Water Quality Sampling on Lake Mead, Arizona – Nevada: Interagency Sampling Events to Facilitate the Comparability of Data

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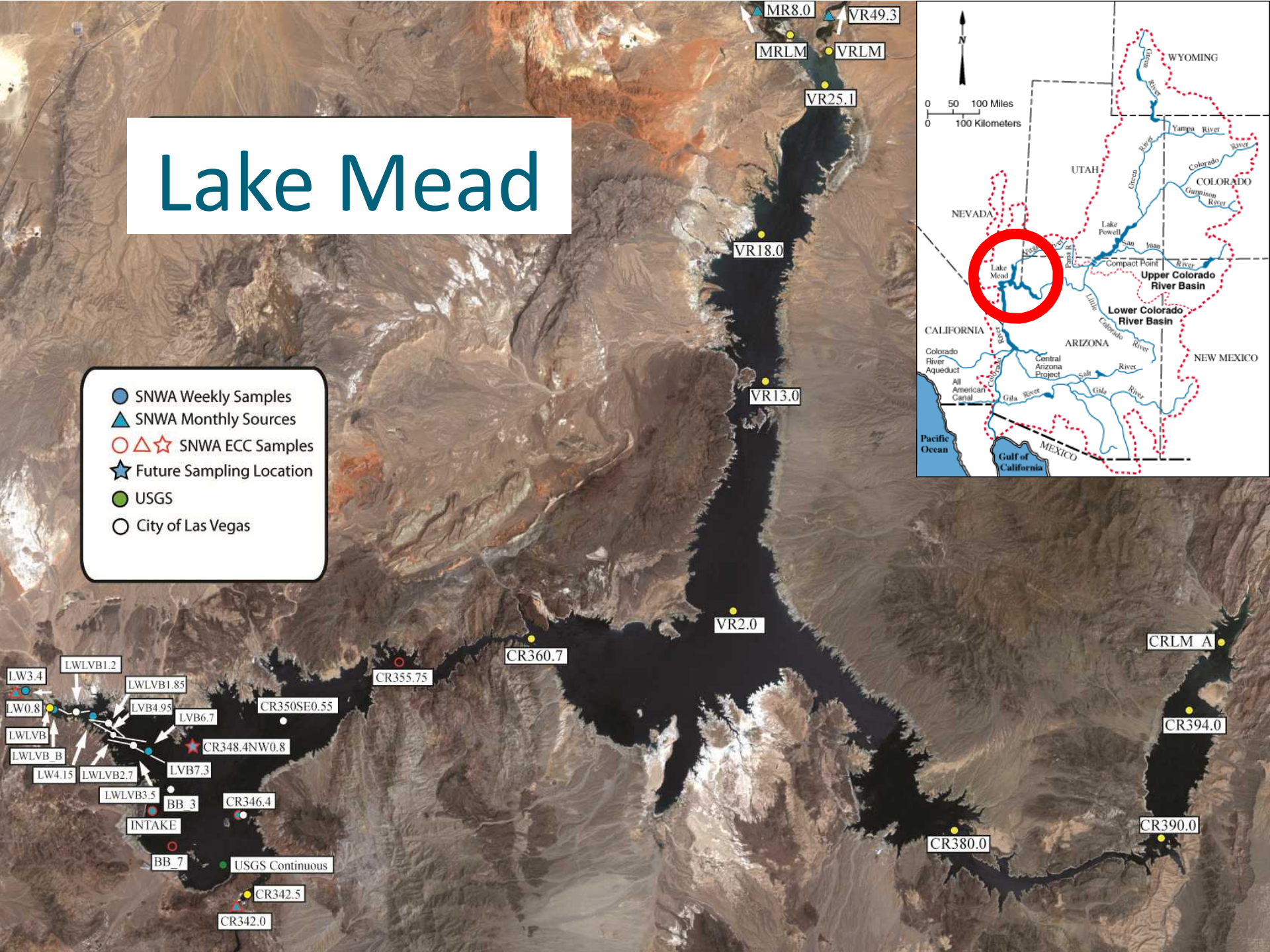
Lake Mead


SNWA Weekly Samples
SNWA Monthly Sources
SNWA ECC Samples
Future Sampling Location
USGS
City of Las Vegas
MR8.0
VR49.3
MRLM
VRLM
VR25.1
VR18.0
VR13.0
VR2.0
CR360.7
CR355.75
CR350SE0.55
CR348.4NW0.8
CR346.4
CR342.5
CR342.0
CRLM_A
CR394.0
CR390.0
CR380.0
LW3.4
LW0.8
LWLVB
LWLVB_B
LW4.15
LWLVB1.2
LWLVB1.85
LVB4.95
LVB6.7
LWLVB2.7
LVB7.3
LWLVB3.5
BB_3
INTAKE
BB_7
USGS Continuous
N
0 50 100 Miles
0 100 Kilometers
WYOMING
UTAH
COLORADO
NEVADA
CALIFORNIA
ARIZONA
NEW MEXICO
Lake Powell
Lake Mead
Compact Point
Upper Colorado River Basin
Lower Colorado River Basin
Colorado River Aqueduct
Central Arizona Project
All American Canal
Pacific Ocean
Gulf of California
MEXICO

Participants in the Interagency Partnership

- City of Henderson
- City of Las Vegas
- Clark County Water Reclamation District
- Clark County Regional Flood Control District
- Lake Mead National Recreation Area (NPS)
- Nevada Department of Environmental Protection
- Nevada Department of Wildlife
- Southern Nevada Water Authority
- United States Bureau of Reclamation
- United States Geological Survey

Participants in Field Sampling

- City of Henderson
- City of Las Vegas
- Lake Mead National Recreation Area (NPS)
- Southern Nevada Water Authority
- United States Bureau of Reclamation
- United States Geological Survey
- Manufacturers
  - Hydrolab, Eureka Environmental, YSI, In-Situ*
    - In-Situ instruments were provided by the manufacturer and are not regularly used by any of the participating agencies

Measurements

- Variable, depending on the sampling event
  - Temperature
  - pH
  - Specific Conductance
  - Dissolved Oxygen
    - Clark cell and Optical (technology varied by manufacturer probes and date of sampling)
- Surface to bottom (5 m intervals frequently)
- Coordinated equilibration time

Calibration

- Variable, depending on sampling event
- All parameters except temperature every time
- Generally followed the manufacturer's instructions
  - Completely independent calibration; independent standards and locations
  - Some coordination; common lot of standards, independent locations
  - Complete coordination, common container of standard, common location
  - “Forced” calibration, setting previously calibrated instruments to an average reading for all instruments

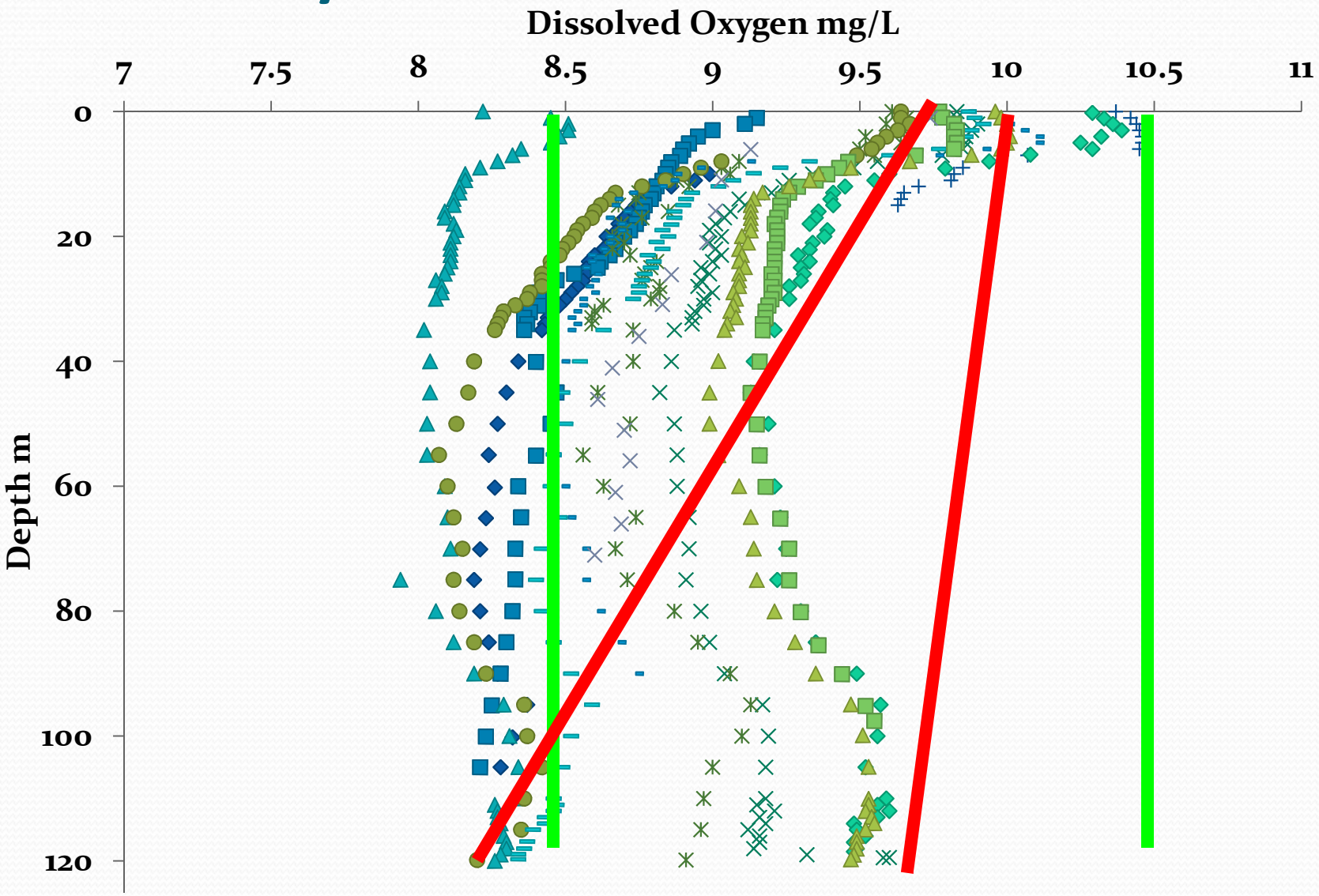
Calibration Results

- Calibration practices matter
- The greatest benefit to the group has arisen from the focus on careful adherence to protocol and to instrument servicing
- Improvements can be made by sharing calibration solutions
- Improvements can be made by completely coordinated calibration
- “Forced” calibration procedures are extremely useful in trying to assess issues
  - Reduces the impact of independent calibration
  - Limits the ability to address the “right” value

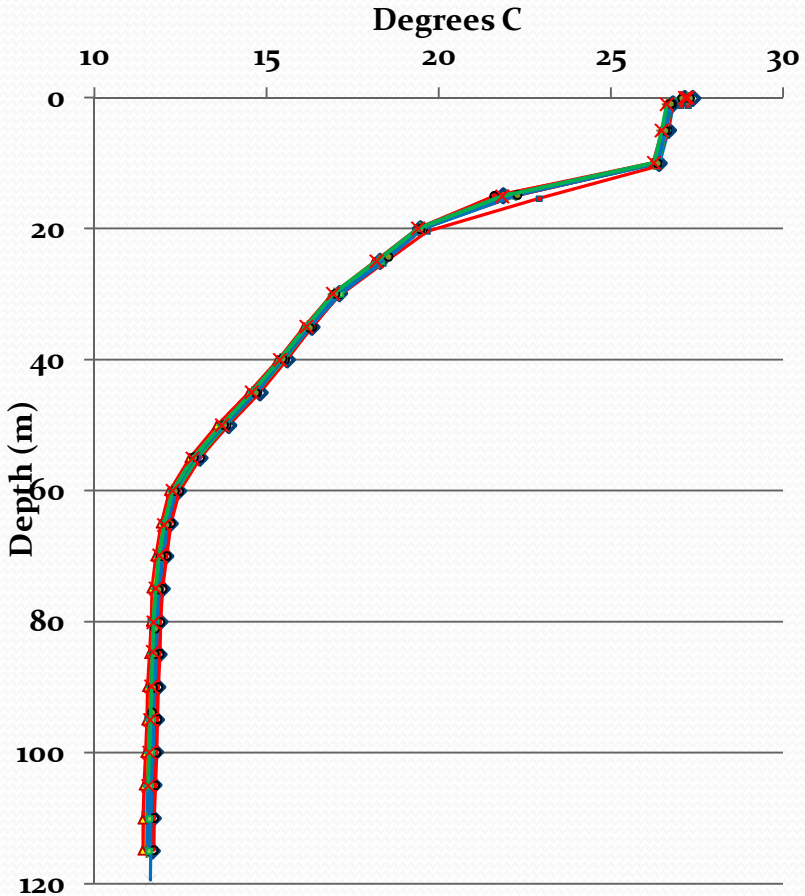
Lake Test

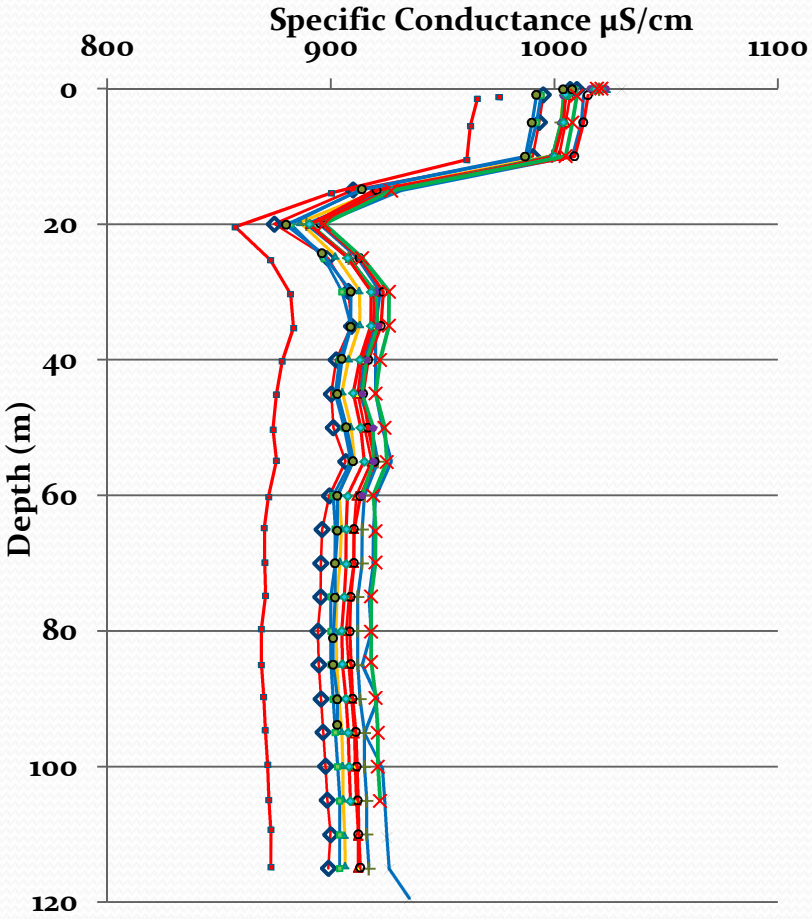
- Over time ~20 coordinated sampling events have been held at Lake Mead (bi-annual)
- Iterative process
  - Sampling event
  - Data review
  - “Problem” identification
  - Suggested solution implemented at the next sampling event

February 2008

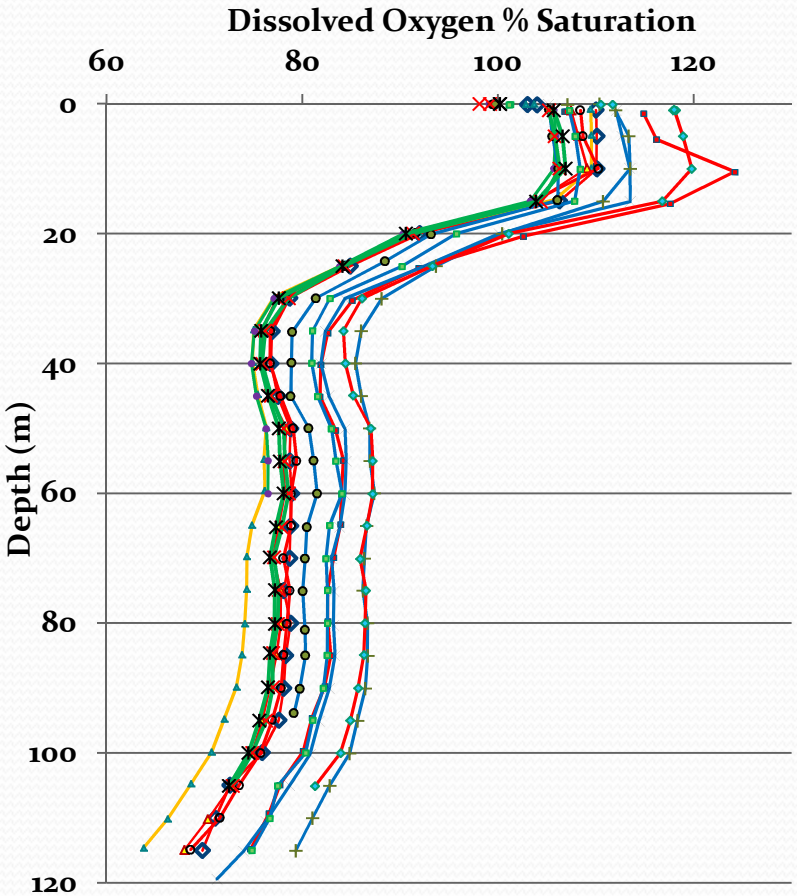


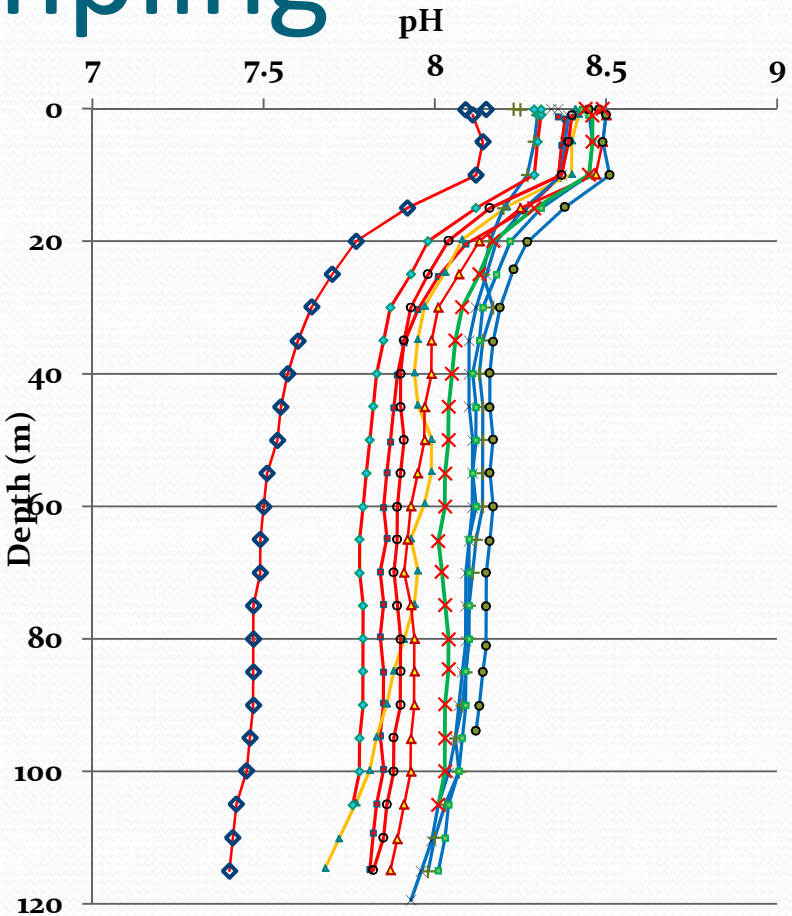
August 2011 Sampling





August 2011 Sampling

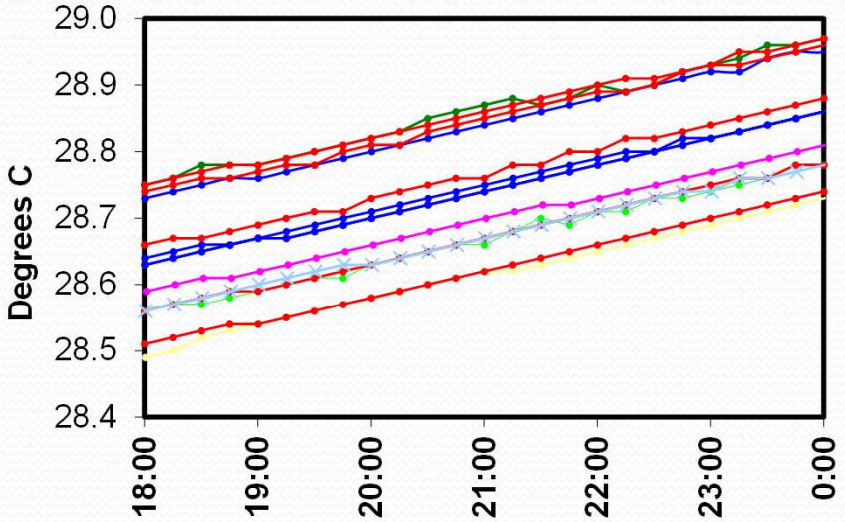


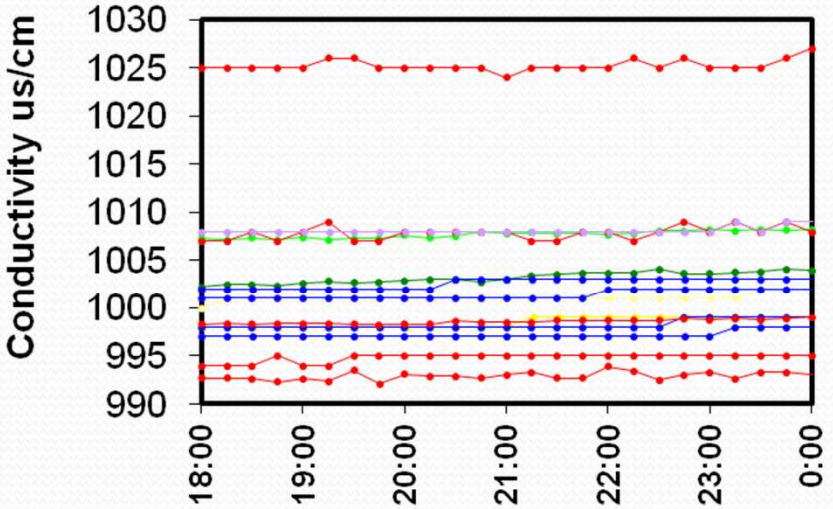


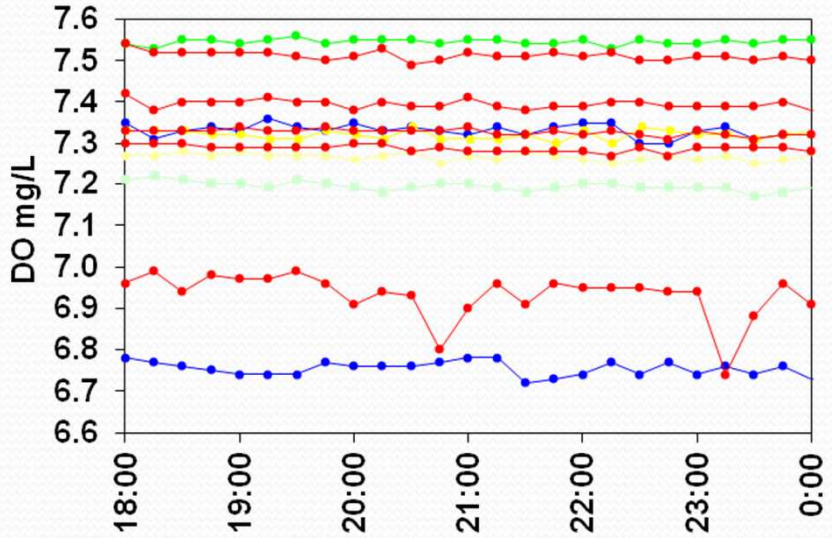
Tank Test

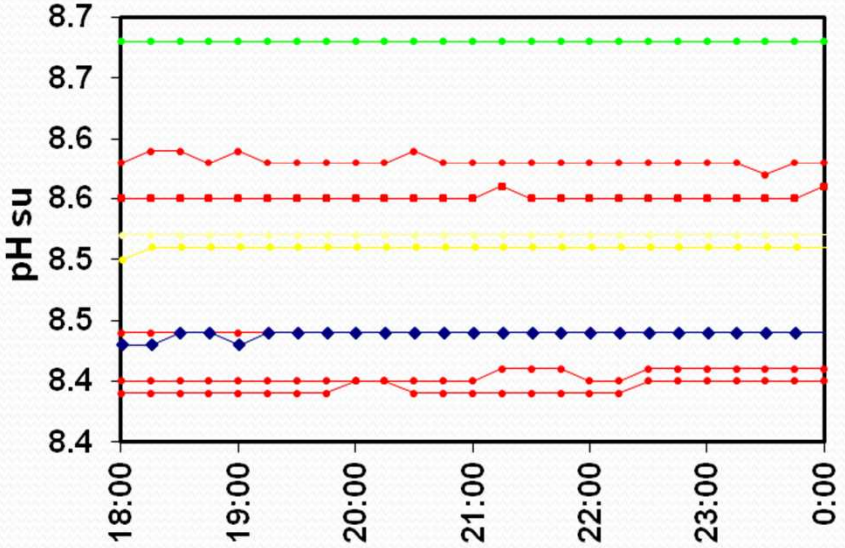
- Basics
  - Instruments put into the tank Thursday afternoon
  - Instruments set to collect data every 15 minutes
    - Temp, Sp Cond, pH, DO
    - Some instruments powered and on constantly (AC power), others came on to collect data (DC power)
- This test should identify underlying instability, if it exists

Tank Test Results

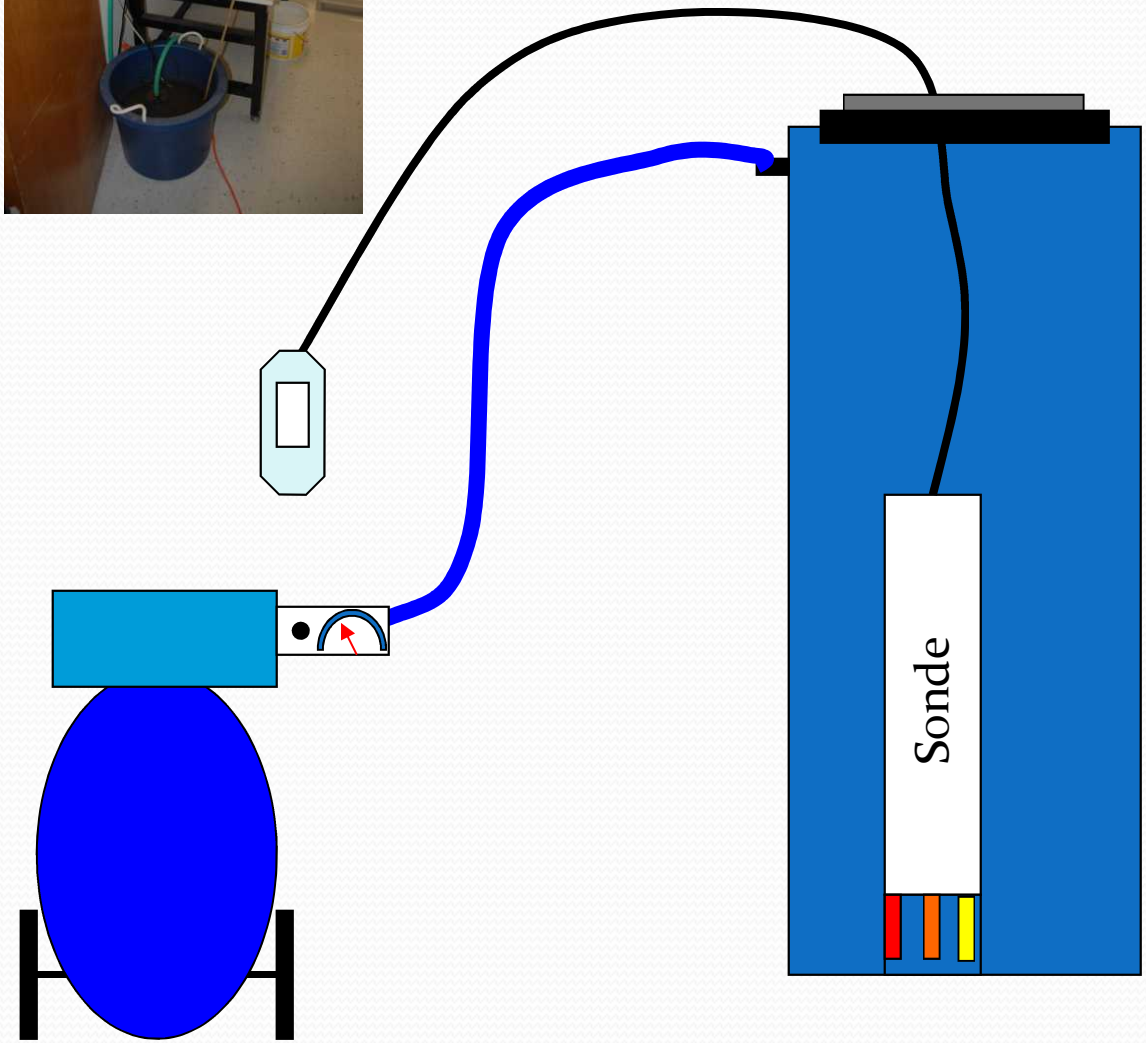




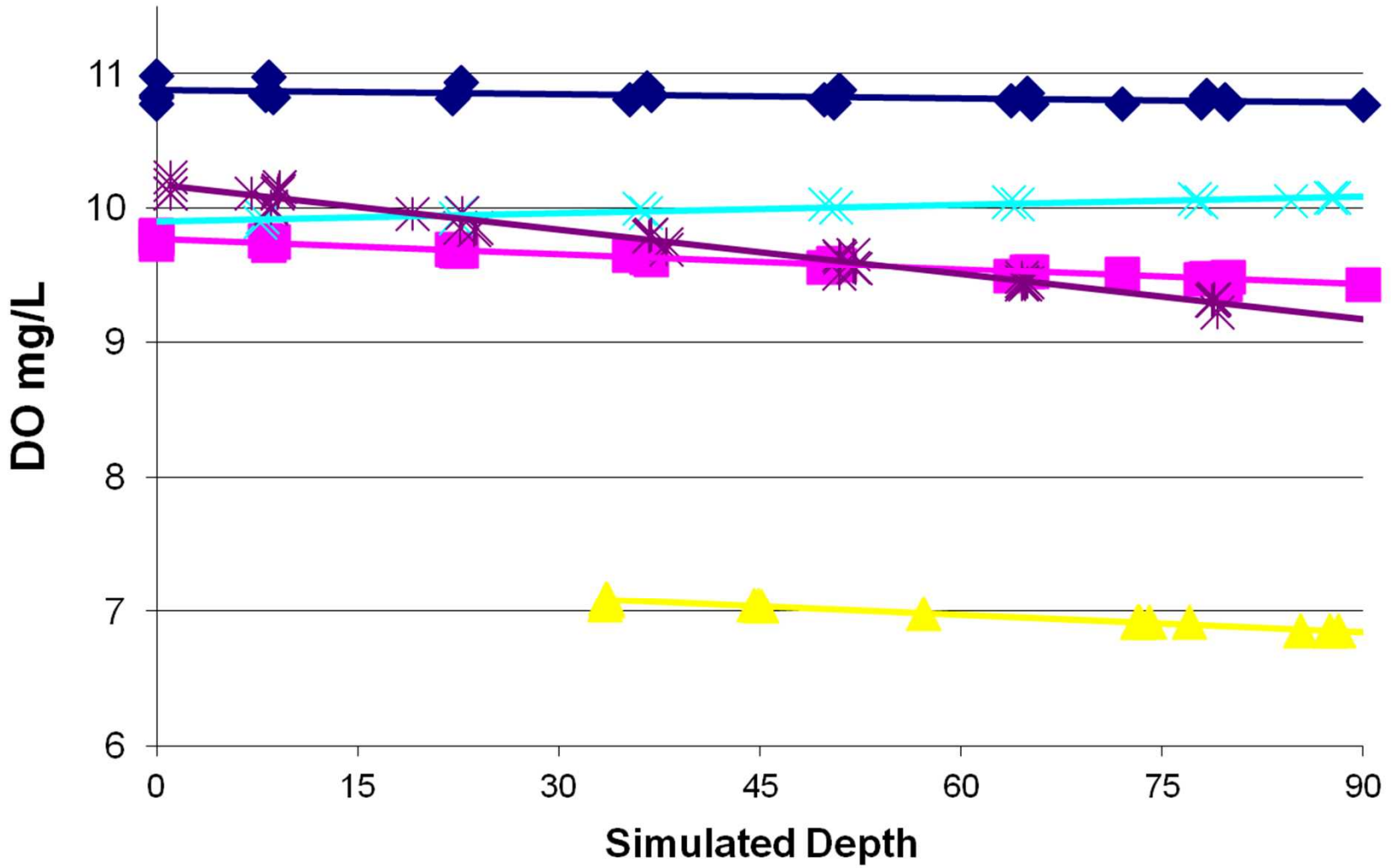




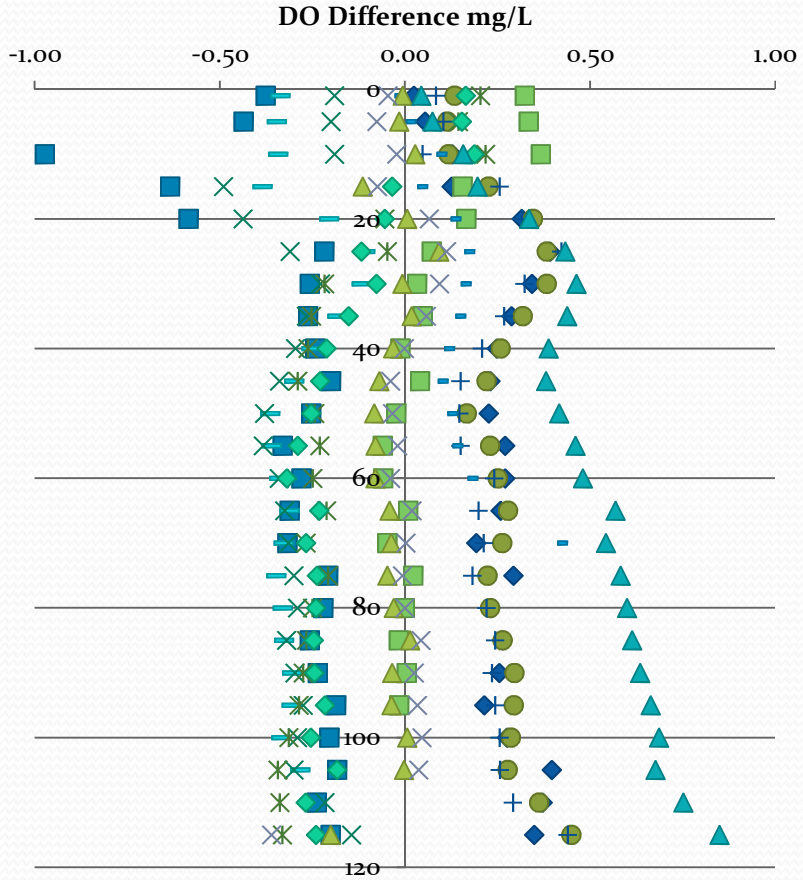
Pressure Test Set-Up



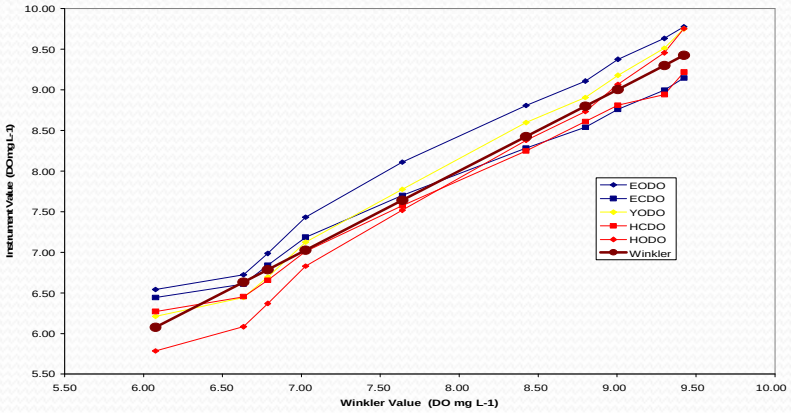
- Sonde put into test chamber
- Chamber sealed
- Pressure gradually increased to <180 psi ~125 m simulated depth with an air compressor
- Parameters recorded as pressure was increased and decreased in most cases


11
10
9
8
7
6
DO mg/L
0
15
30
45
60
75
90
Simulated Depth

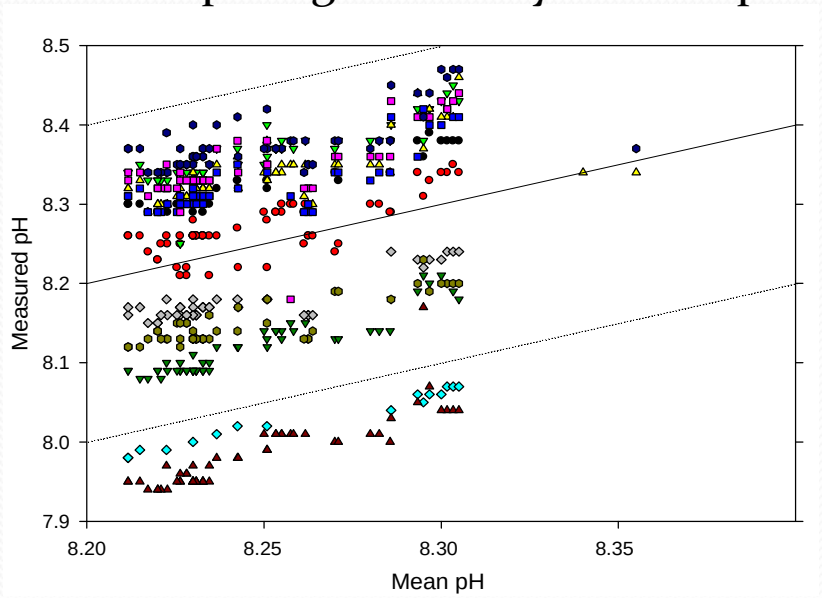
Data Presentation



Comparing instrument DO to Winkler DO



Comparing variability to tech specs



Conclusions

- We have made significant strides in data consistency through this process
  - Calibration and maintenance enhancements
  - Collaborative evaluation of shared results
  - Greater understanding of the sampling procedures and techniques of other agencies
  - Increased communication on sampling issues and data sharing
- Some issues have been resolved by improvements within and among the group
- Some issues have required the assistance of manufacturers

Still to Come

- Continued Interagency Sampling Events
  - Continue the exchange of data and ideas
  - Continue assurance that data from all agencies is equivalent
  - Assess changes that occur as new instrumentation is adopted
- We need to develop “confidence intervals” for the groups data based on the published specifications for the instruments