Lessons Learned from the National Aquatic Resource Assessments (2004-2012)

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What is a Survey of the Nation’s Waters?

A series of water surveys being conducted by states, tribes, the U.S. Environmental Protection Agency, and other partners

- 2004- 1,200 wadeable streams,
- 2007- 1,028 Lakes, representing approximately 49,546 Lakes
- 2008/2009- 2,081 wadeable and non-wadeable rivers and streams
- 2010- 1,400 Coastal Sites (including Great Lakes and Great Lakes Embayments)
- 2011- 1,258 wetlands
- 2012 NLA Initiation (approx. 1,275 sites)
NARS Purpose

Generate statistically-valid and environmentally relevant reports on the condition of the Nation’s lakes and reservoirs
From a Logistical Perspective

1. Support the Development of QAPP’s, FOM, LOM, Site Evaluation Guidelines and Quick Reference Guides
2. Prepare Training Materials
3. Conduct Train the Trainer Workshops
4. Conduct Regional State and Tribal Crew Training
5. Facilitate the Supply of Approximately 60-80 Field Crews each NARS year
6. Help Answer Sampling Questions
7. Replace Lost Equipment
8. Initiate Site and Sample Tracking
9. Other Duties as Assigned
Typical Sampling Design
Probability Sampling – National Lakes Survey (909 lakes + 176 extra) (90 Repeat visits in parentheses)

States requiring in-kind services (contractors) for sampling (227 lakes)

States confirming that they will sample their lakes

States doing a state-wide draw of lakes (extra lakes in blue)

States doing a region-wide draw of lakes (extra lakes in blue)
Revisits and Field Duplicate Design

First 10% of Lakes on list

Visit 1

Space revisits as far apart as practical

Visit 2

Primary Sample (P)
Chlorophyll
Phytoplankton
Microcystin
Water Chem
Zooplankton
Mercury
Sediment Core
Physical Habitat
Benthos
Enterococci

Filter Blank (F)
Enterococci
(Potential for contamination)
Collect filter blank on the visit where duplicate samples are NOT collected

Primary Sample (P)
Chlorophyll
Phytoplankton
Microcystin
Water Chem
Zooplankton
Mercury
Sediment Core
Physical Habitat
Benthos
Enterococci

Field Duplicate (D)
Chlorophyll
Phytoplankton
Microcystin
Water Chem
Zooplankton
Enterococci

Duplicates = "measurement" variation
Revisits = "measurement" variation + index period variation
NLA was the first one to jump into the pond…
1\textsuperscript{st} guy in the pool…
1\textsuperscript{st} boat in the water…
1\textsuperscript{st} toe in the water…
National Aquatic Resources Surveys (NARS)

- National Coastal Conditions Assessment (2010)
- National Lakes Assessment (2007)
- National Wetland Condition Assessment (2011)
- National Rivers and Streams Assessment (2008/09)
- National Wetland Condition Assessment (2011)
From the Yukon to Puerto Rico
## NARS Logistics
### Critical logistics elements (from Baker and Merritt, 1990)

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National Aquatic Resource Assessment
Shipment of field sampling kits
Logistics Planning
   Equipment procurement (i.e., what equipment is necessary and what EPA may consider providing the field crews);
   Logistics of shipping equipment and site kits to the field crews;
   Sample tracking forms, sample labels and tracking sampling progress.

Feasibility
   Time budget for field operations (i.e., can a field crew accomplish all of the sampling in one day?);
   CONDUCT A PROOF OF CONCEPT TRIAL
   Feasibility of processing samples;
   Identification of the index period and the geographical selection of the index period;
   Other practical considerations.

Preparing for training
   Transition of existing methods into training materials;
   Training Logistics: staging the components in a training course to maximize experiential learning.
Example Field Sampling Scenario

Verify lake as target and determine launch site
Set up staging area

Sampler A Activities:
- Prepare forms, equipment & supplies

Sampler B Activities:
- Calibrate multi-probe meter

Load equipment and supplies onto boat

LOCATE INDEX SITE & ANCHOR BOAT
(deepest point of lake)

Measure Secchi depth

Collect integrated water samples #1 & 2 (phytoplankton, chlorophyll-a, & algal toxins)

Collect integrated water sample #3 & 4 (water chemistry)

Collect sediment core; take mercury subsample and remove top and bottom slices for sediment diatoms

Locate & travel to physical habitat stations

Conduct habitat characterizations

Sample benthic macroinvertebrates in littoral zone

Collect fecal indicator sample at 10th station

RETURN TO SHORE

Preserve benthic sample and prepare for transport

Filter chlorophyll-a and Enterococci samples; prepare for transport

Clean and organize equipment for loading

Sampler A Activities:

Sampler B Activities:
- Check and prepare zooplankton, phytoplankton, and algal toxin samples for transport
- Check and prepare water and sediment samples for transport
- Inspect and clean boat, motor, & trailer to prevent transfer of nuisance species and contaminants

Review data forms for completeness

Report back to Field Logistics Coordinator
“So where are your samples?”
Field Logistics Coordinator

Important duties during assessment

- Review submitted status forms and tracking forms for potential errors and omissions
- Contact teams directly with corrections or questions.
- Weekly cross check between the status and sample portions of the tracker database to identify samples that may be being held longer than the designated holding period. FLC contact teams directly to correct issues.
- An open line of communication would be established between the FLC and the labs to determine if the samples are arriving in good condition. If problems are noted with samples.
- FLC will follow up with the field crew to provide corrections and help avoid similar issues with future samples.
- Providing immediate feedback to teams should result in a continually diminishing amount of errors.
So What Did We Learn?
Lessons Learned

• Access and Permission
• Local Knowledge
• Site Recon
• Scheduling
• Adaptive Training
• Field Conditions
• Information Management and Sample Tracking
Achieving the Objectives

• Probability design means we can extrapolate beyond the sample to the national population of surface water and wetlands that meet our sampling criteria

**But only if we stick to the rules!**

− Non-target or otherwise not sampleable sites must be substituted in a specific order, and
− All sites on the list must be accounted for, even if not sampled
− Even if you know a better way to do it, stick to the protocols to maintain consistency across waterbodies and regions
  • Clearly note any deviation you have made and why
− We don’t know what you found if you don’t write it down on a data form
“invaluable to the success of this precedent-setting national effort”

“highest priorities for EPA’s National Water Program”

“…With your help, over 1,300 lakes were sampled all across the country in the space of just four months --

-- a phenomenal accomplishment!”
Managerial Insight- “Never send four 22 year olds into the field alone”