Equipment

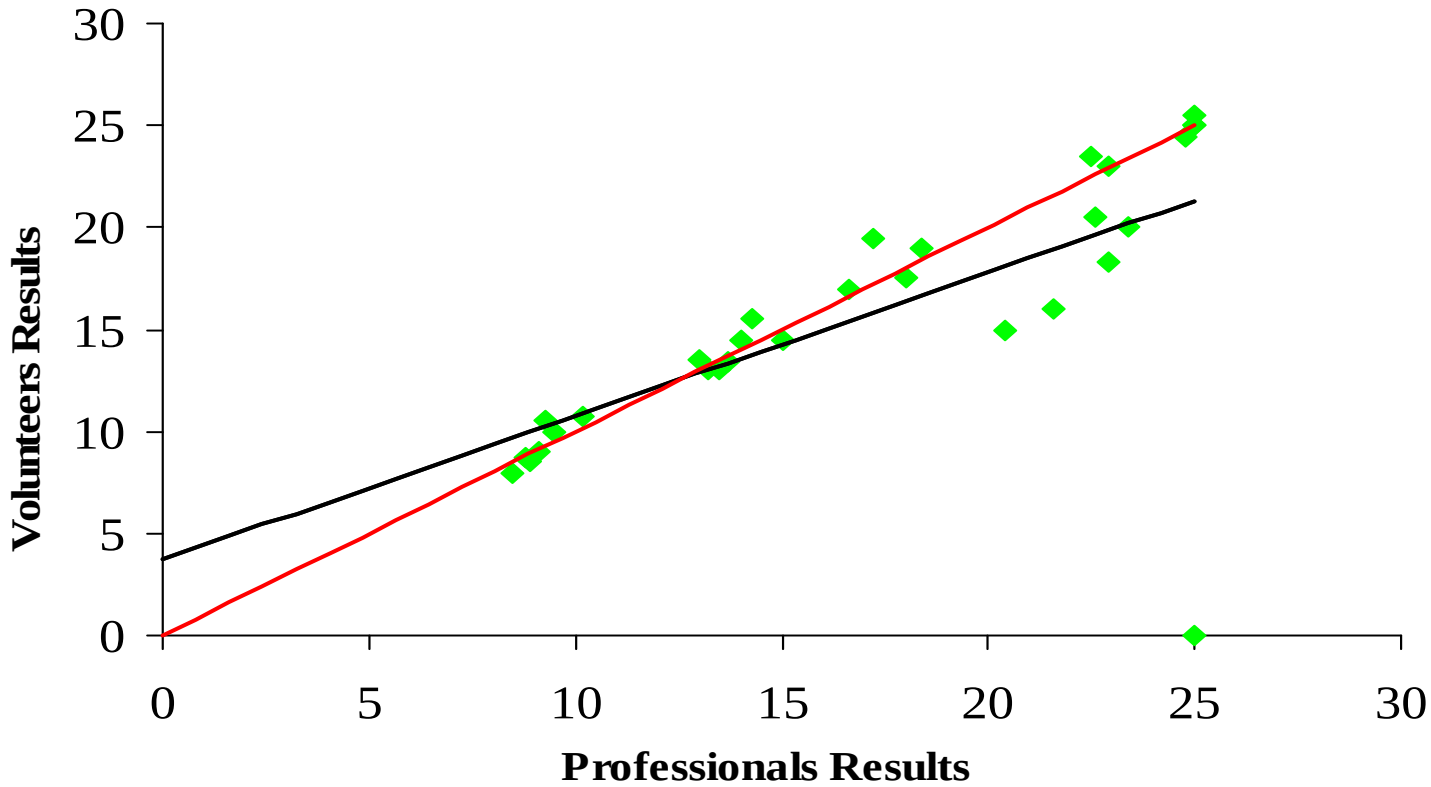
Data Errors

The Evidence

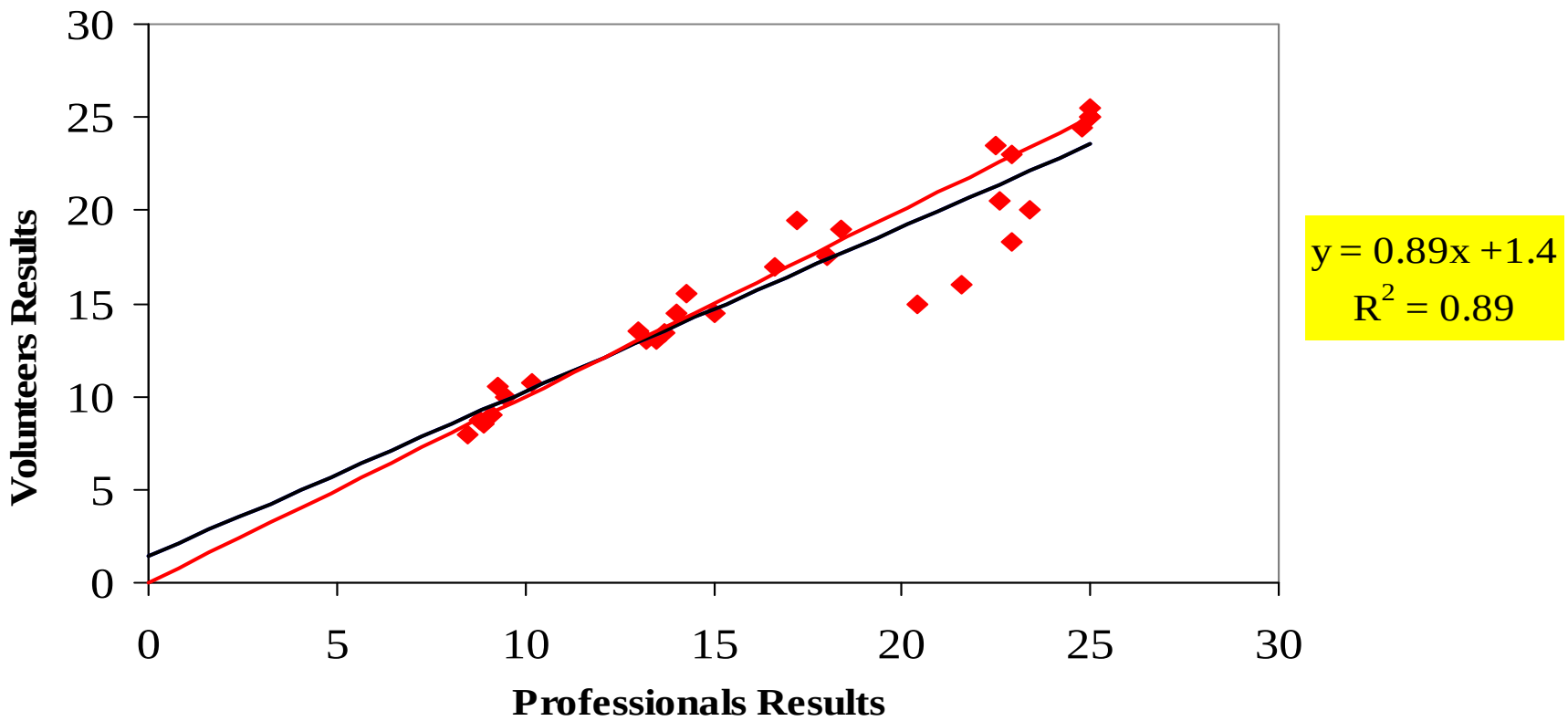
- Accuracy
- Precision
- Sensitivity
- Representativeness
- Comparability



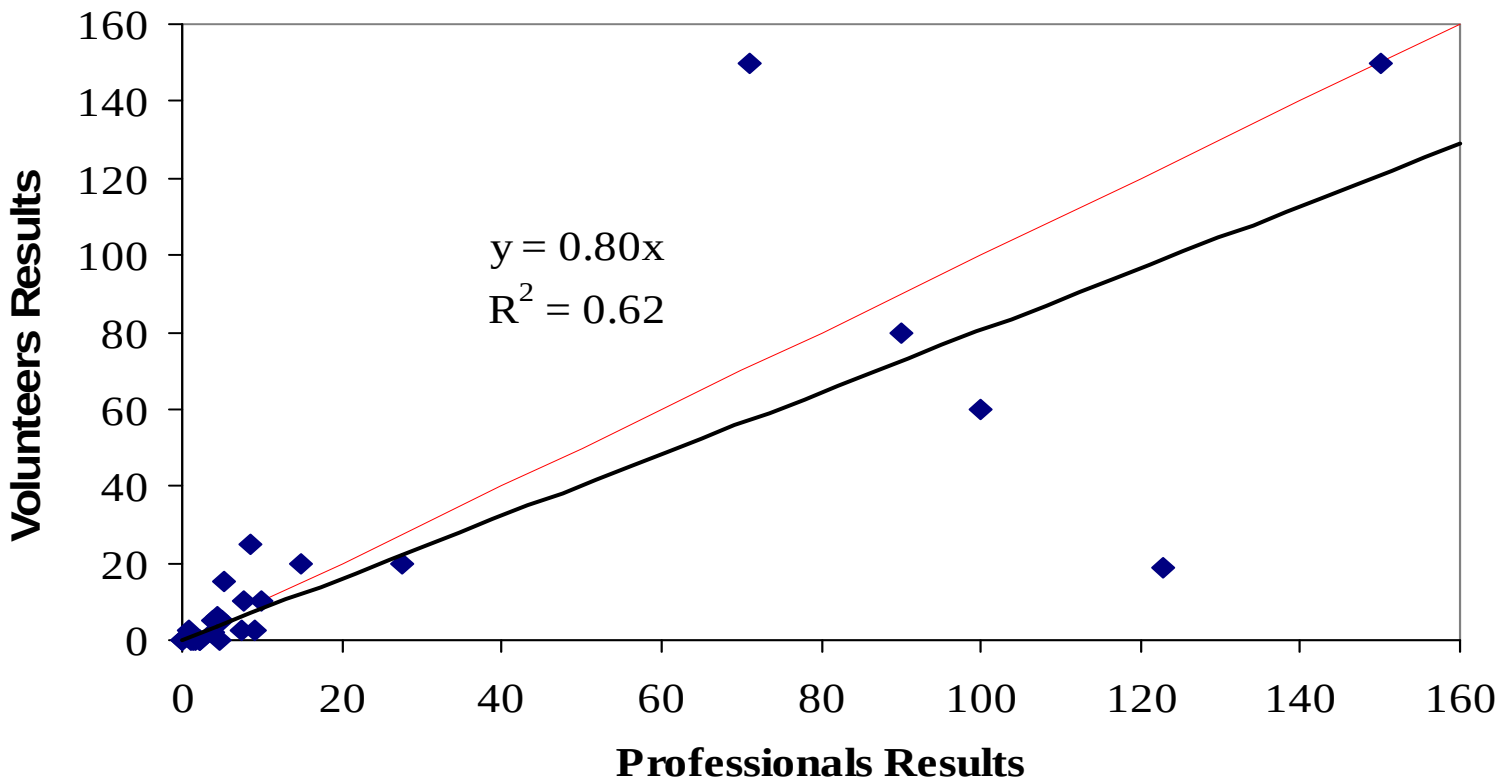
Example of Data Error
Temperature Data



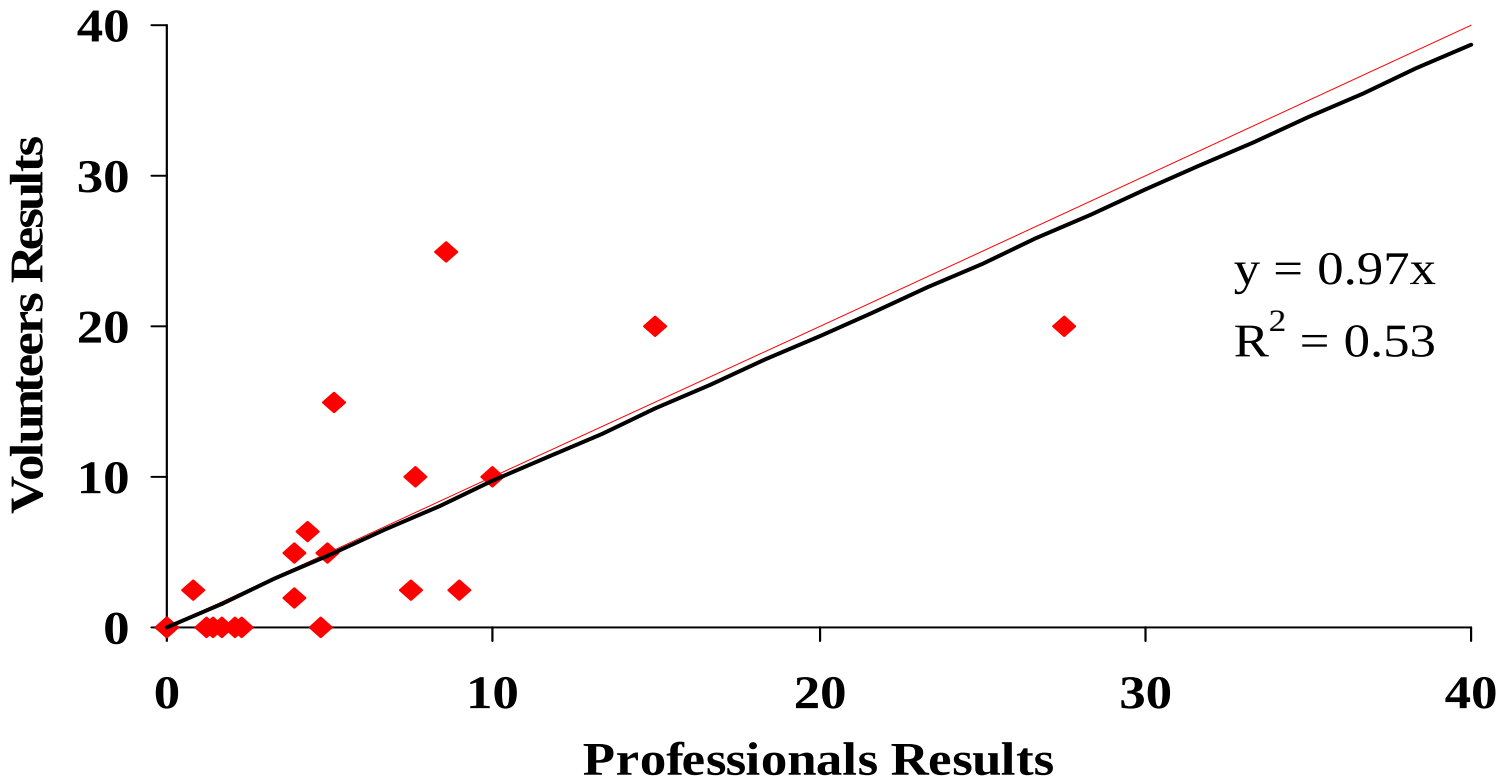
Temperature Data



Example of Method Error: Turbidity



Example of Method Error: Turbidity



Bacterial Indicators

Indicator	Illness
Total coliform	Skin rash
Fecal coliform	Skin rash
E. coli	Earache Nasal Congestion
Enterococcus	Diarrhea with blood Gastrointestinal symptoms (Type 1)
Ratio of total to fecal coliform	Diarrhea Gastrointestinal symptoms (Type 2)
Ratio of total coliform to enterococcus	Nausea Diarrhea Gastrointestinal symptoms (Types 1 and 2)

Detective QA

- Quality Assurance: All the things you do to ensure that your data are adequate to meet your goals

QA

Choosing the appropriate:

- method
- indicator
- sampling sites
- quality control procedures

QA Plan

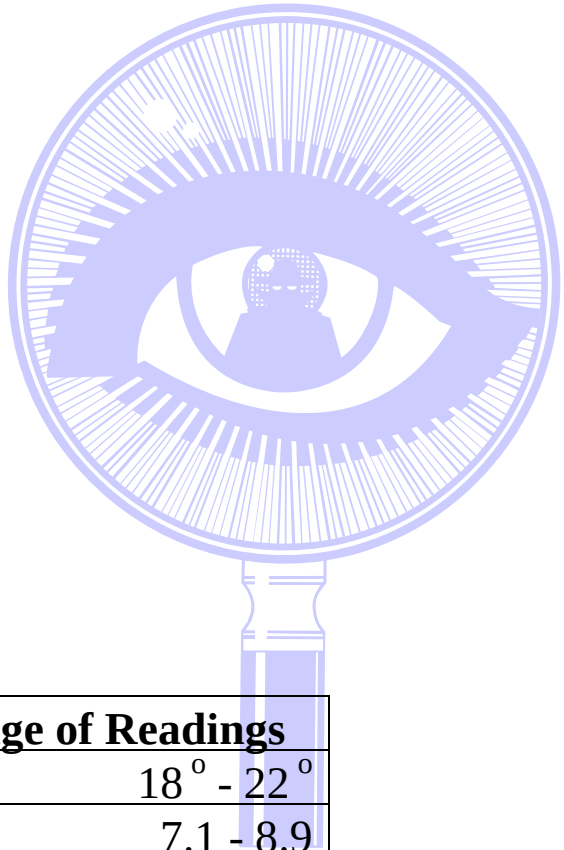
Describes all the steps you take to ensure good quality data

- program organization
- monitoring goals
- ***data quality objectives***
- data sampling techniques
- methods
- training
- equipment calibration
- comparison to standards, professionals
- data management
- reporting

How to get started with QA?

- Find technical advisors
- Talk to resource managers: decide on appropriate level of effort
- Review existing QA plans
- Revise QA plan to fit your needs
- Follow QA plan
- Ask for help

The Facts



Parameter	Bias (%)	SD (%)
Temperature	2	10
Dissolved Oxygen	4	11
pH	-2	5
Conductivity	5	18
Turbidity	4	94

EXAMPLES

Parameter	True	Average Reading	Range of Readings
Temperature	20^{o}	20.4^{o}	18^{o} - 22^{o}
Dissolved Oxygen	8 ppm	8.3 ppm	7.1 - 8.9
pH	8.0	7.8	7.6 – 8.4
Conductivity	200 uS	210 uS	164 - 236
Turbidity	15 JTU	15.6JTU	1-29