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Methods and Data Comparability Board

ACWI Update
Contaminants, Statistics, and Event Monitoring Work Groups
February 10, 2009

http://acwi.gov/methods/

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Data comparability

The characteristics that allow information from many sources to be of definable or equivalent quality so that this information can be used to address program objectives not necessarily related to those for which the data were collected. These characteristics need to be defined but would likely include detection limit precision, accuracy, bias, and so forth (ITFM/Data Methods Collection Task Group).

http://acwi.gov/monitoring/glossary.html

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Methods Board Operations

- Identify needs of the water monitoring community with respect to comparability issues
- Pull together experts into Work Groups to get consensus on how to resolve issues
- Develop and provide tools to the users to promote comparability

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Outline of Presentation

- Methods Board work groups in planning stages
  - Contaminants
  - Statistics
  - Event monitoring
- How these work groups intersect with each other and the National Monitoring Network for U.S. Coastal Waters and their Tributaries
- Needs of National Network Demonstration Projects—Delaware, Lake Michigan, SF Bay

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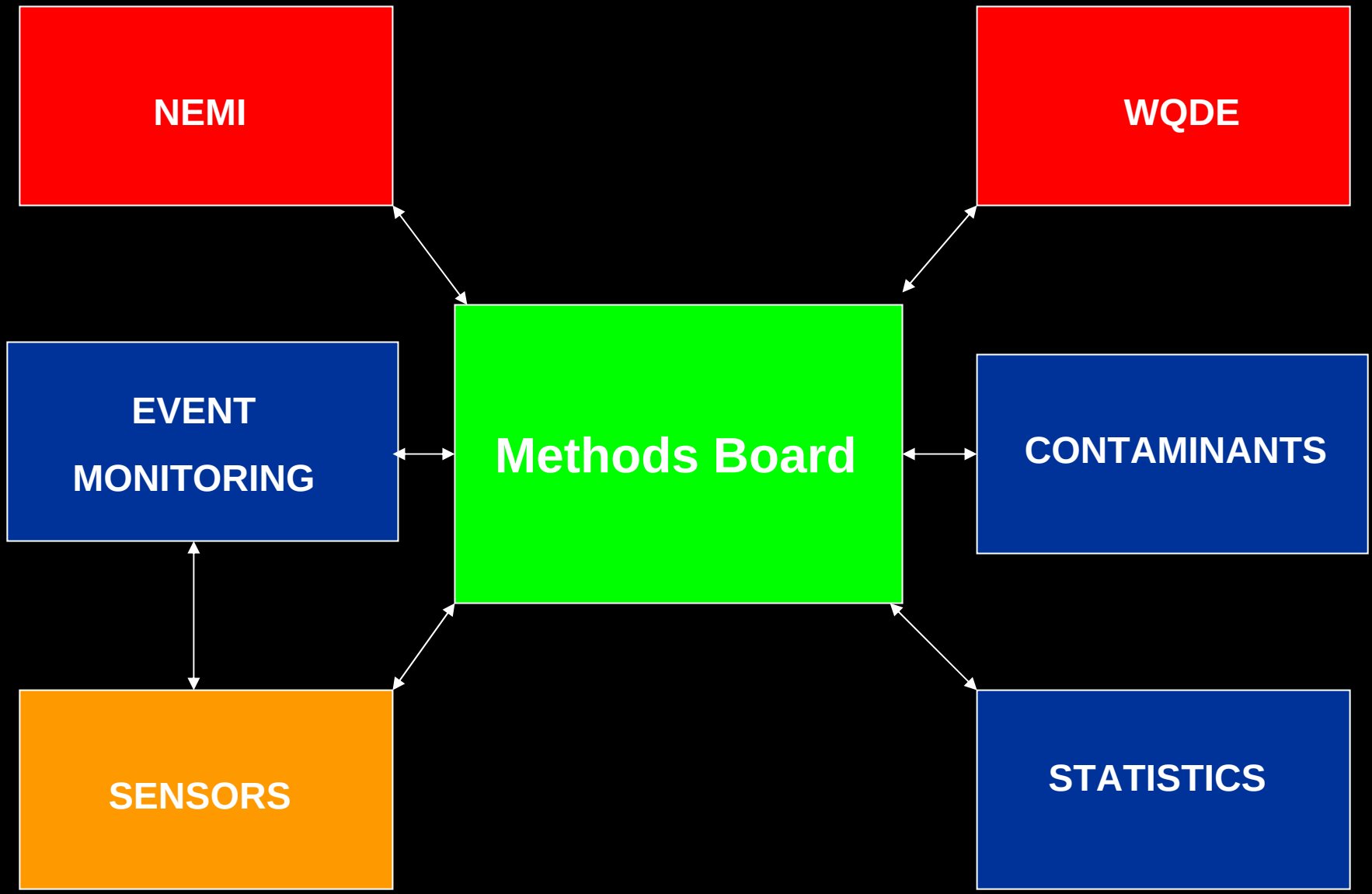
Methods Board Work Groups



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Methods and Data Comparability Board

Current Projects
- NEMI
- Data Elements
- Bioassessment Comparability
- Data Comparability (National Monitoring Network)

Products & Publications
- NEMI
- Data Elements
- Publications

About the Board
- Background & Strategy
- Members
- Workgroups

National Water Quality Network

A pilot phase of the National Water Quality Monitoring Network (Network) for U.S. Coastal Waters and their Tributaries is moving forward. The goal of the Network is to provide information about the health of our oceans and coastal ecosystems and inland influences on coastal waters for improved resource management. Read more...

Water Quality Data Elements

The Water Quality Data Elements User Guide is now available in PDF format to download and print. download

The Data Elements workgroup of the Methods and Data Comparability Board and the National Water-Quality Monitoring Council are preparing lists of what are believed to be the necessary or "core metadata" to allow comparability assessments. The proposed lists are not a set of required information but are recommended to help data collectors and data managers more effectively characterize their data and thereby facilitate and promote the use of those data by others. The Water Quality Data Elements User Guide was written to help facilitate the use of data elements by monitoring groups in their monitoring programs.

The Methods and Data Comparability Board and the National Water Quality Monitoring Council were created in 1997, as subgroups of the Advisory Committee on Water Information (ACWI), which is formally chartered under the Federal Advisory Committee Act.

NEWS AND EVENTS

MEETINGS

Across the Board latest issue

CONTACTS:

Eric Vowinkel, Co-Chair
U.S. Geological Survey
New Jersey Science Center
(609) 771-3931

Steve Wendelken, Co-Chair
U.S. Environmental Protection Agency
(513) 569-7491

Dan Sullivan, Exec. Secretary
U.S. Geological Survey
Wisconsin Water Science Center
(608) 821-3869

http://acwi.gov/methods/

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Contaminants Work Group Possible Objectives

- Determine if the National Water Quality Monitoring Network for U.S. Coastal Waters and Their Tributaries? is a priority of the new administration
- Are Contaminants of Emerging Concern (ECs) a priority?
- If ECs are a priority then get a Work Group together to recommend a “new” list of contaminants to be monitored in the Network
- Are there other chemicals a priority?
- Prioritize the contaminants into high, medium, and low need by hydrologic compartment
- Determine appropriate MRLs appropriate in each hydrologic compartment
- Suggest appropriate analytical methods and enter all methods into NEMI

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What are emerging contaminants?

The term “emerging contaminant” encompasses a wide range of compounds. Emerging contaminants are chemicals or materials that are characterized by a perceived, potential or real threat to human health or the environment or lack of published health standards. A contaminant may also be “emerging” because of the ability for it to be detected by new test methods or by the discovery of a new source or a new pathway to humans.

- Pharmaceuticals and personal care products (PPCPs)
- Endocrine disrupting chemicals (EDCs)
- Organic wastewater contaminants (OWCs)
- Persistent organic pollutants (POPs)
- Contaminants of emerging concern (CECs)
- Microconstituents
- Nanomaterials

Pharmaceuticals and Personal Care Products

Octavia Conerly

Office of Water

U.S. Environmental Protection Agency

Washington, DC

Northeast Water Science Forum

August 8, 2007

…to protect human health and the environment

http://www.neiwpcc.org/ppcpconference/ppcp-docs/OctaviaConerly.pdf

*Contaminants of Emerging Concern in Water**

PFOA

Pharmaceuticals and Personal Care Products

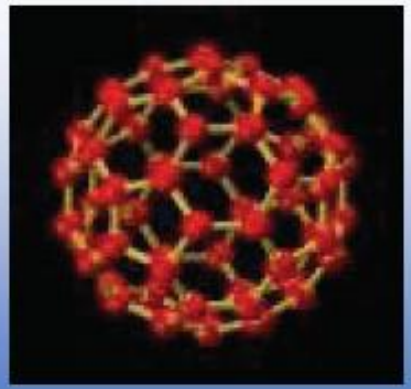
Prions

Nanomaterials

Pesticides

Endocrine Disrupting Compounds

PBDEs



*Not an exhaustive list.

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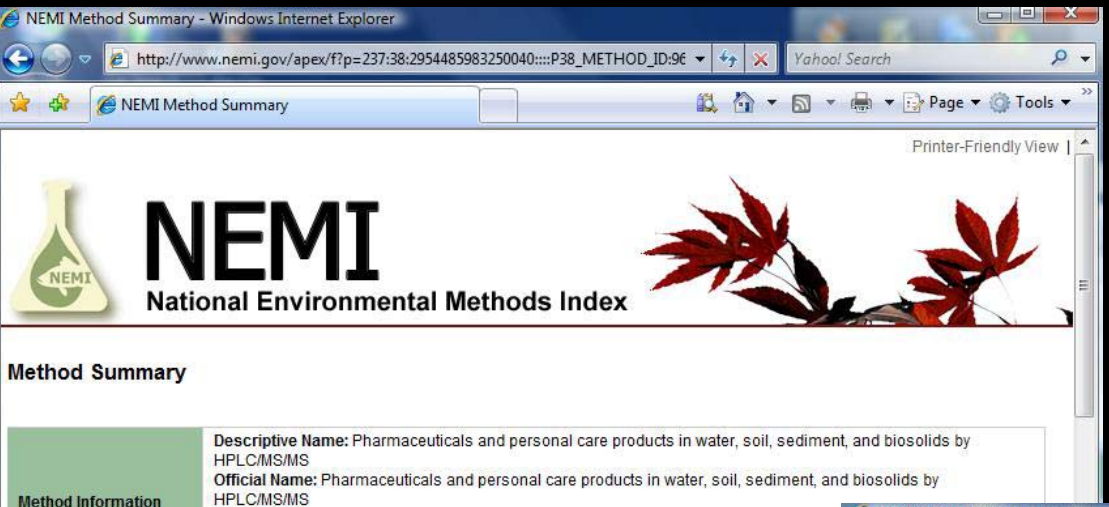
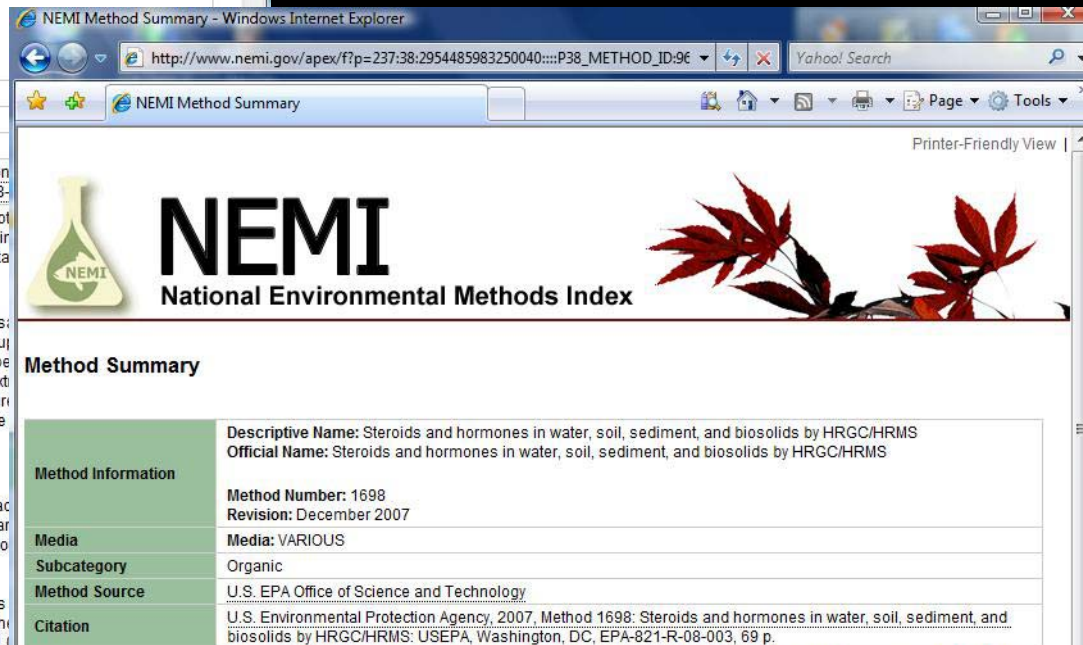
USEPA EC Methods in NEMI





Pharmaceuticals in the Environment: *What we know and need to know*

USEPA Region 2
December 16, 2008

Herb Buxton
USGS Toxic Substances Hydrology Program

Chemicals of Emerging Environmental Concern: *Emerging Contaminants*

- Human Drugs
- Vet. Drugs
- Antibiotics
- Hormones
- Steroids
- Detergents
- Plastics
- Antioxidants
- Fire retardants
- Disinfectants
- Fumigants
- Fragrances
- Insecticides/ Repellants

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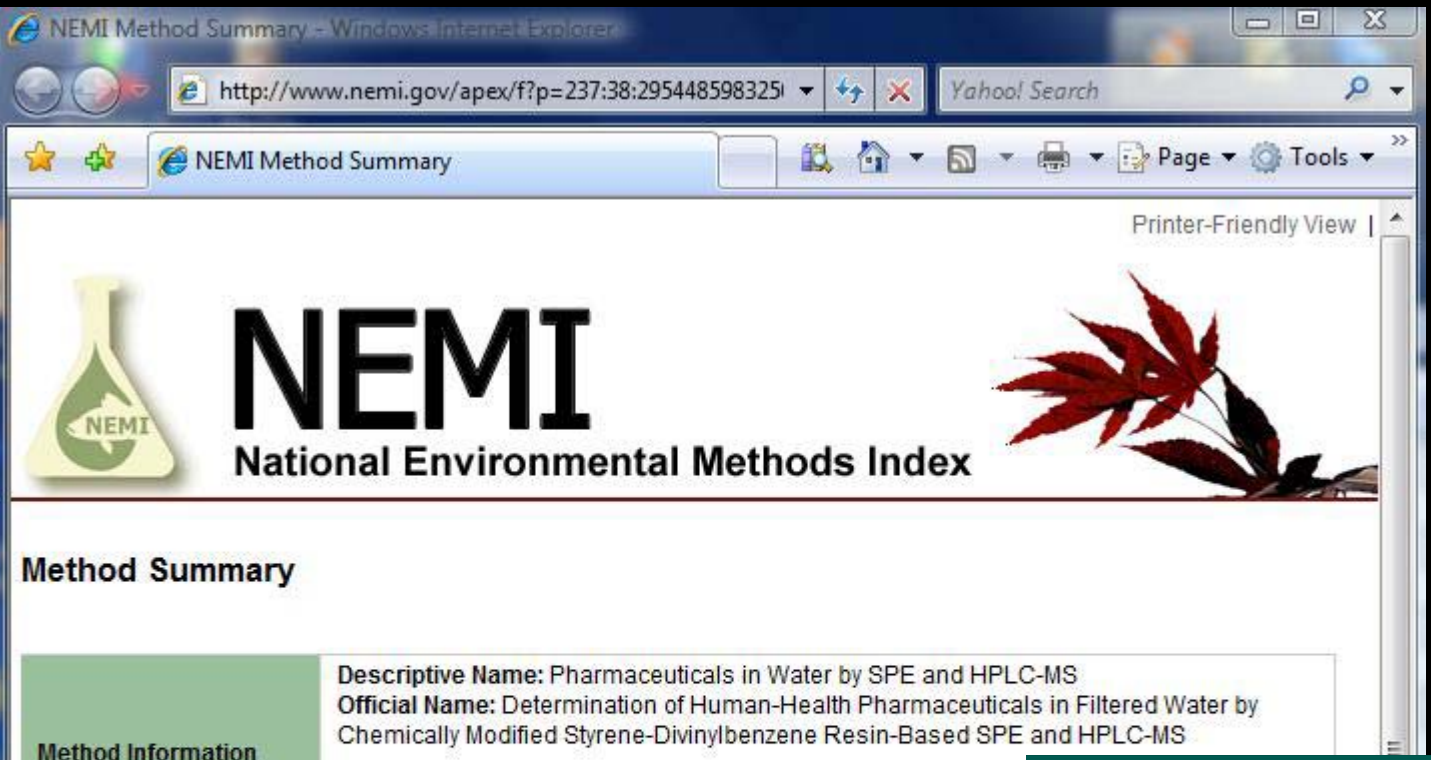
USGS EC Methods in NEMI



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Emerging Contaminants NJWMCC Meeting—1/23/08

http://www.nj.gov/dep/wms/wmccmeetinginfo.html

- Emerging Contaminants: Identification, Concerns, Actions - *Roland Hemmitt, EPA Region 2*
- Chemicals of Emerging Environmental Concern: the New Micropollutants – *Herb Buxton, USGS Toxics Program*
- Emerging Contaminants: Monitoring & Standards Development – *Leslie McGeorge, NJDEP*
- Perchlorate Case Studies:
  - Potable Water Occurrence & MCL Development – *Judy Louis, NJDEP*
  - Surface Water Monitoring - *Tom Vernam, NJDEP/WM&S*
- Organic Wastewater-Related Contaminants in New Jersey Streams and their Removal at Drinking Water Treatment Plants – *Jeff Fischer, USGS NJ Water Science Center*
- Emerging Contaminants in Groundwater – *Mike Serfes, NJDEP/NJGS*
- Monitoring Emerging Contaminants in the Tidal Delaware River – *Ronald MacGillivray, DRBC*

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Emerging Contaminants
USGS Briefing to EPA Region 2 - 12/16/08

http://www. (epa internal web site)

- Pharmaceuticals in the Environment: What we know and need to know USGS – *Herb Buxton, USGS Toxic Substances Hydrology Program*
- Source Water Quality Assessments: Low level organic chemicals in surface-water sources of drinking water – Mike Yurewicz, USGS Eastern Region
- Preliminary results of NAWQA source water quality sampling at a surface-water site in New Jersey and ground-water wells on Long Island – *Jeff Fischer, USGS NJ Water Science Center*
- USGS Emerging Contaminant Research in New York and Vermont – Patrick Phillips, USGS NY Water Science Center

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Sixth National Monitoring Conference Results - Session G

Session G1 - Monitoring for Emerging Contaminants

Moderator: Tracy Hancock

Pharmaceutically Active Compounds in Animal Waste Matrix and Their Leaching Properties | Abstract
Rominder P.S. Suri, Gangadhar Andaluri, Magdalena Velicu, *Villanova University*

Effect Monitoring for Endocrine Disrupting Substances in the Rhine River | Abstract
Minne B. Heringa, *Kiwa Water Research*; Sander C. van der Linden, *BioBetectionSystems*; Peter G. Stoks, *RIWA*

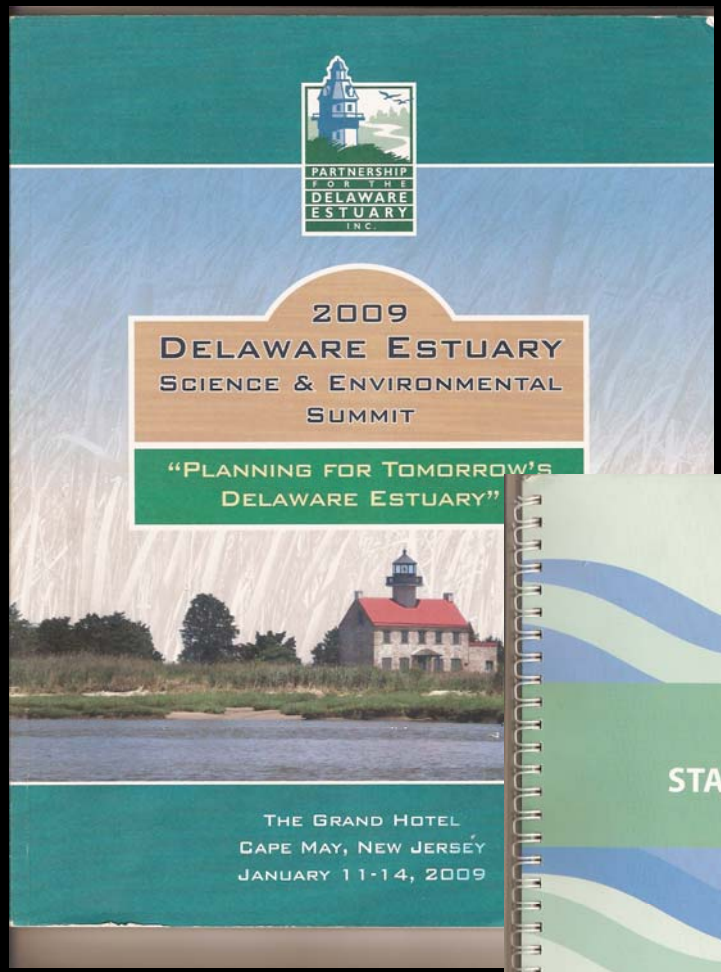
Use of Triclosan and Polycyclic Musks as Indicator Chemicals for Domestic Wastewater | Abstract
Tatsuji Ebihara, *LFR Inc.*; J.L. Strickland, *CDM*

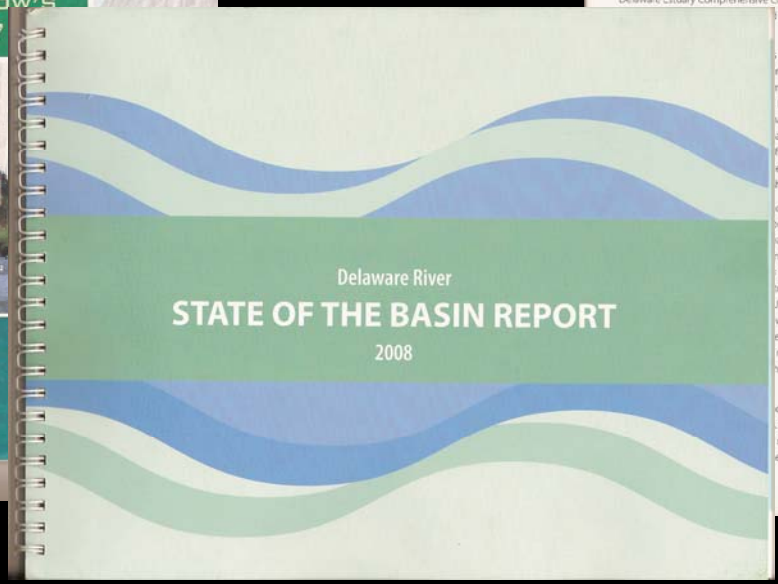
Monitoring for Emerging Contaminants in Pennsylvania Waters | Abstract
Andrew G. Reif, J. Kent Crawford, Vicki S. Blazer, *U.S. Geological Survey*

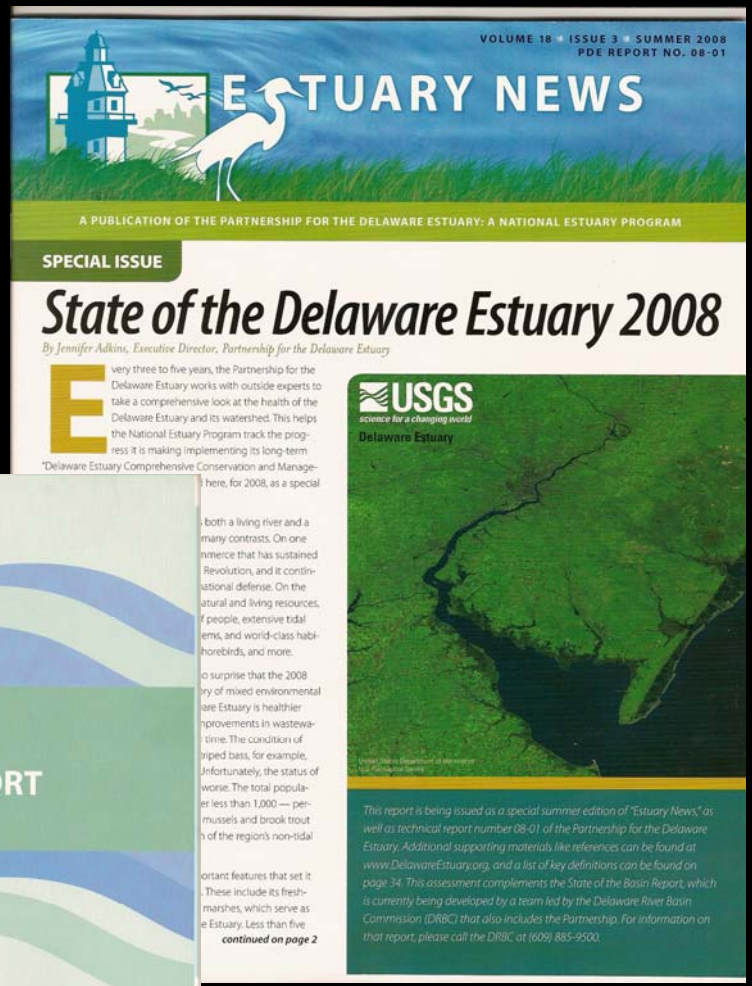
http://acwi.gov/monitoring/conference/2008/sessiong.html

Delaware River Basin Demonstration Project recent highlights

http://www.delawareestuary.org/







http://www.state.nj.us/drbc/SOTB/index.htm

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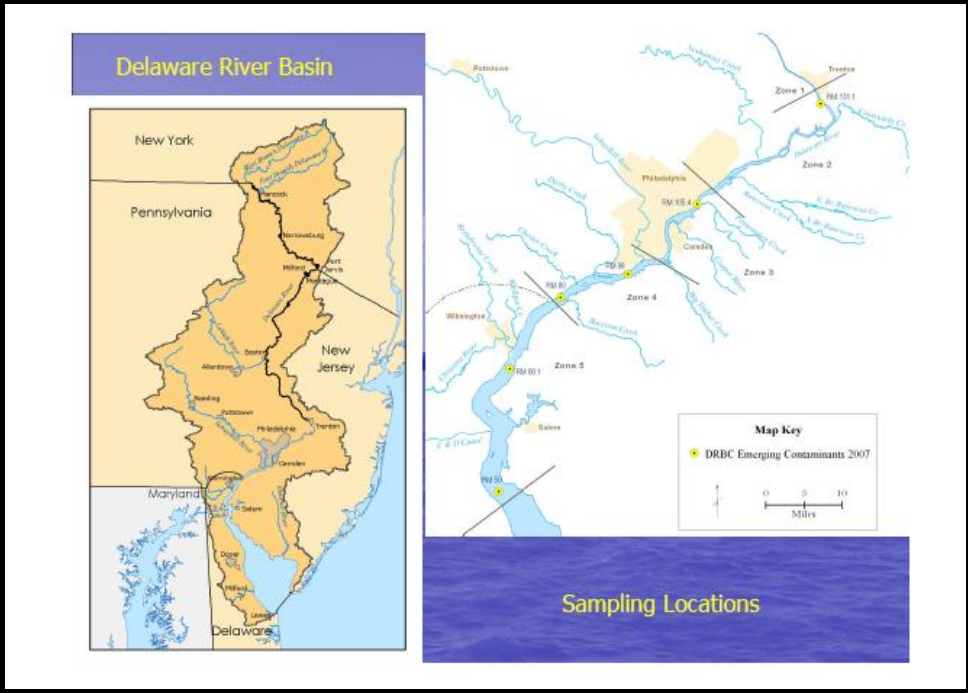
EC Monitoring in the Delaware Estuary by MacGillvray (DRBC)



2007 Parameters	# of analytes
PBDE - polybrominated diphenyl ethers	46 HR GC/MS EPA Method 1614
PFC - perfluorinated compounds	13 LC/MSMS
PPCP - pharmaceuticals and personal care products	54 LC/MSMS
Hormones and sterols	24 GC/LRMS
Carbamate pesticides	21 LC/MSMS
NP and NPE – nonylphenol and NP ethoxylates	3 GC/MS

Nice coverage of sites along the tidal estuary

Useful in track down of possible source areas

Methods developed by private Laboratory Axys at [ng/L] levels

Methods not in NEMI to date

Difficult to compare with other methods and results

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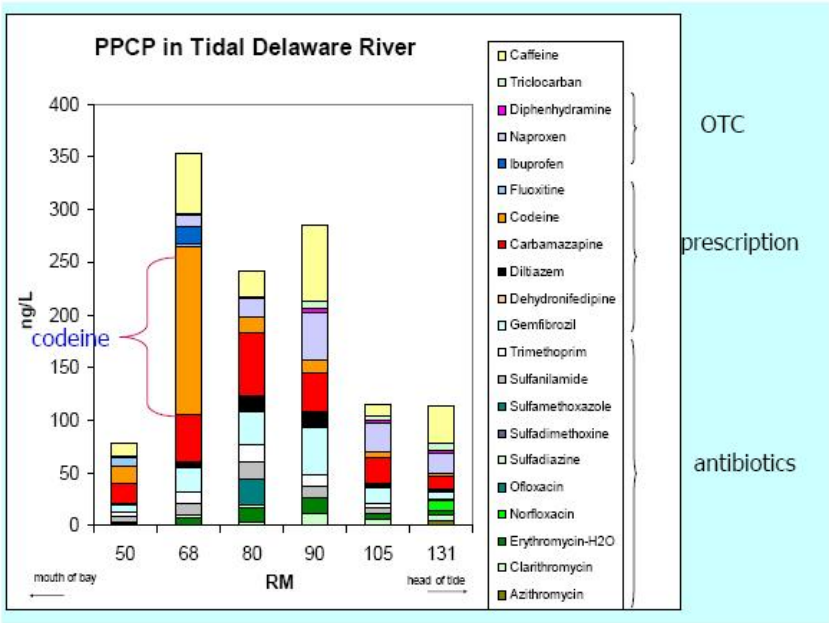
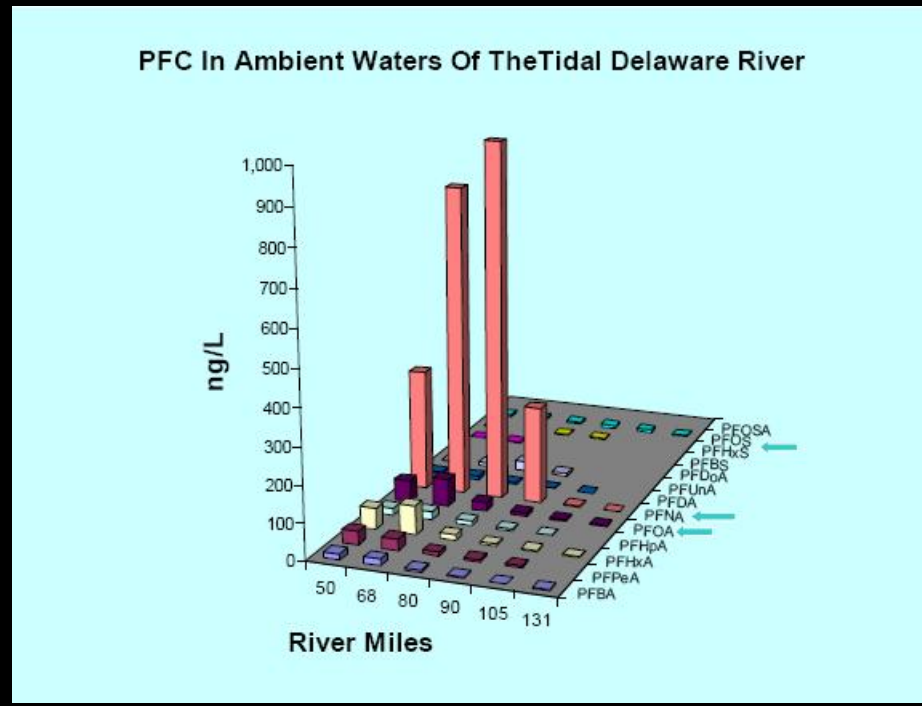
Results of EC Monitoring in Delaware Estuary



Summation of PPCPs by river mile



Individual PFCs by river mile

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Proposed Statistics Work Group

- Develop proposed agenda and objectives for the Work Group
- Invite selected experts to join in regular conference calls
- Refine the agenda for the Work Group and create subgroups to work on specific items
- Develop a menu within NEMI to enter statistical methods
- Recommend appropriate statistical and graphical techniques to interpret monitoring data
- What are the statistical needs of the National Water Quality Monitoring Network for U.S. Coastal Waters and Their Tributaries?
- How do you integrate discrete, probabilistic, continuous, and satellite imagery data to tell status and trends

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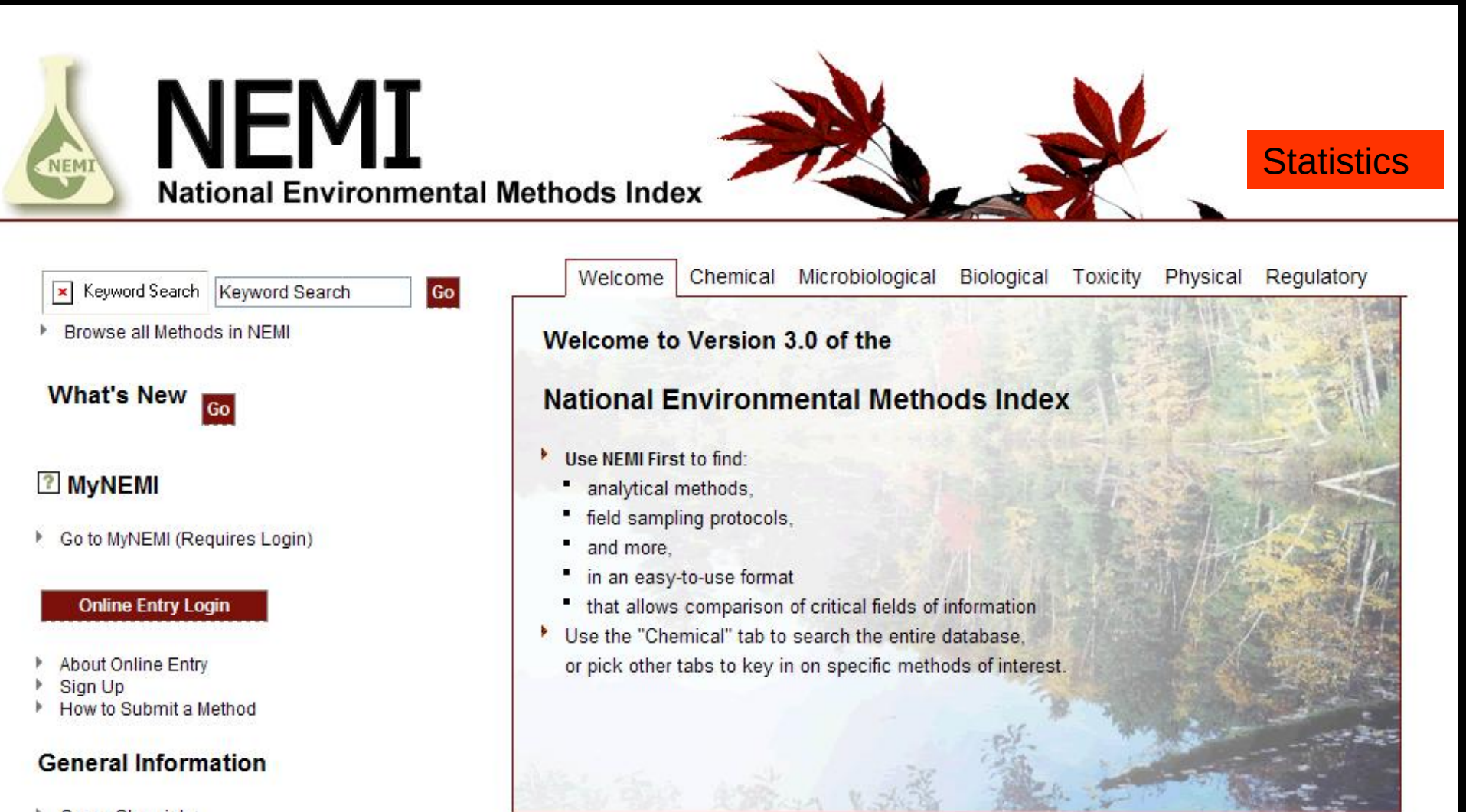
Possible Statistics Drop Down Menu on NEMI?



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Possible Pull Down Menus on NEMI for Statistics

- Individual methods into NEMI
- Graphing and mapping techniques
- Exploratory Data Analysis
- Summary statistics
- Hypothesis testing
- Regression analysis
- Probability sampling design
- Continuous monitoring
- Parametric analysis
- Losistic Regression analysis
- Status
- Threshold levels
- Nonparametric analysis
- Bibliophgraphy
- Trends
- Non detects

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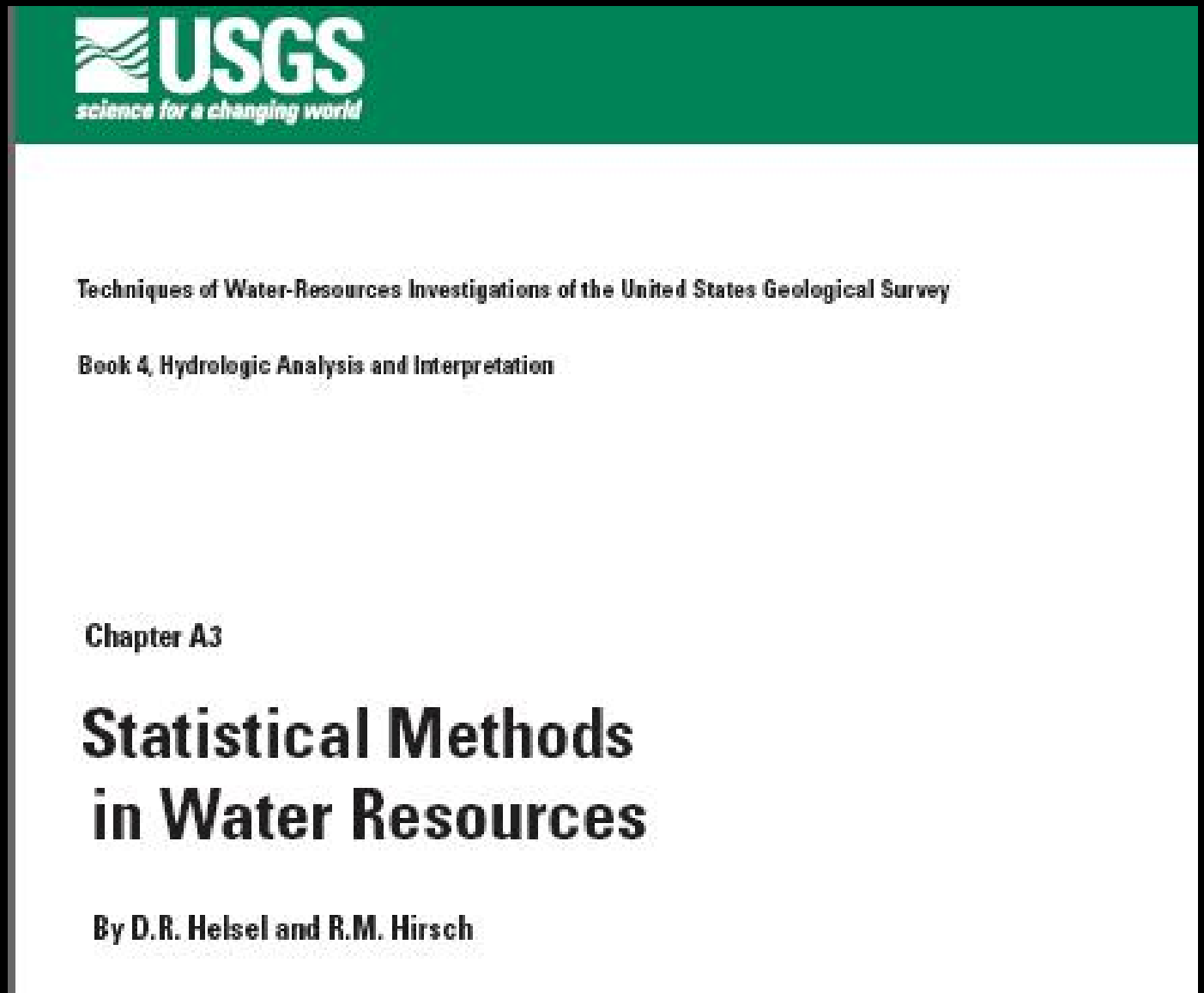
Build a Bibliography of Reports and Publications


USGS
science for a changing world

Techniques of Water-Resources Investigations of the United States Geological Survey

Book 4, Hydrologic Analysis and Interpretation

Chapter A3

Statistical Methods in Water Resources

By D.R. Helsel and R.M. Hirsch

Integrating different types of data from rivers, estuaries, coasts

Discrete

Probabilistic design

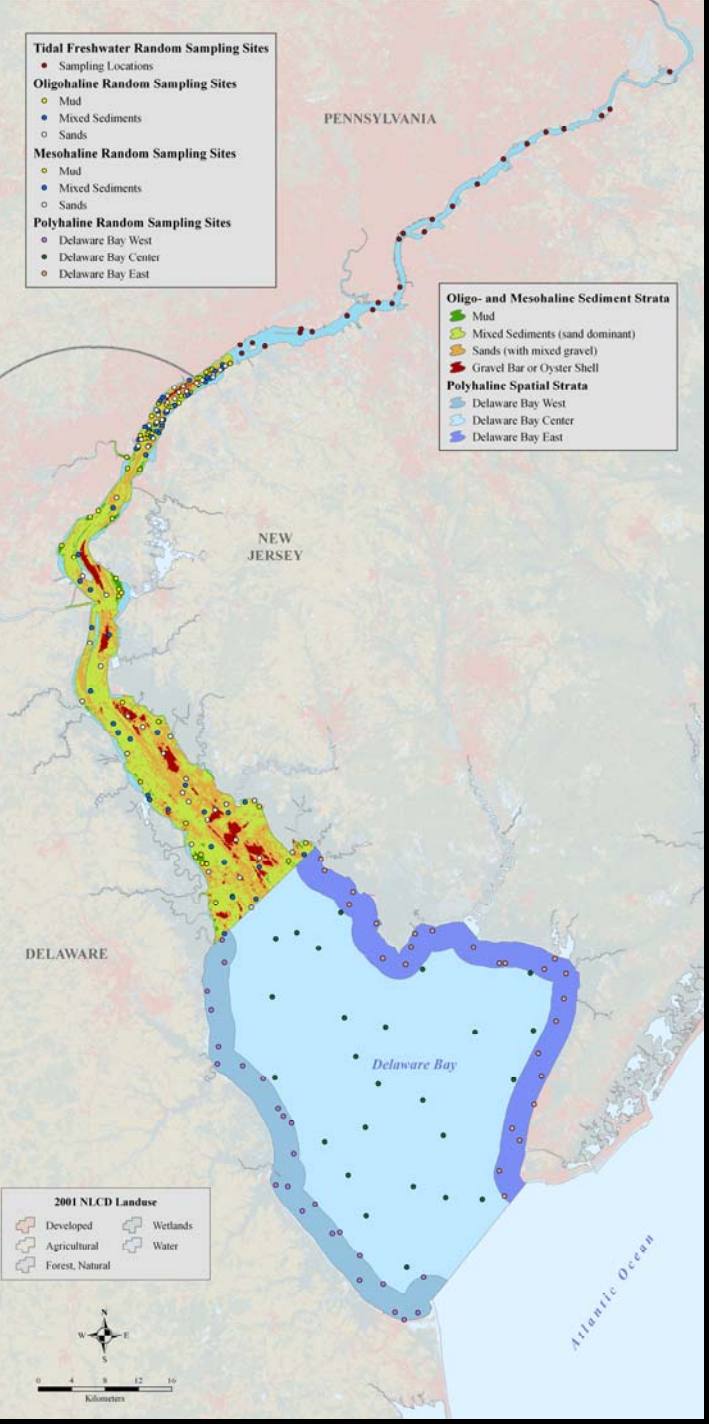
Continuous

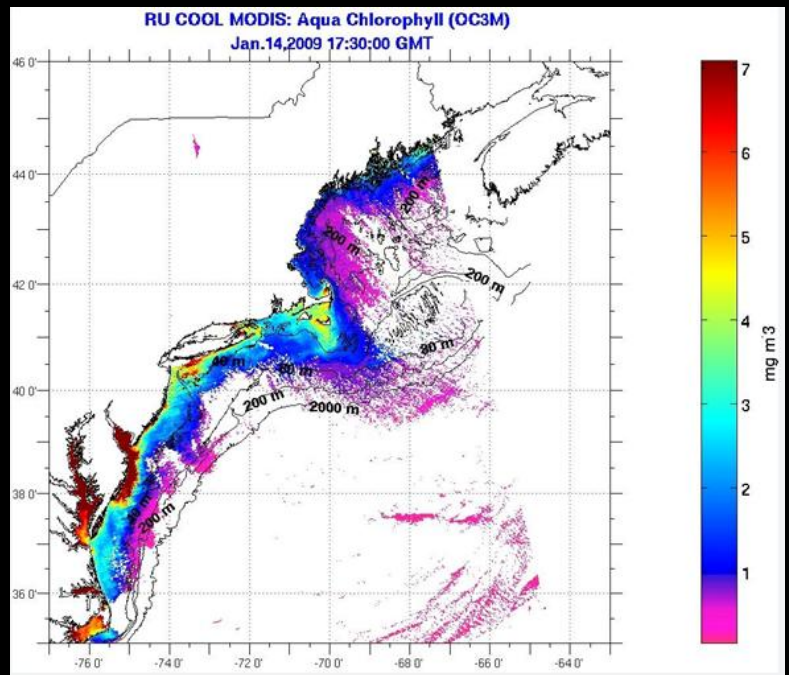
Satellite

Physical

Chemical

Biological





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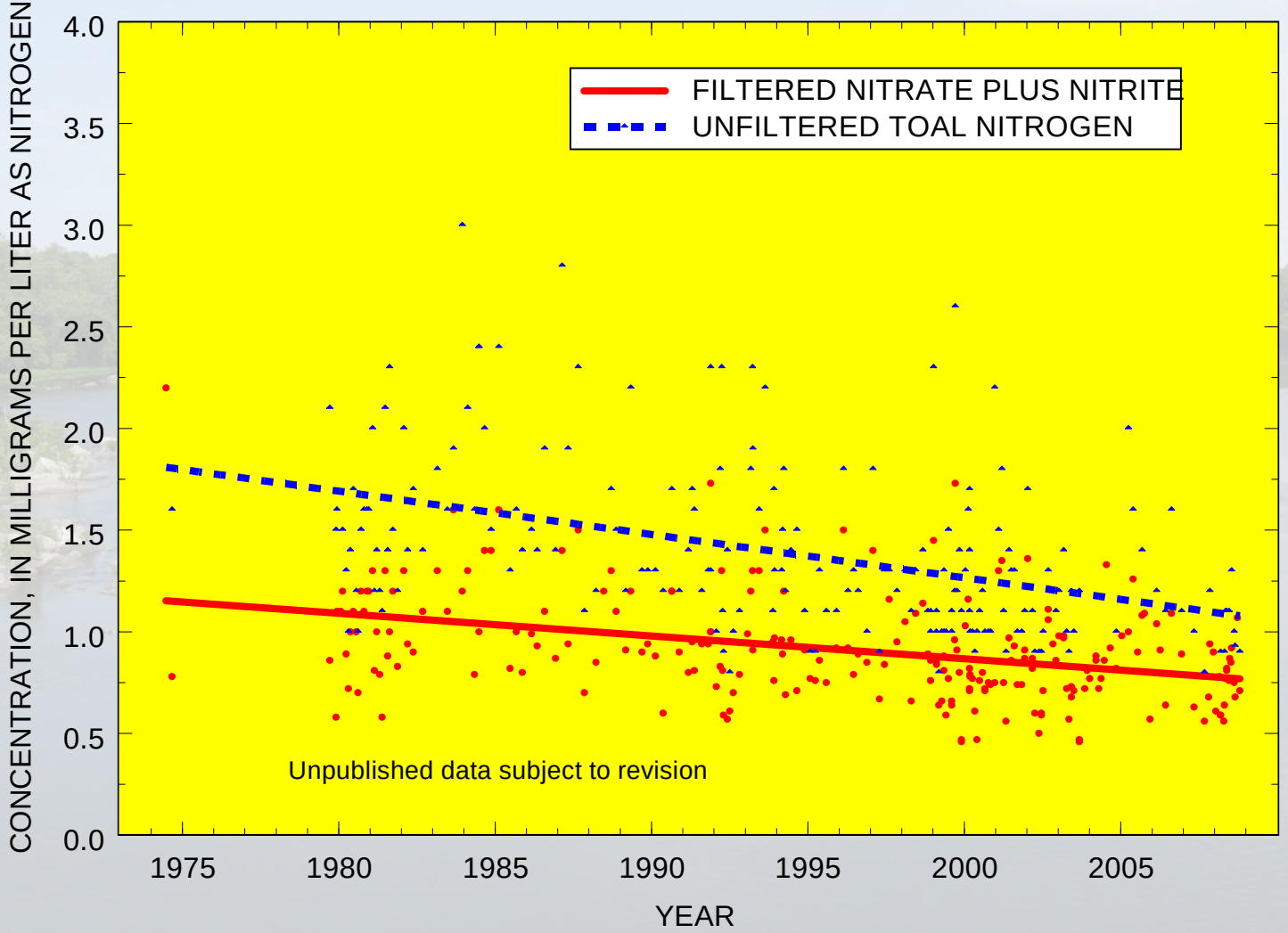
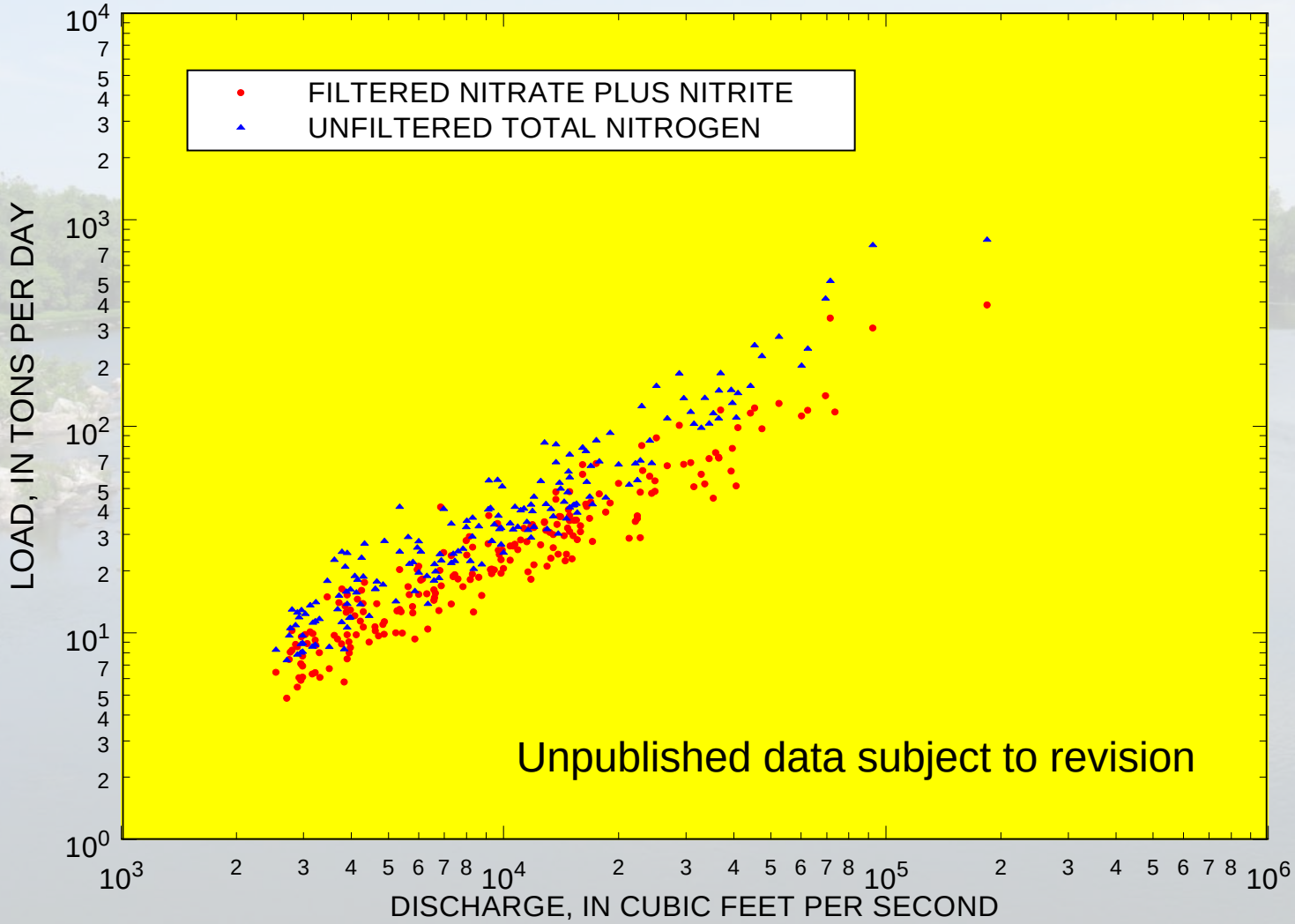
Possible Objectives of the Event Monitoring Work Group

- Develop proposed agenda and objectives for the Work Group
- Invite selected experts to join in regular conference calls
- Refine the agenda for the Work Group and create subgroups to work on specific items
- Develop a menu within NEMI to enter event monitoring methods
- Recommend appropriate statistical and graphical techniques to interpret event monitoring data
- What are the statistical needs of the National Water Quality Monitoring Network for U.S. Coastal Waters and Their Tributaries relative to event monitoring?

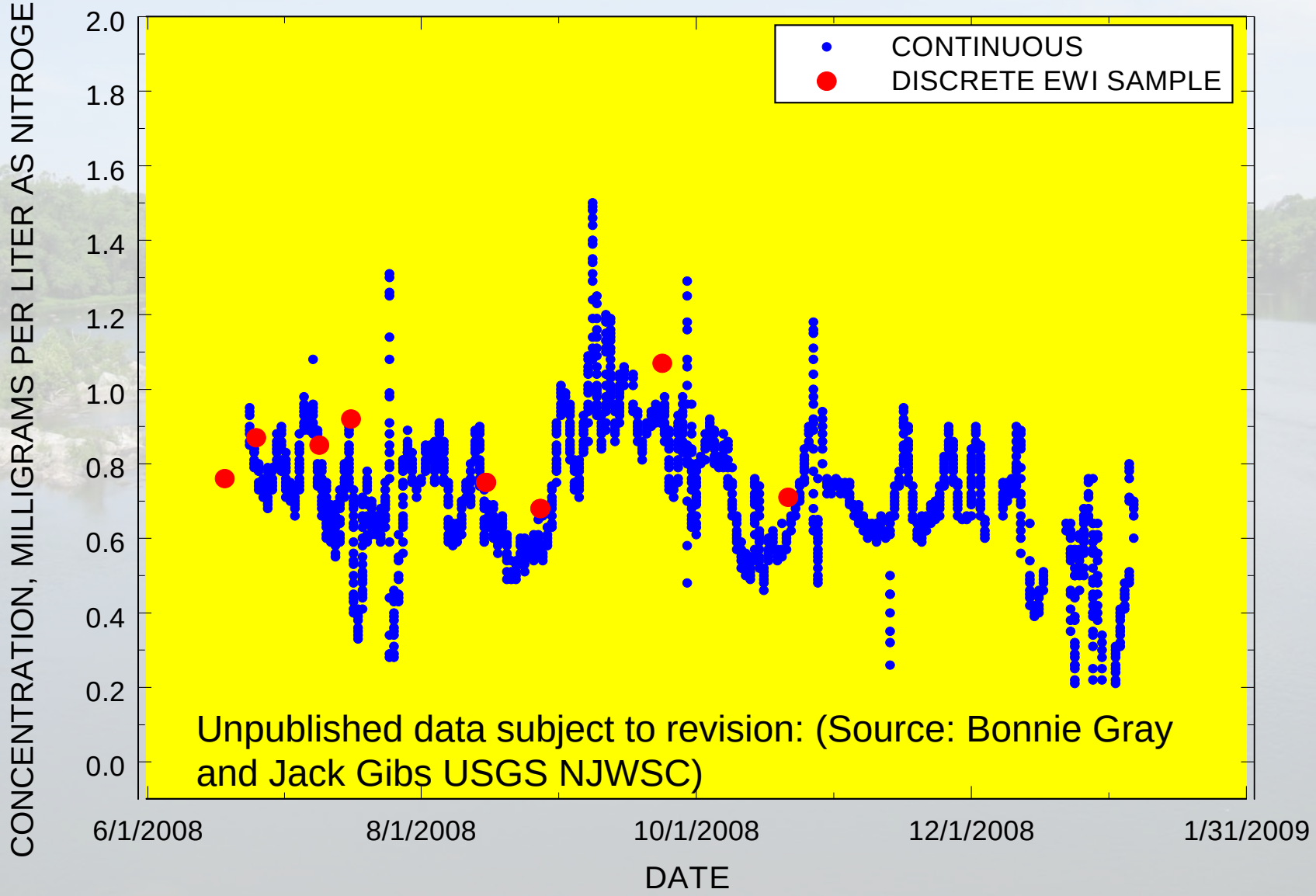
DELAWARE RIVER AT TRENTON--TRENDS IN CONCENTRATIONS
FILTERED NITRATE PLUS NITRITE AND TOTAL NITROGEN



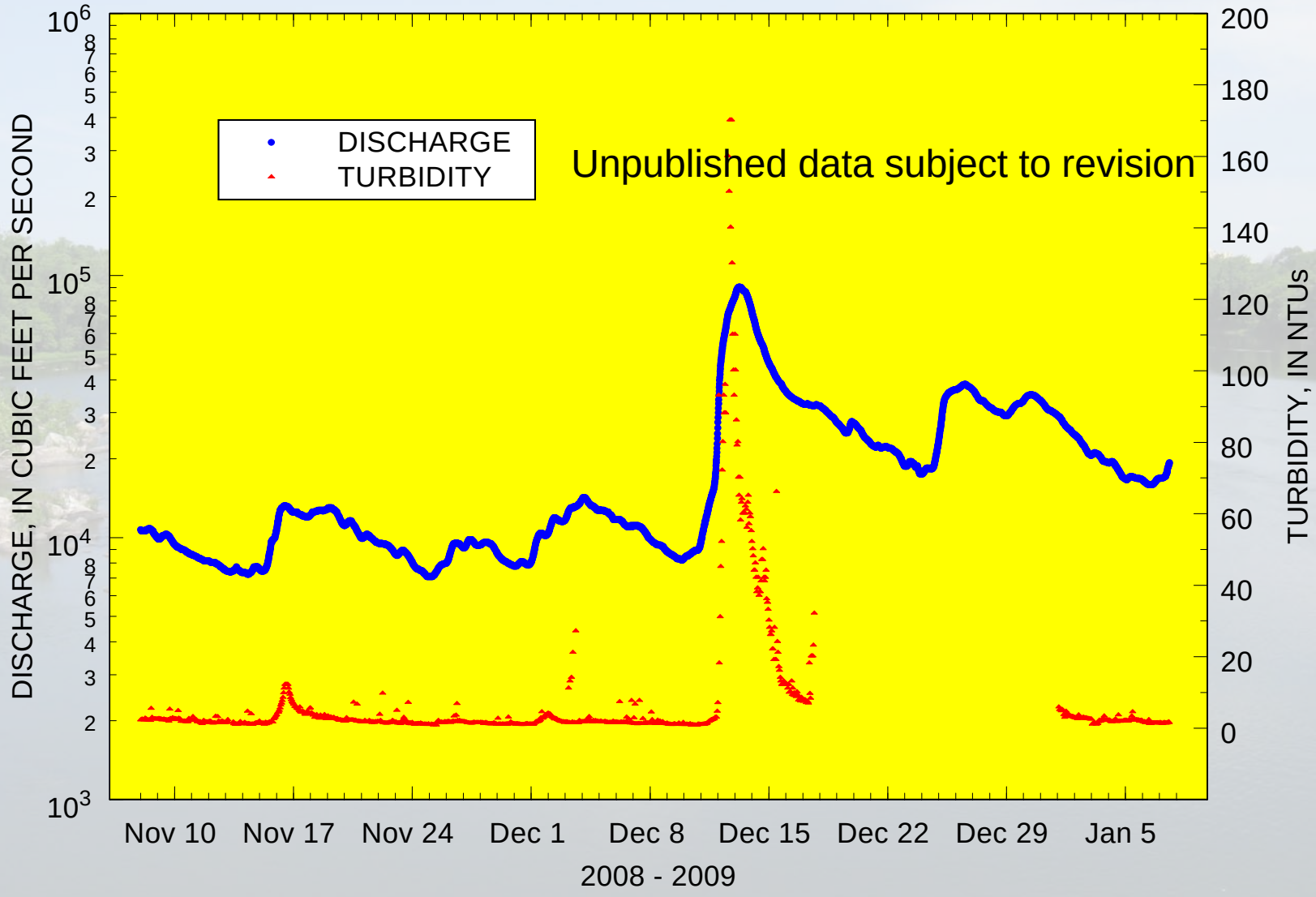
DELAWARE RIVER AT TRENTON--LOADS
FILTERED NITRATE PLUS NITRITE AND TOTAL NITROGEN



DELAWARE RIVER AT TRENTON--NITRATE PLUS NITRATE USING CONTINUOUS vs. DISCRETE EWI SAMPLES

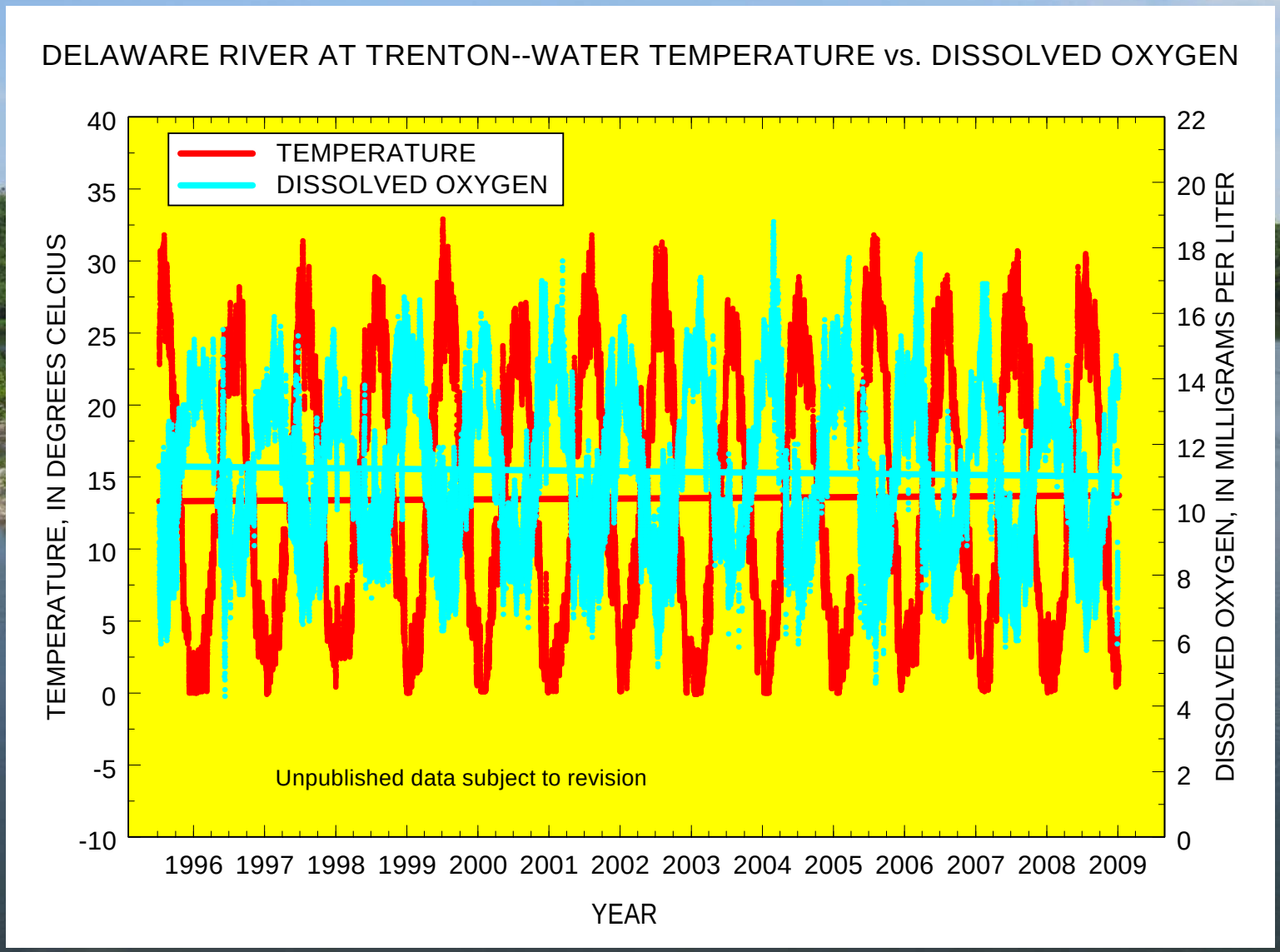


DELAWARE RIVER AT TRENTON--TURBIDITY vs. DISCHARGE



Delaware River at Trenton

Continuous temperature and dissolved oxygen



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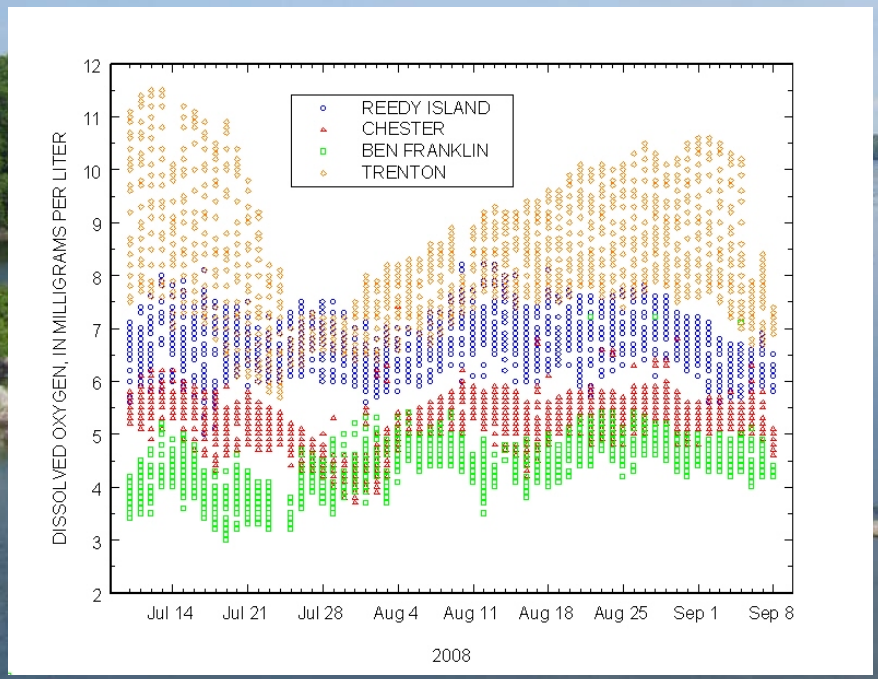
Method Board Priorities

1. Contaminants—if Network is a priority
2. Statistics
3. Event monitoring—may merge with Sensors Work Group

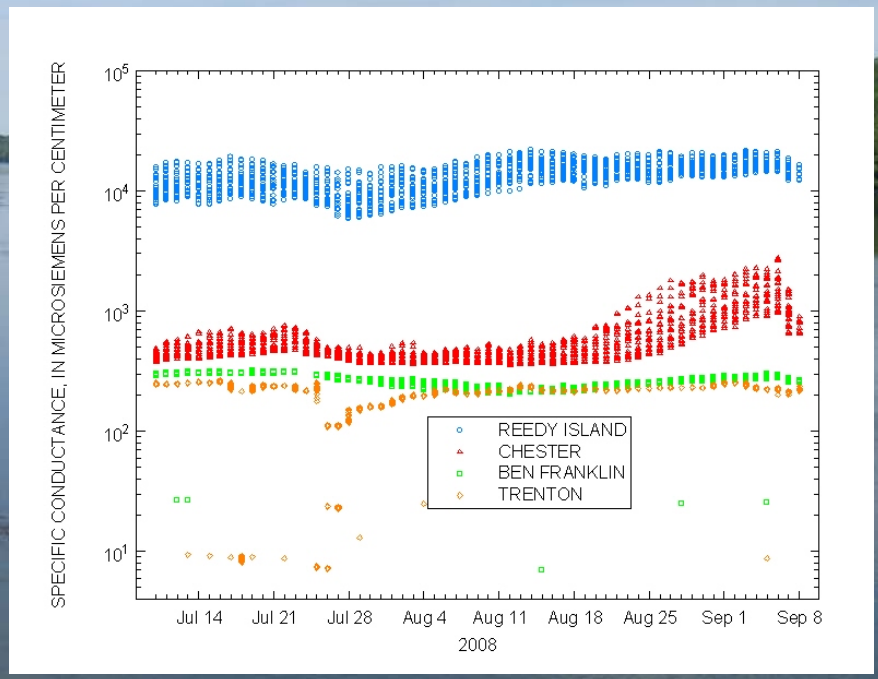
Questions???

Results of continuous real-time monitoring on the at 4 sites on Delaware River and estuary

Dissolved oxygen



Conductance



Unpublished data subject to revision

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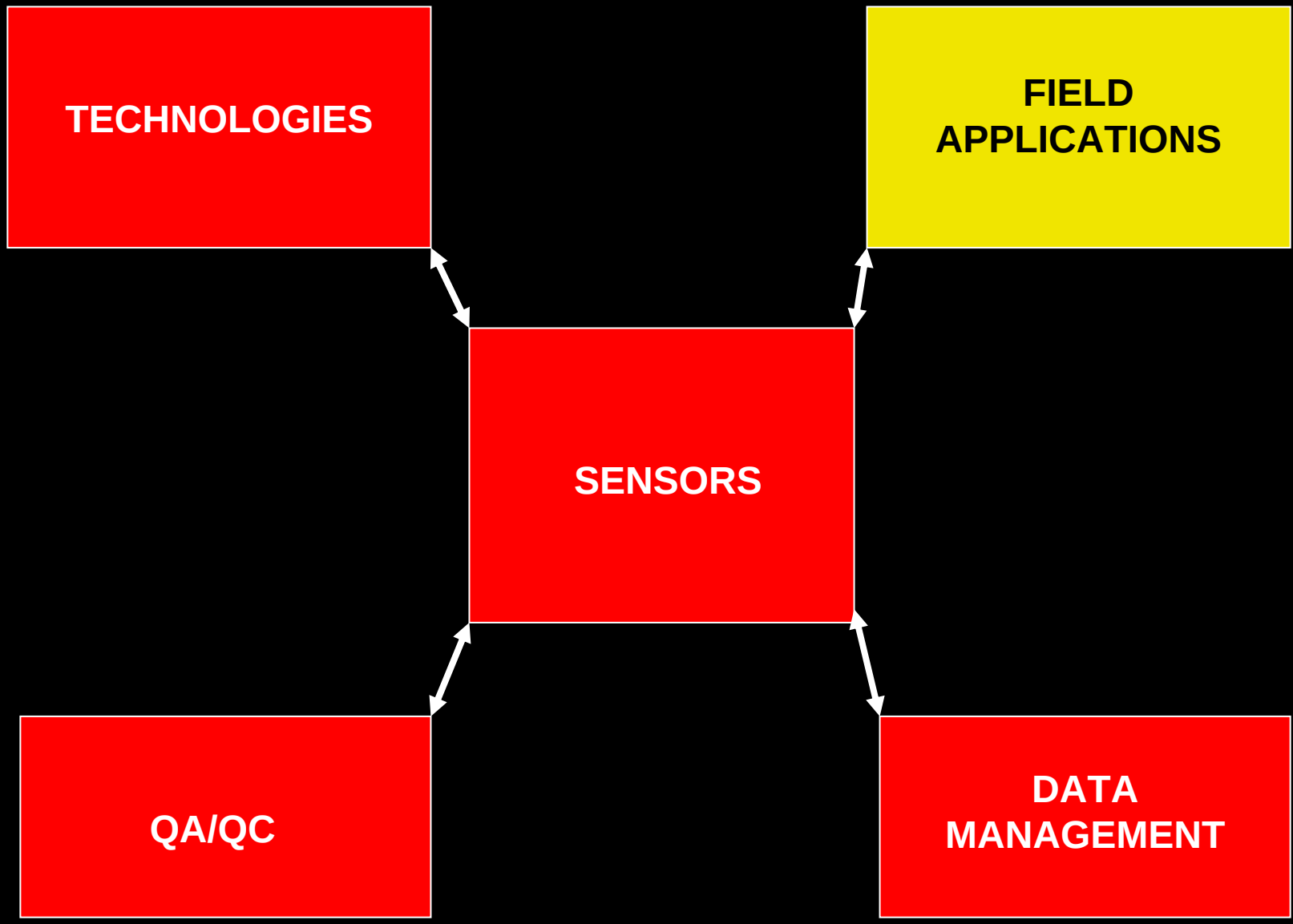
Sensors Work Group



STATISTICAL NEEDS

- **Trend analysis -- is it getting better or worse?**
- **Handling data below detection limits.**
- **Using control charts and prediction intervals.**
- **How hypothesis tests work.**
- **How different are they, and how sure are you?**
- **How to build a good regression equation, & when not to.**
- **Dealing with outliers.**
- **When are transformations OK?**
- **How many samples do I need?**
- **Good graphs and more.**

http://typhoon.mines.edu/short-course/stat.htm

Nondetects and Data Analysis: Statistics for Censored Environmental Data -- Thomas 5 (1): 508 - - Windows Internet Explorer
http://vzj.geoscienceworld.org/cgi/content/full/5/1/508?ck=nck
google
Nondetects and Data Analysis: Statistics for Censore...
Page Tools

BOOK REVIEWS

Nondetects and Data Analysis: Statistics for Censored Environmental Data

DENNIS R. HELSEL (USGS). John Wiley and Sons, New York. 2004. Hardcover, 268 pp. US $94.95. ISBN 0–471–67173–8.

Helsel's Book: A Clever Thing About Supposedly Nothing

We have all seen them in textbooks, papers, or our own research datasets—the dreaded "less than" data, those environmental (most often chemical analysis) data that are "less than" some detection or reporting limit or some other small limit. In the interpretation and particularly in the statistical analysis of environmental data, the "less than" data or "nondetects" are but a nuisance to the practitioner: our beloved software programs apparently have no use (at least that most of us know of) for "less than" data. We ignore them or simply zero them out. They are nothing, rien, NADA. My statistics software, for example, automatically excludes all spreadsheet cells with character-type content (such as "<5.0" or "less than 5.0") when I run the summary statistics on a list of reported values. I confess that on more than one occasion I have converted those "nondetect" data to zeros in my data tables to at least acknowledge that a measurement was taken, yet avoid the hassles of nonnumeric entries. The logic typically goes something like "they are so small that they are—for practical considerations—like zero." The almost equivalent, but more "scientific" approach recommended by citable sources, such as USEPA and the Army Corps of Engineers, is to replace the "less than" data with a value of one-half of the reporting limit before proceeding with standard statistical analyses of the dataset.

Were you ever bothered by such a simplification? Then read on. In his introduction, Dennis Helsel makes a convincing and illustrative, yet simple, bid for taking a different approach: the tragedy of NASA's space shuttle Challenger may well have been avoided if engineers had more carefully considered their "nondetects". Helsel argues that in the case of the Challenger the consequences of ignoring nondetects were "a tragic one-time loss of life. For environmental sciences, the consequences are likely more chronic and continuous." The motivation for this book was to provide a college textbook or practitioner's resource that has the potential to jump-start the analysis of nothing ("NADA" being the initials of the rather clever book title) into something that should be practiced much more widely.

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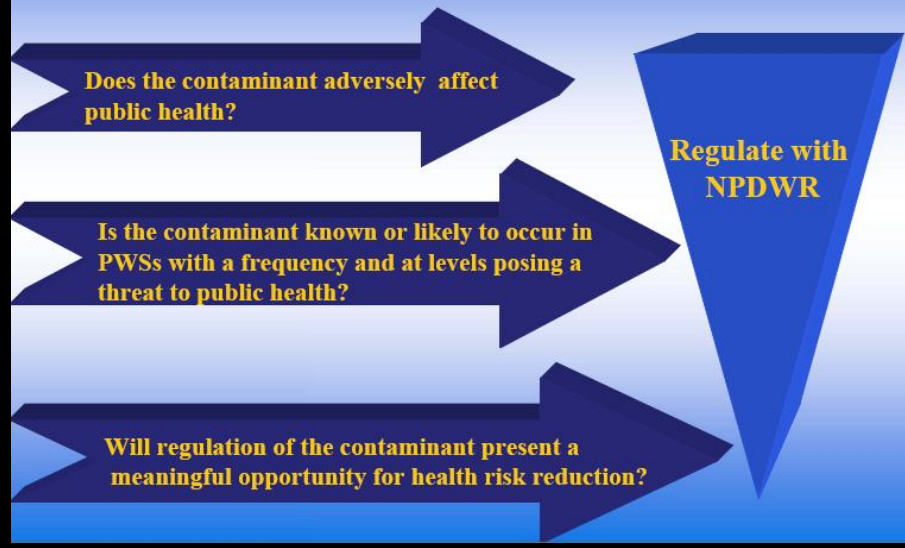
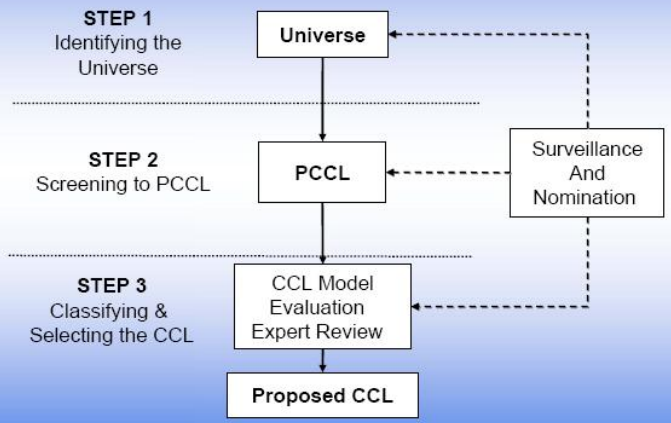
Why the concern?

- A large number of chemicals are getting into the environment with known and unknown concentrations and effects
- Detection of these chemicals is likely to increase as analytical methods become more sensitive.
- Many of these chemicals are designed to impact the human hormone system
- Numerous reports of intersex fish and other species have triggered Congressional and public interest

Regulation under SDWA



CCL 3 Process



Ongoing Office of Water Activities

- National Pilot Study of PPCPs in Fish Tissue
  - Sampling for 37 PPCPs in fish tissue from effluent-dominated streams at five locations in various parts of the U.S.
  - Analysis expected to be completed by December 2007

- Publicly Owned Treatment Works Study
  - Influent, effluent and sludge sampling for over 150 pharmaceuticals, pesticides, and steroids/hormones
  - Study expected to be completed by December 2009

- National Targeted Biosolids Survey
  - Sampling for presence and concentration of metals, priority pollutants, PPCPs and flame retardants
  - Draft report expected December 2007

Framing Research Questions

- ***Are ECs entering our environment?***
- ***What are the sources, their chemical signatures, and are there sensitive settings?***
- ***Do ECs have adverse eco health effects?***
- ***Do ECs persist to finished drinking water and are they a human health risk?***
- ***How can we minimize their entry to the environment or remove them?***

Are ECs entering our environment?

ECs in Susceptible Settings

- Present in water at *sub-ppb conc.'s*.
- Present as complex *mixtures*.
- Entering via *human & animal waste pathways*.

(Kolpin, et al., 2002)

Prioritizing Chemicals?

- **Potential to Enter the Environment.**
  - ✓ **Quantities used.**
  - ✓ **Anticipated environmental behavior.**
  - ✓ **Pathways for chemical release.**
- **Health significance (Accessing avail. info).**
  - ✓ **Using all available information**
  - ✓ **Mode of Action (mixtures)**
- **Ability to measure - Reliably.**
- **Potential as chemical indicators/tracers.**

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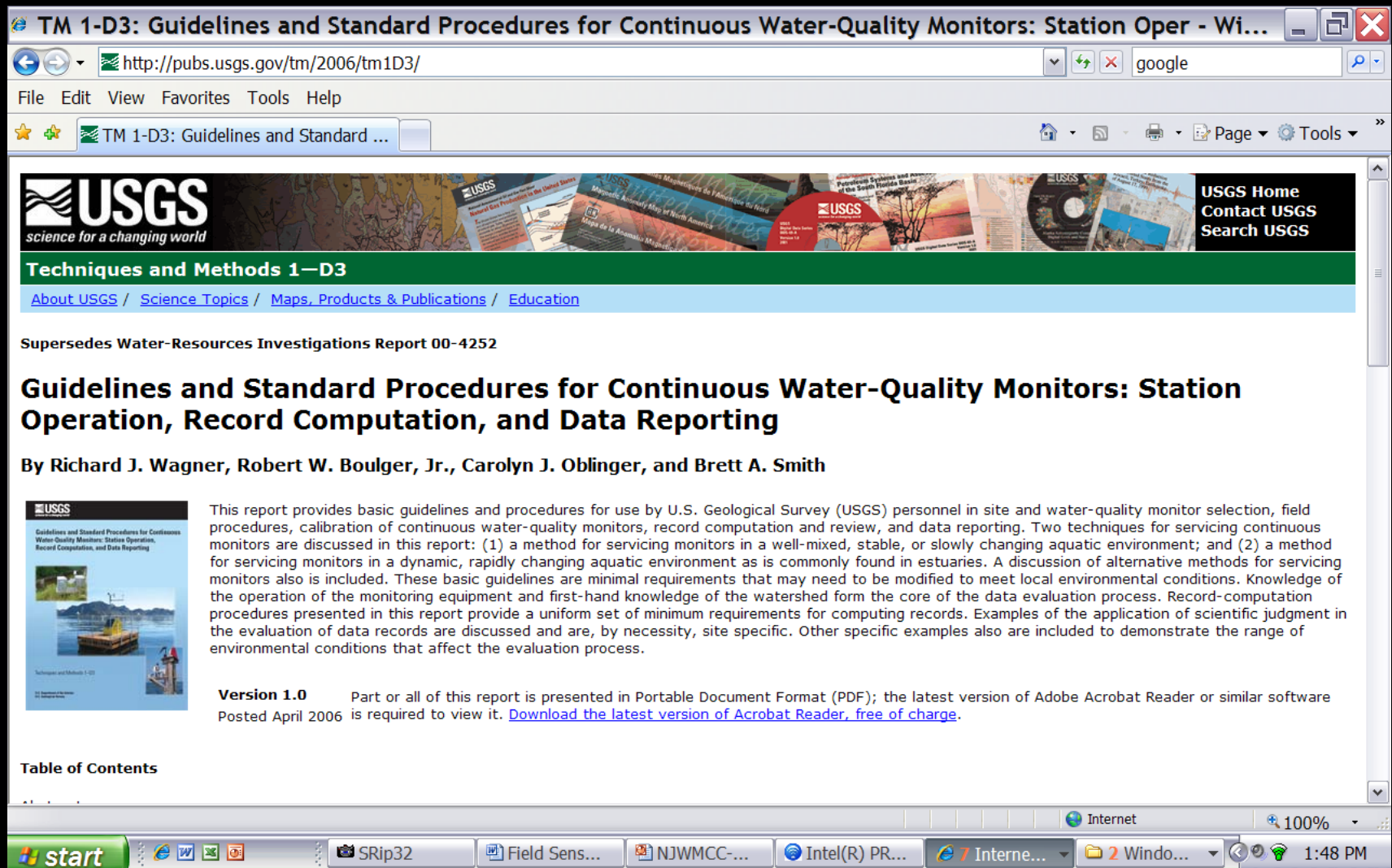
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

USGS Guidelines

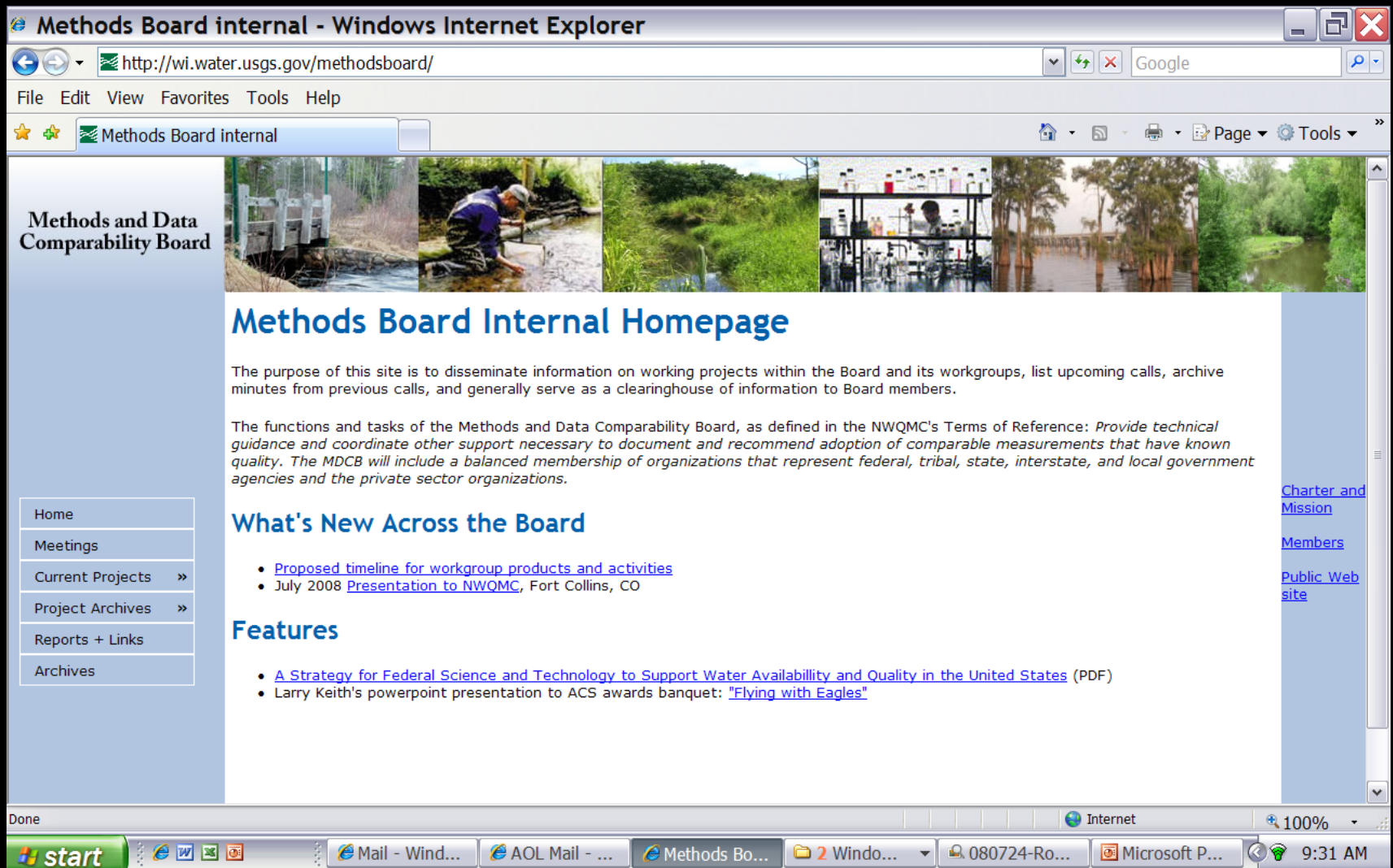
http://pubs.usgs.gov/tm/2006/tm1D3/

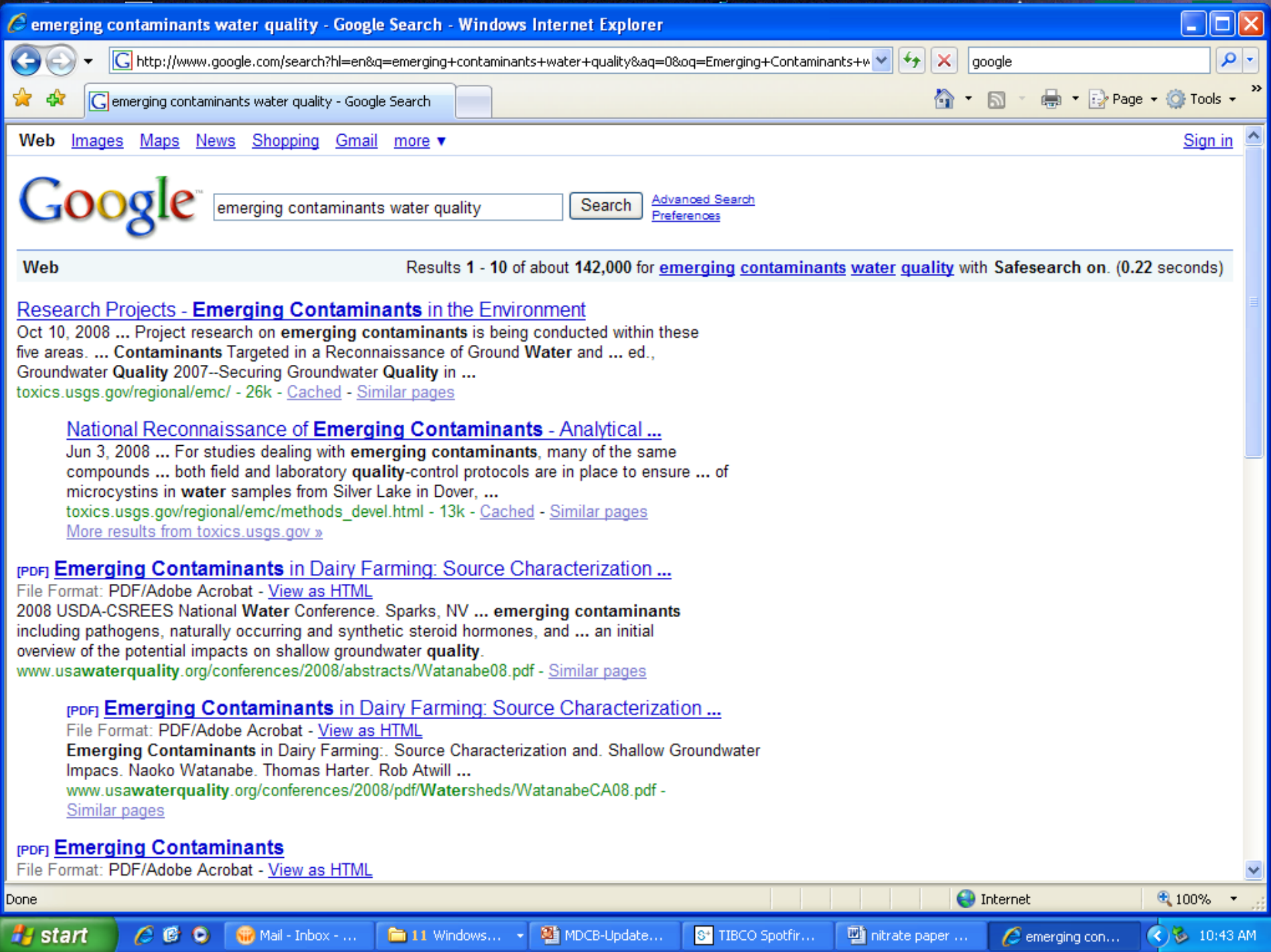


MDCB Internal Web page

http://wi.water.usgs.gov/methodsboard

username: methods password: nocarpp99

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Oct 10, 2008 ... Project research on emerging contaminants is being conducted within these five areas. ... Contaminants Targeted in a Reconnaissance of Ground Water and ... ed., Groundwater Quality 2007--Securing Groundwater Quality in ...
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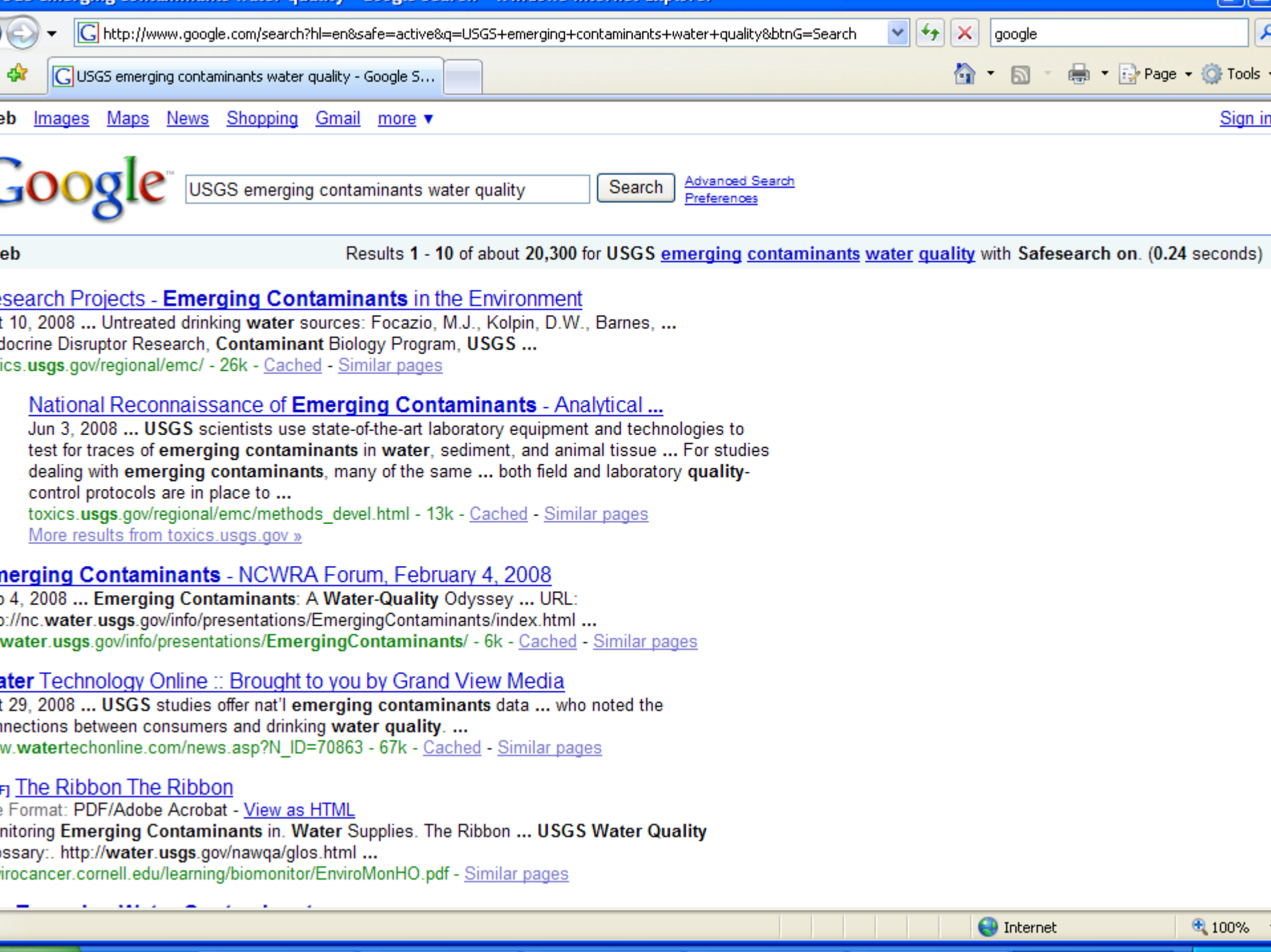
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