FINAL AGENDA

NADP Spring Meeting

Joint Subcommittee Meeting

March 25-26, 2003

Tuesday, March 25

8:00-8:15	Introduction of Attendees and Agenda Overview	Nilles
8:30-9:10	NADP Program Office Report	Van Bowersox
9:10-9:40	CAL Report	Karen Harlin
9:40-10:00	Bag liner experiments	Karen Harlin
10:00-10:30	Break	
10:30-11:00	MDN Report	Clyde Sweet
11:00-11:30	HAL Report	Bob Brunett
11:30-1:00	Lunch	
1:00-5:00	Subcommittee Meetings	
	Network Operations Subcommittee (NOS)	Mark Nilles
	Data Management Subcommittee (DMAS)	Bob Larson
	Effects Subcommittee	John Sherwell

Wednesday, March 26

8:00-8:30	YES Inc. Collector performance	Scott Dossett
8:30-8:45	Climate Reference network CD-ROM	Scott Dossett
8:45-9: 10	Precipitation data-collocated NTN and MDN sites	Van Bowersox
9:10-9:30	N-CON version II MDN prototype collector	Mark Nilles
9:30-9:45	Ott Pluvio update, reports, software and telemetry	Mark Nilles
9:45-10:15	Break	

10:15-11:00	Discussion: Testing& decisions for new equipment	All
11:00-11:30	Network QA Report	Chris Lehmann
11:30-1:00	Lunch	
1 :00-2:30	Urban site data utilization in NADP products and other Data subcommittee issues for joint session	Bob Larson
2: 30-3 :00	Break	
3:00-4:30	Environmental effects agenda items joint session	John Sherwell
4:30-4:45	Other business	
4:45-5:00	Straw poll for Spring 2004 Meeting and closing	Latysh
5:00	Adjourn	

Attachment 1B, NADP Joint Subcommittee minutes, Spring 2003

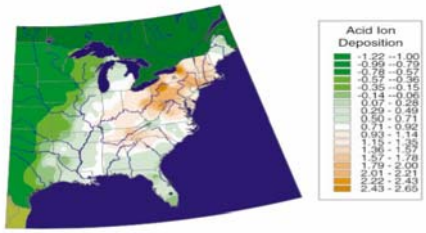
March 2003 NADP

Participation List

NAME	Agency/Assoc'n/Etc.	Phone
Karen Harlin	ISWS/CAL	217-244-6413
Mark Nilles	USGS	303-236-1878
Jane Rothert	CAL	217-333-7943
Kirsi Longley	HAL	206-622-6960
Megan Vogt	HAL	206-622-6960
Nicholas McMillan	HAL	206-622-6960
Gerard Van Der Jagt	HAL	206-622-6960
Bob Brunette	HAL	206-622-6960
Kemp Howell	MACTEC	352-333-6612
David Schmeltz	EPA	202-462-7305
Natalie Latysh	USGS	303-236-1874
Luther Smith	ManTech	919-406-2154
Pam Padgett	USDA-FS	909-680-1584
Kathy Douglas	CAL/PO	217-333-7871
Chris Lehmann	ISWS/NADP	217-265-8512
Jack Beach	n-con system	800-932-6266
Chul-Un Ro	Env. Canada	416-739-4455
Dave Maxwell	NPS	303-969-2810
Greg Wetherbee	USGS	303-236-1837
Scott Dossett	ISWS/NTN	217-244-0372
Clyde Sweet	ISWS/MDN	217-333-7191
Mike Kolian	EPA-CAMD	202-564-2684
Chris Rogers	MACTEC	904-242-8852
John Shimshock	ATS	412-967-1800
Tom Jones	ATS	412-967-1900
Otto J. Zuelke III	LDEQ	225-765-2581
Louis Johnson	LDEQ	225-765-2405
John Sherwell	MD-DNR	410-260-8667
Maggie Kerchner	NOAA	410-267-5670

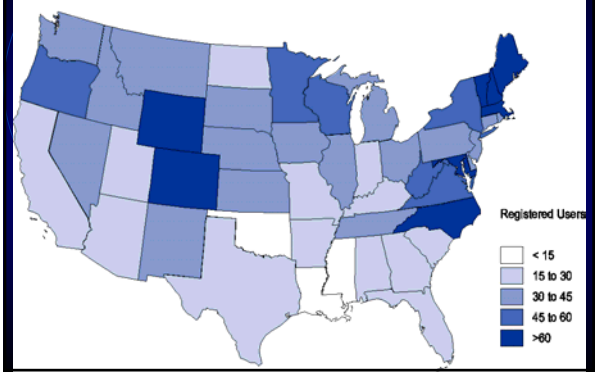
Adverse effects of acid rain on the distribution of the Wood Thrush *Hylocichla mustelina* in North America

Ralph S. Hames*, Kenneth V. Rosenberg, James D. Lowe, Sara E. Barker, and Andre A. Dhondt
Cornell Laboratory of Ornithology, Cornell University, Ithaca, NY 14850

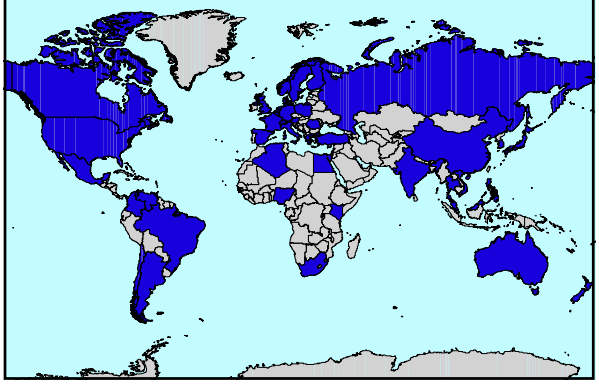


http://nadp.sws.uiuc.edu

Registered NADP Users per Million People



Countries with Registered NADP Users

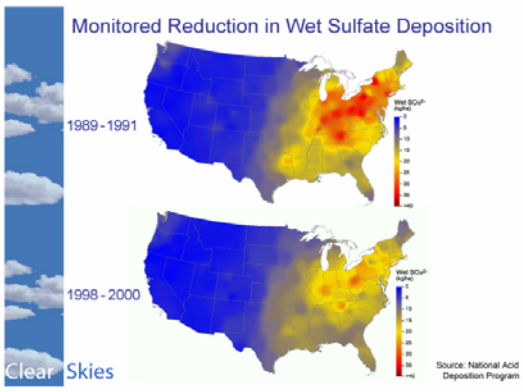


The NADP Vision

- Remain one of the nation's premier research support projects
- Serve scientists and educators

• Support informed decisions on air quality issues related to precipitation chemistry

Monitored Reduction in Wet Sulfate Deposition



USES OF NADP ISOTOPE DATA

^{2}H

Study Climate Reconstructions

Study Watershed Processes

^{18}O

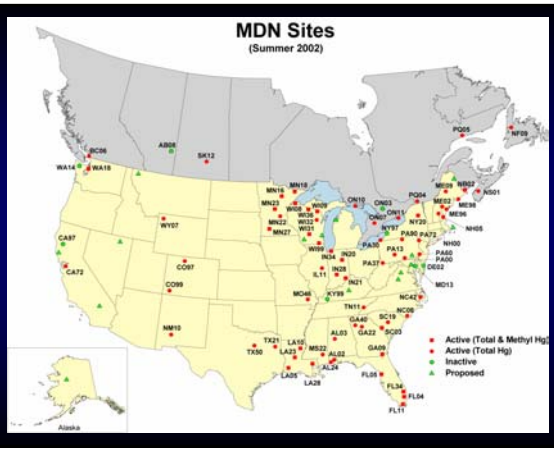
Study Biosphere/ Atmosphere Interactions

Quality Data?

What do we mean when we say:

"NADP provides quality assured data and information in support of research…."

→ **Data Quality Objectives**



→ ?

AeroChem Metrics Collector

YES Collector

N-Con Collectors

The NADP Vision

- Remain one of the nation's premier research support projects

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

A Cooperative Research Support Program of the
State Agricultural Experiment Stations (NRSP-3)
Federal and State Agencies
and Private Research Organizations

NADP

National Research Support Project #3
- A Long-term Monitoring Program
In Support of
Research on the Effects of Atmospheric
Chemical Deposition

NADP

National Research Support Program-3 Proposal
The National Atmospheric Deposition Program
A Long Term Monitoring Program in Support of Research on the Effects of Atmospheric Chemical Deposition

This proposal can also be reviewed within the
National Information Management and Support System (NIMSS)

Proposal Documents	What is NRSP-3? Additional Information
• Proposal • Appendix E. Project Participation • Attachment 1. NADP Role in Monitoring Atmospheric Chemical Deposition • Attachment 2. Informational and Educational Brochures and Programs • Attachment 3. Publications by NADP (NRSP-3) Scientists • Attachment 4. NADP (NRSP-3) Cooperators and Technical Committee • Attachment 5. Budget Information	• NRSP-3 Governance • NRSP-3 History • NRSP-3 Products • Administrative and Technical Review Report • SAES-122 Multistate Research Activity Accomplishments Report - 2001

Adobe Acrobat Reader is required to view these files.
The free Acrobat Reader can be downloaded here:
Get Acrobat Reader

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http://nadp.sws.uiuc.edu/nrsp3

SAAESD Southern Association of Agricultural Experiment Station Directors

Accepted 5-year renewal of NRSP-3.
October 2002 - September 2007

Northeastern Regional
Association
of State Agricultural
Experiment
Station Directors

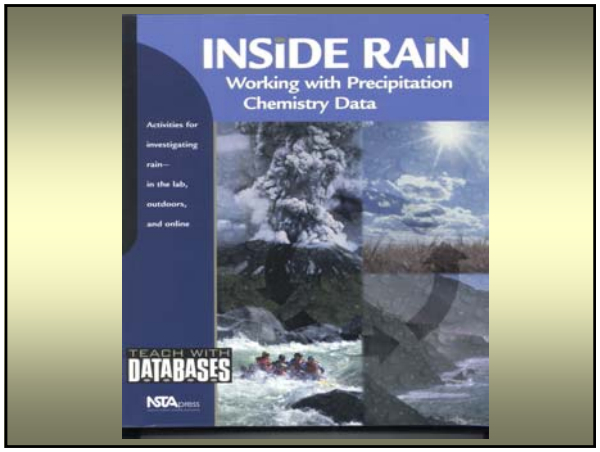
"Recommend approval of proposal subject to consequences of NRSP Review Task Force."

NORTH CENTRAL ASSOCIATION OF
AGRICULTURAL EXPERIMENT STATION DIRECTORS

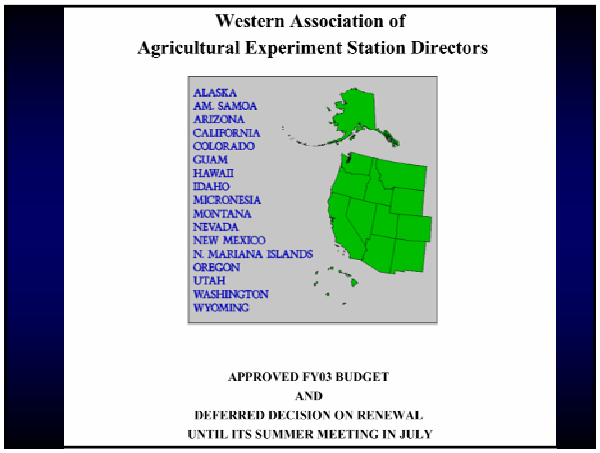
VOTED TO EXTEND NRSP-3 FOR ONE YEAR

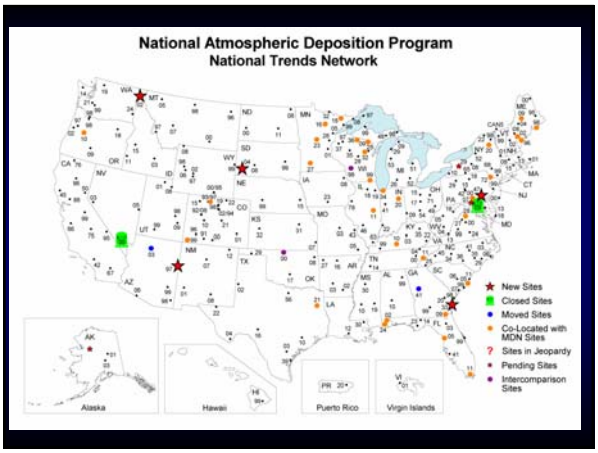
AND

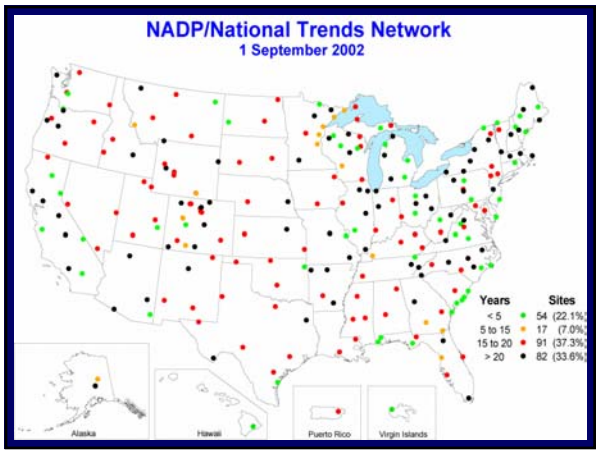
CONSIDER A 4-YEAR RENEWAL IN SPRING OF 2003

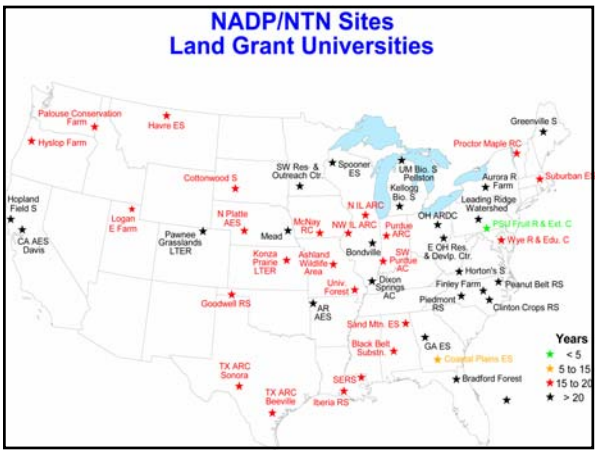

INSIDE RAIN
Working with Precipitation Chemistry Data
Activities for investigating rain— in the lab, outdoors, and online
TEACH WITH DATABASES
NSTA PRESS

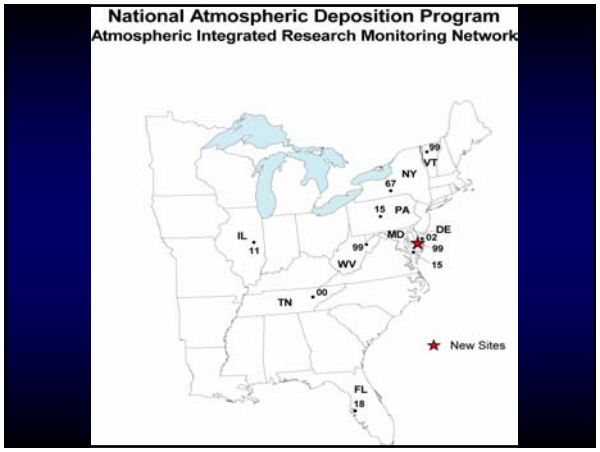

ECOSYSTEM CHANGE AND PUBLIC HEALTH
A Global Perspective
ENVIRONMENTAL GEOLOGY
Meteorology
Applying Chemistry to Society


Western Association of
Agricultural Experiment Station Directors
ALASKA
AM. SAMOA
ARIZONA
CALIFORNIA
COLORADO
GUAM
HAWAII
IDAHO
MICRONESIA
MONTANA
NEVADA
NEW MEXICO
N. MARIANA ISLANDS
OREGON
UTAH
WASHINGTON
WYOMING
APPROVED FY03 BUDGET
AND
DEFERRED DECISION ON RENEWAL
UNTIL ITS SUMMER MEETING IN JULY


National Atmospheric Deposition Program
National Trends Network
New Sites
Closed Sites
Moved Sites
Co-Located with MDN Sites
Sites in Jeopardy
Pending Sites
Intercomparison Sites
Alaska
Hawaii
Puerto Rico
Virgin Islands

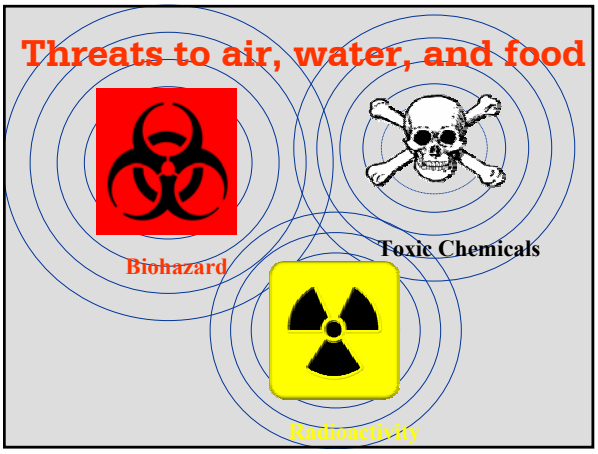

NADP/National Trends Network
1 September 2002
Years
Sites
< 5 54 (22.1%)
5 to 15 17 (7.0%)
15 to 20 91 (37.3%)
> 20 82 (33.6%)
Alaska
Hawaii
Puerto Rico
Virgin Islands

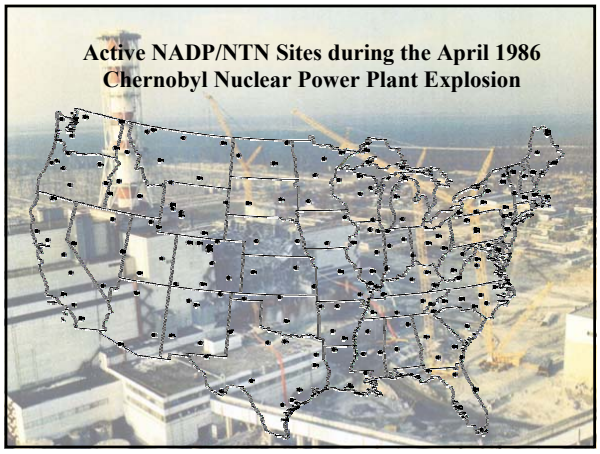

NADP/NTN Sites
Land Grant Universities
Palouse Conservation Farm
Havre ES
Hyslop Farm
Greenville S
Proctor Maple RC
Cottonwood S
SW Res. & Outreach Ctr.
Spooner ES
UM Bio. S
Pellston
Kellogg Bio. S
Aurora R Farm
Suburban ES
Leading Ridge Watershed
Hopland Field S
CA AES Davis
Logan E Farm
N Platte AES
Pawnee Grasslands LTER
Mead
McNay RC
N IL ARC
NW IL ARC
Purdue ARC
OH ARDC
PSU Fruit R & Ext. C
Wye R & Edu. C
Bondville
SW Purdue AC
E OH Res. & Devlp. Ctr.
Konza Prairie LTER
Ashland Wildlife Area
Horton's S
Univ. Forest
Dixon Springs AC
Finley Farm
Peanut Belt RS
Goodwell RS
AR AES
Piedmont RS
Clinton Crops RS
Sand Mtn. ES
Black Belt Substn.
GA ES
Coastal Plains ES
Years
< 5
5 to 15
15 to 20
> 20
TX ARC Sonora
TX ARC Beeville
SERS
Iberia RS
Bradford Forest

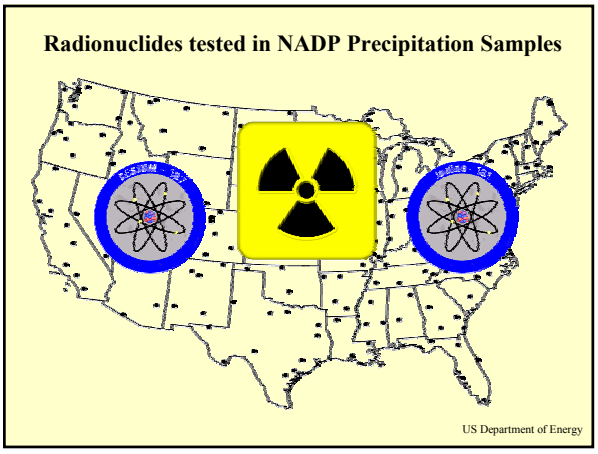


The NADP Vision

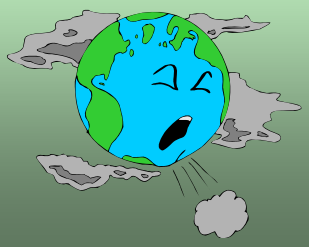
- Remain one of the nation's premier research support projects
- Serve scientists and educators
- Support informed decisions on air quality issues related to precipitation chemistry
- **Respond to emerging issues**

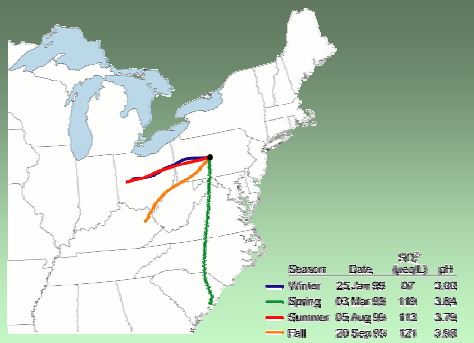






Atmospheric Integrated Research Monitoring Network (AIRMoN) 1992





Trajectories based on NOAA Air Resources Laboratory HYSPLIT model

The NADP Vision

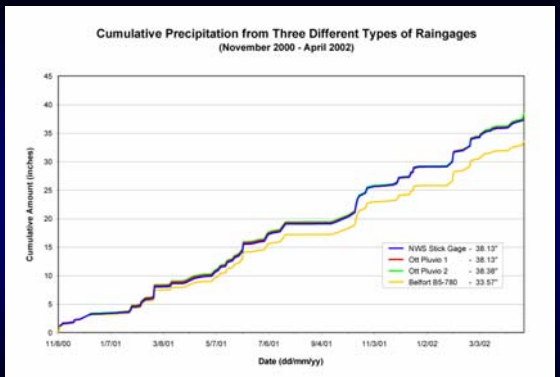
- Remain one of the nation's premier research support projects
- Serve scientists and educators
- Support informed decisions on air quality issues related to precipitation chemistry
- Respond to emerging issues
- **Efficient measurement system**

→ ?

Belfort B5-780

Geonor T-200

Ott Pluvio



Statistic	Ott 1	Ott 2	
Number of Events	132	132	
Mean Precipitation (inches)	0.28(9)	0.29(1)	
Median Precipitation (inches)	0.13(5)	0.13(0)	
Total Precipitation (inches)	38.13	38.38	

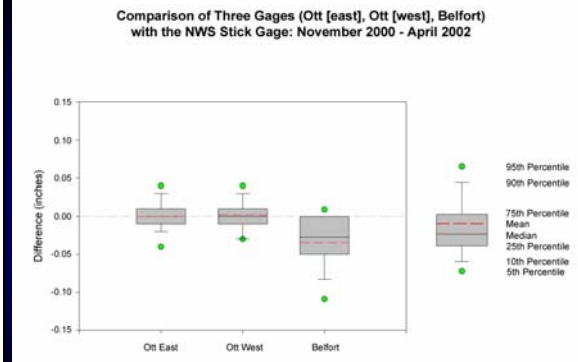
Paired t -Test	Mean Difference	p-value	Hyp: Mean Difference = 0	
Ott 1 vs. Ott 2	-0.00(2) ± 0.00(6)	0.1831	Do Not Reject	
Paired t -Test	Mean Absolute Difference			Std. Dev.
Ott 1 vs. Ott 2	0.01(8) ± 0.01(0)			0.01(5)

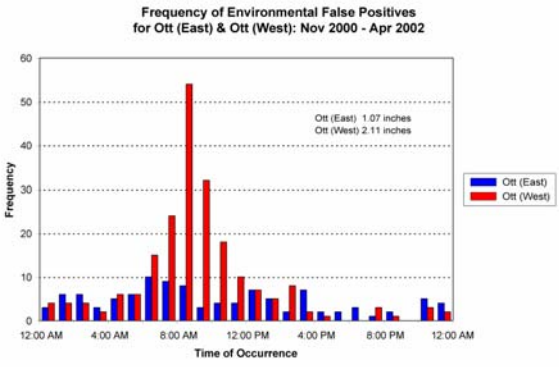
Wilcoxon signed -rank test	p-value	Hyp: Mean Difference = 0	
Ott 1 vs. Ott 2	0.0810	Do Not Reject	

Statistic	Ott 1	Belfort	Stick	Conclusion 1
Number of Events	132	132	132	From Nov 2000 to April 2002, the accumulated precipitation in the Ott and stick gages agree to within ~0% and are ~14% higher than the Belfort gage.
Mean Precipitation (inches)	0.28(9)	0.25(4)	0.28(9)	
Median Precipitation (inches)	0.13(5)	0.10(5)	0.13(0)	
Total Precipitation (inches)	38.13	33.57	38.13	

Paired t -Test	Mean Difference	p-value	Mean Difference = 0	Conclusion 2
Ott 1 vs. Belfort	0.03(5) ± 0.00(8)	~0	Reject	Paired t-test shows that for 132 events, the Ott and stick gages agree and are 0.03-0.04 inches higher than the Belfort gage.
Ott 1 vs. Stick	0.00(0) ± 0.00(5)	1.0000	Do Not Reject	
Stick vs. Belfort	0.03(5) ± 0.00(8)	~0	Reject	

Wilcoxon signed -rank test	p-value	Mean Difference = 0	Conclusion 3
Ott 1 vs. Belfort	~0	Reject	Wilcoxon test results: Ott and Stick gage measurements agree; Ott & Belfort and stick & Belfort do not agree
Ott 1 vs. Stick	0.9843	Do Not Reject	
Stick vs. Belfort	~0	Reject	





NOAH III Raingage Analysis

- Two identical raingages with optical sensors placed approximately 20 feet apart; identified as North (N) and South (S).
- Data divided into three groups: unfiltered, filtered, and filtered with step-down removed.

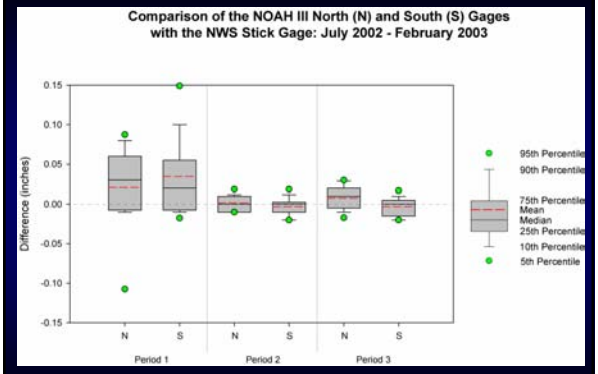
NOAH III Raingage Analysis

	Dates	Number of Events	Number of Frozen Events	Data Type
Period 1	July 2002 – August 2002	15	0	Unfiltered
Period 2	September 2002 – December 2002	13	2	Filtered
Period 3	December 2002 – February 2003	17	12	Filtered with step-down on North gage

NOAH III Raingage Analysis

	Dates	Data Type	Number of False Positives	Amount of False Positives
Period 1	July 2002 – August 2002	Unfiltered	197*	6.33"*
Period 2	September 2002 – December 2002	Filtered	0	0.00"
Period 3	December 2002 – February 2003	Filtered with step-down on North gage	0	0.00"

* Totals for both gages are included



The NADP Vision

Support user needs

Central Analytical Laboratory (CAL) Report
March 2003

Site Operations

NTN 250 active sites as of 03/20/03 (includes 2 collocated sites 02OR and 98WI)

18 new sites or 8% increase in 2002

AIRMoN 10 active sites (Note DE99 to become NTN site in 2003); 3 sites had ATS audit

Inventory required = 300 sampling supplies (buckets, lids, and 1-liter bottles)/wk

Site Operator Training Course

33rd Site Operation Training Course -- April 8-10, 2003

2nd yr that special sessions for MDN and AIRMoN operator training are included. 30 have registered

NTN Site Operation Manual revisions

Revised Appendix A (NTN Equipment Requirements)--done

Revised Section 7 (contact information) –done

Appendix B (Troubleshooting pH and Conductivity Measurements) –final proofing

Revisions to be sent in site mailings this spring with a summary cover letter

2004 CALendar

April site mailing will request submission of pictures and information

Deadline May 30

Ideas for this year's theme are welcome

Distributed at the Fall Technical meeting and included in September site mailings

NTN training video "Every Tuesday Morning"

Digitized

Undergoing review by CAL staff prior to being distributed on CDs

On-site troubleshooting decal (new)

To aid in on-site evaluation of motor unit, sensor, or power supply failures

Developed and ready for distribution

NTN Lid Seal Change

Scheduled July 8, 2003

Purchase a 1-year supply this year to deplete inventory pending new collector design

CSU can provide lid seals for new collectors

June 4, 2002; 95 % returned, no unusual problems

Laboratory Operations

Samples received as of 3/21/03

NTN: 236,051

AIRMoN: 14,800

New instrumentation

Replace the 10-year old AAS for major cations (Na, K, Mg, Ca)

Targeted reduced volume (AAS requires 8 mL sample)

elimination or automated addition of modifier

Varian Vista Pro Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) purchased

Lab preparations in progress

Expect install in May

Plans to conduct parallel analysis of AAS vs. ICP as referenced in "Flow Injection Analysis Method Validation Study", Nov 1989

Optimization of nutrient methods

Source of standards, external check samples, and in-house sample handling

Total Nitrogen

Sulfate interference was found with Dionex sampler vials with filters (used for AIRMoN)

CAL experienced delays in ion chromatography analysis which the source of the interference was investigated. The problem was resolved after the source was identified. Only vials without filters are now used at CAL. AIRMoN samples are now decanted for IC analysis rather than filtered.

NADP NTN active archive and current (special) samples

approved at the July 02 and Fall 2002 meetings have been shipped to researchers. AIRMoN archive sample distribution is pending. (See Program Office report)

AAS chemist (Bachman) retired Dec 2002

QA/QC

NOS Review/Audit of CAL operations March 13-15, 2002

CAL received the final report from the review team May 13, 2002

Draft response report to the NADP QA Manager and to the committees in September 2002

Final response report was delivered to the NADP QA Manager for review and distribution in February 2003

2000 CAL Quality Assurance Report -- completed December 2002. CAL and NADP web sites or hard copy by request

2001 CAL Quality Assurance Report

In progress and will be available at fall 2003 meeting

CAL Quality Assurance Plan -- completed August 2002

CAL and NADP web sites or hard copy by request

SOPs

Yearly review on a timetable

Updates proceeding

Quality Assurance Programs (external programs)

USGS

- Field Blank Samples (~100/year)
- Blind Audit Samples (now SHE) (~100/year)
- Interlaboratory Comparison Samples (26 sets/year, 4 per set)

National Water Research Institute, Burlington, Ontario (NWRI), Ecosystem Interlaboratory QA Program (2 sets per year, 10 per set)

World Meteorological Organization (WMO)/Global Atmospheric Watch (GAW) (2 sets per year, 3 per set)

Acid Deposition Monitoring Network in East Asia (EANET), NEW PROGRAM 2001

Norwegian Institute for Air Research (NILU), 1 sample set/year, 4 per set

Data Management Operations

Data to Program Office is on schedule!

NTN Data to PO through **early November 2002**

AIRMoN Data to PO through **mid-December 2002**

Site Information Database -- completed

Information for all three networks (NTN, MDN, AIRMoN)

Includes contact, location, equipment, role, meetings attended, training courses attended, etc.

Programming by Larson, data entry and data entry/updates by CAL

Final Data Review Specialist (NTN) -- Replacement hire

Support programmer (Dzurisin) retired Feb. 2003

Research

The **World Meteorological Organization/Global Atmospheric Watch (WMO/GAW)**

Interlaboratory comparison study

96 laboratories in 48 countries

CAL prepared the first set of 100 sample sets of three samples

- shipped to the Atmospheric Science Research Center in Albany, NY March 20th

Two sets are prepared each year

Jane Rothert coordinates this effort for the CAL

Research

Organic and total nitrogen in NADP precipitation samples

CAL measures inorganic nitrogen (as nitrate and ammonium) in precipitation

Total nitrogen analysis minus inorganic nitrogen = organic nitrogen

NTN Chesapeake Bay samples are being split with Dr. Mark Castro (Univ. of Maryland, Center for Environmental Science Appalachian Laboratory at Frostbury, MD) to compare data between the two laboratories

Research

Biohazards and microbes in precipitation

"Feasibility Study to Evaluate the Use of Precipitation Samples as an Effective Means of Monitoring the Environment for Naturally Occurring, Accidental, or Intentional Release of *Bacillus anthracis* and Other Toxic Agents" submitted to USDS Innovation Fund by Bowersox, Harlin, Maddox (microbiologist), and Jones.

The proposal was not funded, however, preliminary work was conducted. CAL collected excess sample from 20 states west of the Mississippi

- method development
- preliminary investigations

Research

Sulfite and sulfate in AIRMoN samples

Jane Rothert is continuing to evaluate the underestimation of sulfate in winter AIRMoN samples due to the incomplete conversion of sulfite to sulfate.

CAL reports only sulfate

Results will be discussed at the fall 2003 meeting.

Research

Evaluation of bucket liners for NADP sampling

Considerable effort and expense in washing and shipping buckets to sites

Investment in buckets, and mailers to ship them in

Limits the ability of the network to investigate sampler designs that could improve the collection efficiency of blowing precipitation

A study protocol was developed to determine the feasibility of using plastic bucket liners for the NADP project and for new sampler design

Preliminary investigations completed/in-progress

Plastic Bag Liners for Sampler

March 2003 Status Report

Background

Plastic bucket liner could reduce costs:

- Buckets & supplies shipped to/from CAL in 15" x 15" heavy duty mailers
  - mailers could be shipped less frequently
- Shipping costs are currently $7 to $25 one-way
- Reduce inventory costs (buckets & mailers)
  - CAL must prepare and ship 300 buckets/week

- Plastic liner could allow sampler redesign
  - Current system:
    - 3.5-gal bucket 10" deep x 11.5" diameter (25cm x 29 cm)
      - depth/width aspect ratio - 0.9
  - Other Systems:
    - 5-gal bucket 14.6" deep x 11.5" diameter (37 cm x 29 cm)
      - depth/width aspect ratio - 1.2
    - CAPMoN sampler 19.7" deep x 12.4" diameter (50 cm x 31.5 cm)
      - depth/width aspect ratio - 1.6
    - Prototype 20" deep x 10" diameter (50.8 cm x 25.4 cm)
      - depth/width aspect ration - 2.0

Research Goals

- Find a plastic bag with the physical characteristics of strength and the ability to conform to the container dimensions
- The bag must be chemically "clean" for the analytes of interest
- The bag must yield recovery of spiked samples which are consistent with current procedures
- Evaluate bags used by other precipitation networks (CAPMoN, NYS)
- Develop a working procedure to install liners in a field situation
- Perform preliminary field tests using paired samplers driven by a common sensor
- Estimate cost savings to networks if monthly or quarterly shipments of site suppliers were implemented

Update

Protocol : Decant into 1-liter bottles as done currently; not mail sealed bag to CAL

What's been done?

- Tested a lot of bags with DI water and synthetic rain solutions
  - 50 mL solution added; decant after ~ 24 hours
- Results: Many bags rejected due to chemical contamination
  - Slip and antiblock chemicals added to polyethylene for processing
  - Many chemicals used
    - pH effects (increase or decrease seen)
    - Ca, Na, Cl, NH4 are biggest sources of contamination
- Field tested selected bags
  - ACM parallel samplers with independent sensors
  - ACM parallel samplers with common sensor

Update (continued)

Results from some likely candidates:

CAPMoN bags, polyethylene and Mylar (Vin Plastics, Ontario)

- \+ Very clean, supplier developed special protocols for precipitation sampling virgin PE, no additives (slip or antiblock), must have polyester for strength
- \- Too rigid to conform to 3.5 gal bucket
- \+ Field tested. Only problems were primarily K (lid seal considerations?)

4 mil PE, clean room level 50 bags (Eastern States Packing, MA)

- \+ Some memory effect when conforming to bucket shape with vacuum
- \- Na ~ 15 ppb
- \- NH4 loss (spike @ 80 ppb = 60 ppb, 75% recovery)
- \- pH drop (DI target @ 5.6 = 5.4; spike target @ 4.96 = 4.88)
- \- Field tested

Update (continued)

Results from some likely candidates:

CAPMoN lid bags, 2 mil polyethylene (Vin Plastics, Ontario)

- \- Na ~ 20 ppb
- \- Ca ~ 10 ppb
- \+ Field tested, conforms well to bucket

Clean room polyethylene, 2 mil, (KNF Clean Room Products, NY)

- \+ Very clean
- \- Only a small surface area tested , (5 x 5)
- \- Not field tested

Clean room Teflon (KNF Clean Room Products, NY)

- \+ Very clean
- \- Very costly! (~$45 per bag)

Update (continued)

Results from some likely candidates:

FDA grade polyethylene, 3 mil (Rutan Polyethylene Supply & Bag Manuf. Co, New Jersey)

- ~ 5-10 ppb NH4
- Only a small surface area tested (8 x 4 x 8.5)
- Producer does not add anything, must come from supplier with additives; technical contact suspects that we could see an intermittent seasonal problem as humidity levels vary

\+ Producer wants to work with us but suggests that KNF may be a better source

What is recommended?

Teflon is idea but too costly (~$45 each)

Ideal polyethylene bag

~ 3-6 mil and chemically "clean"

fit dimensions of sampler container well

Consistent product quality for 16,000 bags/year

Dimensions to fit existing ACM or equivalent sampler

- 15.5" deep x 19 in. diameter
- Pail liner style bag needed

Dimensions to fit new sampler design if 20" x 10"

- 27" deep x 17.5" diameter

What is recommended?

Vin Plastics, Ontario

- Very clean, has worked with Canadian program to customize a suitable system
- Cannot make polyethylene bag wo/mylar, but can make it with thinner polyester film to reduce rigidity
- Has never made pail-liner style bag, but will evaluate the possibility
- Can taper the bottom for a flat style bag
- Cost for flat bag $0.80- $1.00 each

KNF Clean Room Products Corp, Ronkonkoma, NY

- Looks OK to date with 5 x 5 bag; they are sending a 20 x 24 bag to test
- QC includes cleaning resin when it arrives, using air showers to remove dirt from product, recleaning it prior to extruding. Used for some NASA applications
- Can do custom manufacturing
- Cost for NASA spec level 100 bag ~ $0.50 each
- Does not make a pail-liner style bag

What next?

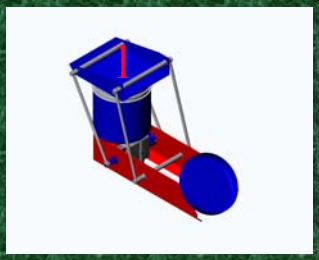
Proceed with field testing a bag that will fit current sampler design (3.5 gallon bucket)?

Plan to get a clean, durable bag and wait until next collector design?

YES Inc. TPS 3000 Collector and Theis Clima optical sensor performance

YES Total Precipitation Sampler TPS 3000

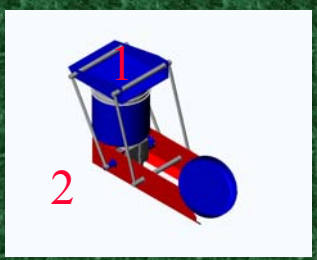
Flat reciprocating lid



YES Total Precipitation Sampler TPS 3000

Flat reciprocating lid

Strong DC drive motor

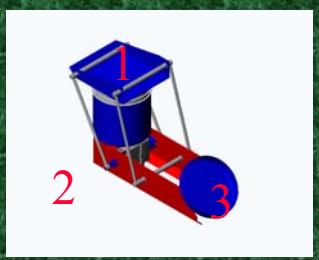


YES Total Precipitation Sampler TPS 3000

Flat reciprocating lid

Strong DC drive motor

Lid rest



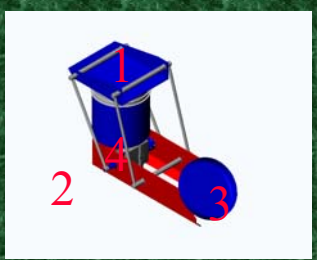
YES Total Precipitation Sampler TPS 3000

Flat reciprocating lid

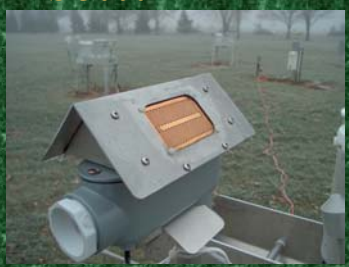
Strong DC drive motor

Lid rest

Holder to secure up to 5 gallon bucket



YES Total Precipitation Sampler TPS 3000



YES Total Precipitation Sampler TPS 3000

Gold grid sensor

YES Total Precipitation Sampler TPS 3000

Gold grid sensor

Logic circuitry inside sensor head

YES Total Precipitation Sampler TPS 3000

Gold grid sensor

Logic circuitry inside sensor head

IRDA data port

Design Review

Design Review

-Sensor head too large for position

Design Review

-Sensor head too large for position

-Assembly procedure OK for prototype

Design Review

-Sensor head too large for position

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-Materials of good quality

Design Review

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-Construction "fit and finish OK for prototype, sensor poor

Design Review

-Sensor head too large for position

-Assembly procedure OK for prototype

-Materials of good quality

-Construction "fit and finish OK for prototype, sensor poor

-Power supply not acceptable (new one just received)

Operational Review

-Approximately 3.5 months of ISWS "backyard" time

-No freeze room or chemistry tests.

-Original unit replaced with YES test collector on 3/11/03.

Operational Review

-Sensor prone to icing

Operational Review

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Operational Review

-Sensor prone to icing

-Drive system prone to sticking system in open position after event (YES things it could be power supply, new power supply received)

Operational Review

-Sensor prone to icing

-Drive system prone to sticking system in open position after event (YES things it could be power supply, new power supply received)

13 occurrences noted since 11/26/02

requires ~30 second power off "manual" reset

Operational Review

-Sensor prone to icing

-Drive system prone to sticking system in open position after event (YES things it could be power supply, new power supply received)

-IRDA port malfunction

Operational Review

Operational Review

-Sensor prone to icing

-Drive system prone to sticking system in open position after event (YES things it could be power supply, new power supply received)

-IRDA port malfunction

-Drive motor "slap" increasing over time

Operational Review

-Sensor prone to icing

-Drive system prone to sticking system in open position after event (YES things it could be power supply, new power supply received)

-IRDA port malfunction

-Drive motor "slap" increasing over time

-Power consumption not compatible with DC operation

Operational Review

nt (YES

ver

ble

Operational Review

-Positive attributes

STRONG DC MOTOR

Operational Review

-Positive attributes

STRONG DC MOTOR

GOOD LID POSITION CONTROL

Operational Review

-Positive attributes

STRONG DC MOTOR

GOOD LID POSITION CONTROL

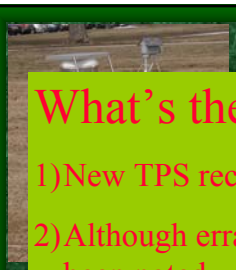
GOOD (NADP STANDARD) LIDSEAL

In one sentence

Operational Review

At present the collector can not be relied upon to make wet-deposition only samples.

srd e-mail to YES 3/7/3



Operational Review

What's the plan:

1) New TPS received and installed.

2) Although erratic lid motion has been noted within the first week of operation OF THE NEW UNIT, we will continue to work with Yankee.

Operational Review

What's the plan:

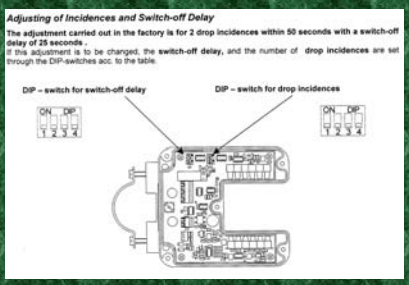
3) It is worth note that YES feels that their responsibilities within PHASE II of the DOC SBIR have been fulfilled.

THEIS CLIMA OPTICAL SENSOR

THEIS CLIMA OPTICAL SENSOR

POSTIVES	NEGATIVE
Small compact design	24 VDC operation
DIP switch settable	Power out default opens collector
Easy mounting	Limited "slit width" reduces sensitivity to snow

THEIS CLIMA OPTICAL SENSOR



Adjusting of Incidences and Switch-off Delay

The adjustment carried out in the factory is for 2 drop incidences within 50 seconds with a switch-off delay of 25 seconds .

If this adjustment is to be changed, the **switch-off delay,** and the number of **drop incidences** are set through the DIP-switches acc. to the table.

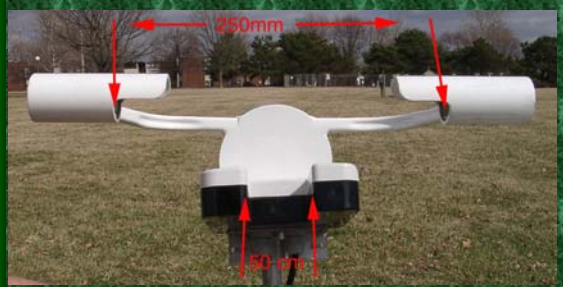
DIP – switch for switch-off delay

DIP – switch for drop incidences

THEIS CLIMA OPTICAL SENSOR

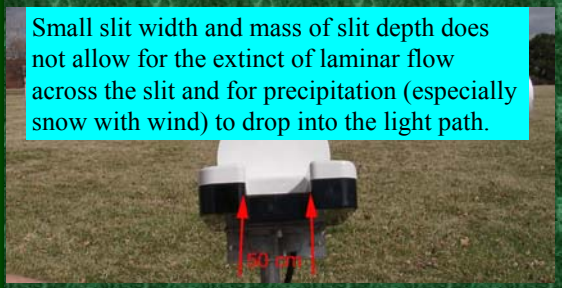
DIP- switch-off delay (1 = ON)					DIP- drop incidences – filter (1 = ON)				
S 1	S 2	S 3	S 4	time (sec)	S 1	S 2	S 3	S 4	drops
0	0	0	0	0	0	0	0	0	0
1	0	0	0	25	1	0	0	0	1
0	1	0	0	50					
1	1	0	0	75	1	1	0	0	3
0	0	1	0	100	0	0	1	0	4
1	0	1	0	125	1	0	1	0	5
0	1	1	0	150	0	1	1	0	6
1	1	1	0	175	1	1	1	0	7
0	0	0	1	200	0	0	0	1	8
1	0	0	1	225	1	0	0	1	9
0	1	0	1	250	0	1	0	1	10
1	1	0	1	275	1	1	0	1	11
0	0	1	1	300	0	0	1	1	12
1	0	1	1	325	1	0	1	1	13
0	1	1	1	350	0	1	1	1	14
1	1	1	1	375	1	1	1	1	15

THEIS CLIMA OPTICAL SENSOR

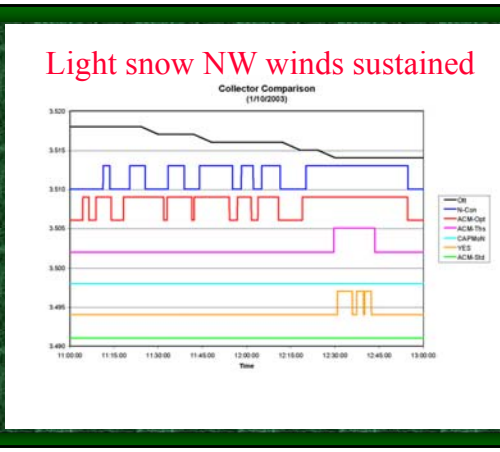


THEIS CLIMA OPTICAL SENSOR

Small slit width and mass of slit depth does not allow for the extinct of laminar flow across the slit and for precipitation (especially snow with wind) to drop into the light path.



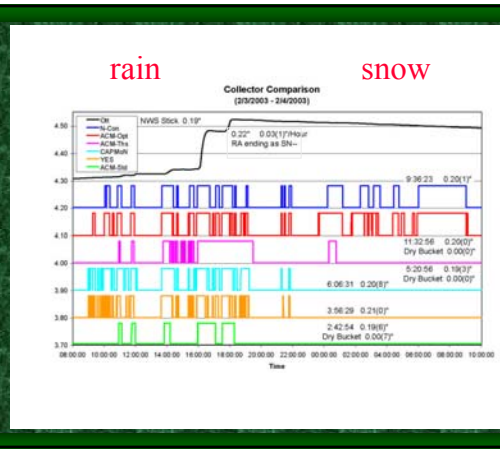
Light snow NW winds sustained



THEIS CLIMA OPTICAL SENSOR

Slit width seems to allow for normal operation during light to moderate rainfall.

rain snow



SUMMARY

Work with YES on improvements to design, operation of TPS 3000

Stop work on THEIS

SUMMARY

BUT WAIT!!!

improvements to design, operation of TPS 3000

Stop work on THEIS

General "sensor" perspectives

General "sensor" perspectives

THANKS to Roger Claybrook for the field work, data editing and slides.

General "sensor" perspectives

THANKS to Roger Claybrook for the field work, data editing and slides.

NOTE: precipitation data taken from OTT Pluvio which (due to the nature of the DMAS) is late to report by ~ 15 minutes.

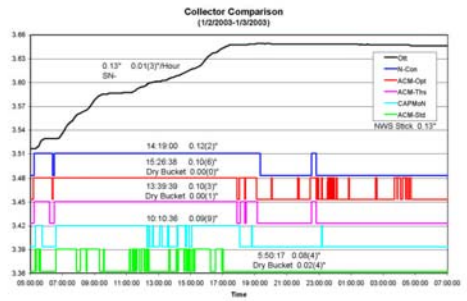
General "sensor" perspectives

Case 1 MODERATE SNOW

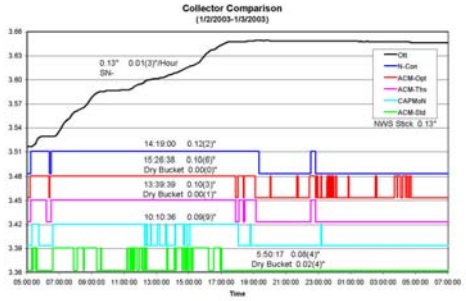
Case 2 LIGHT RAIN

Case 3 MODERATE RAIN

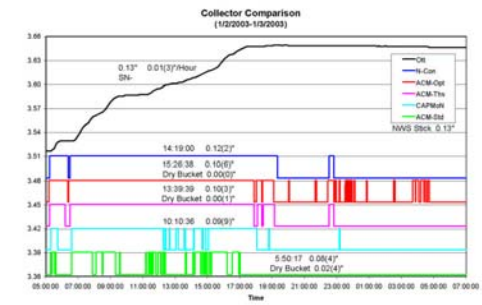
Case 1 MODERATE SNOW



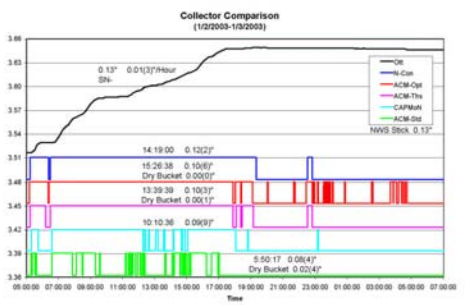
Typically poor grid-plate sensor performance



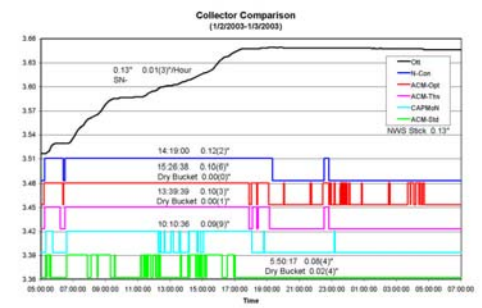
CAPMON better than ACM but not as good as optical



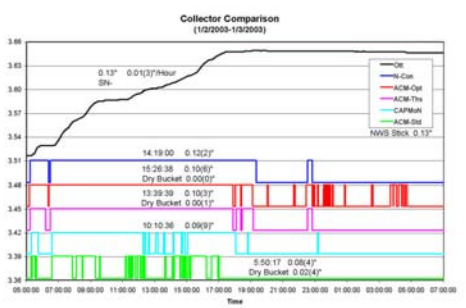
Snow with little wind, THEIS and CAPMON OK



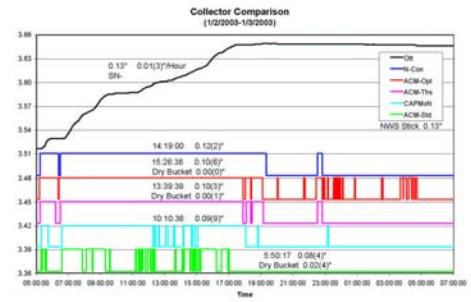
Two ETI's different but most sensitive



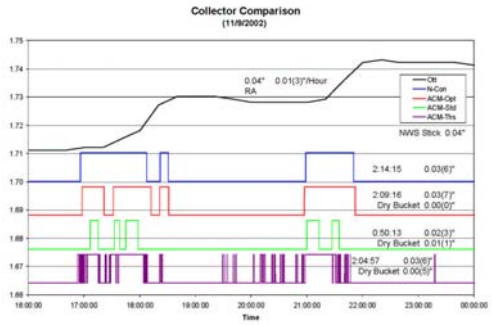
OTT seems to miss late event



Review catch data, Thanks to Van

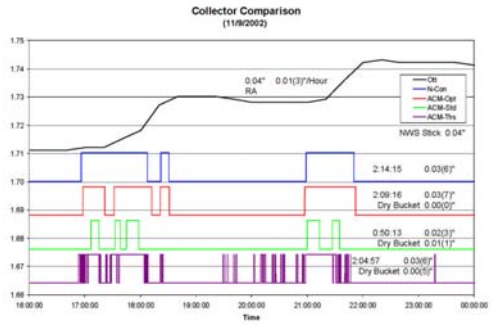


Case 2 LIGHT RAIN

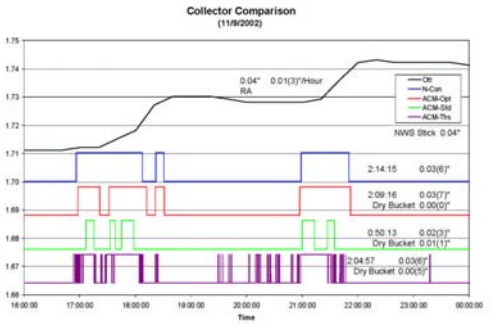


HYPER CLOSE-UP - 8 hour event

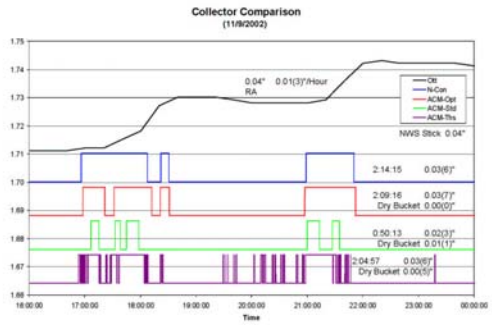
THEIS (purple) and ETI's close (some ETI differences), some THEIS cycling



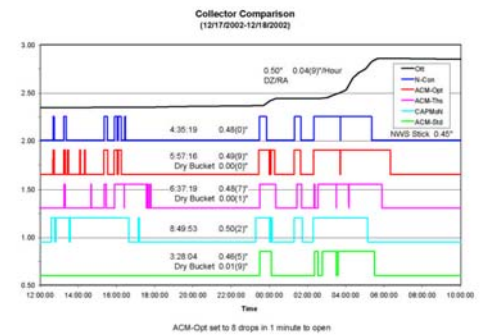
ACM last one out of the gate and missing event



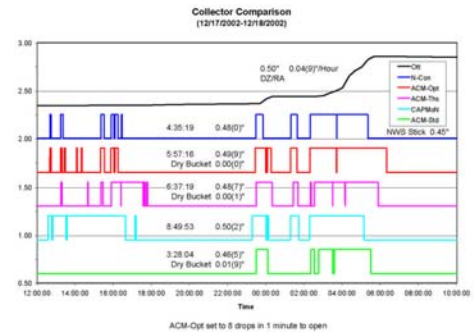
Review catch data



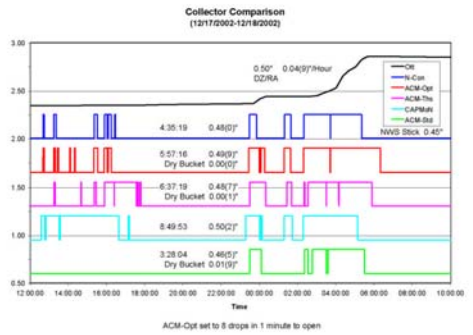
Case 3 MODERATE RAIN



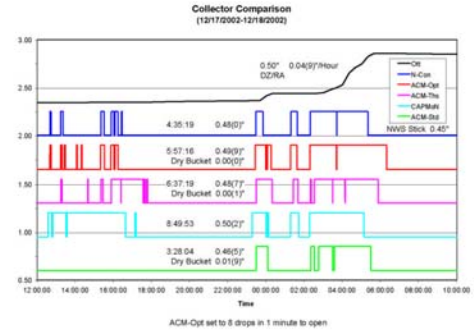
ACM misses light early events



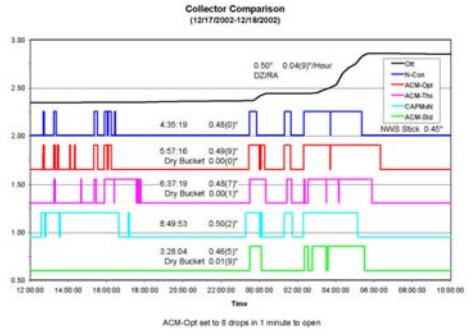
CAPMON open more for early very light precip



THEIS carries event well past other opticals, water"roll off"?



Review catch values (ACM low)



WRAP UP/PLANS

WRAP UP/PLANS

Add 2 more ETI sensors (with NOAH III gages) to array TOTAL OF 4

WRAP UP/PLANS

Add 2 more ETI sensors (with NOAH III gages) to array TOTAL of 4

Run fine grid YES

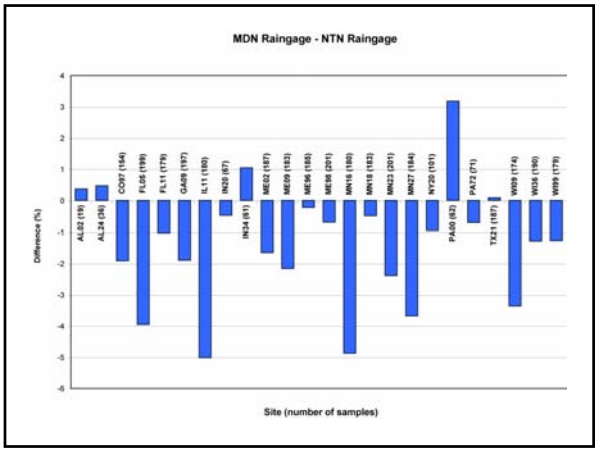
WRAP UP/PLANS

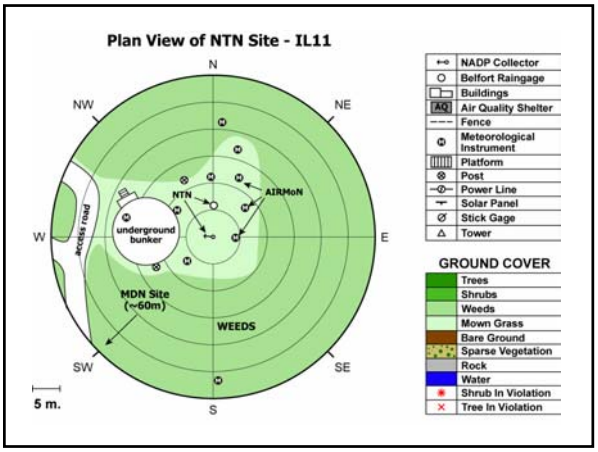
Add 2 more ETI sensors (with NOAH III gages) to array TOTAL of 4

Run fine grid YES

Continue to run

- Standard ACM
- ETI ACM
- ETI NCON
- MIC
- YES

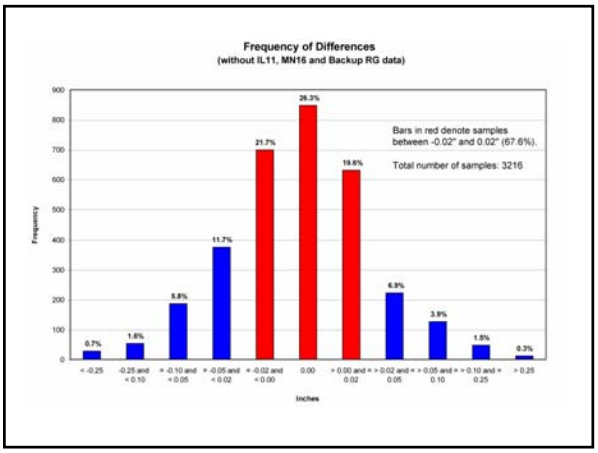


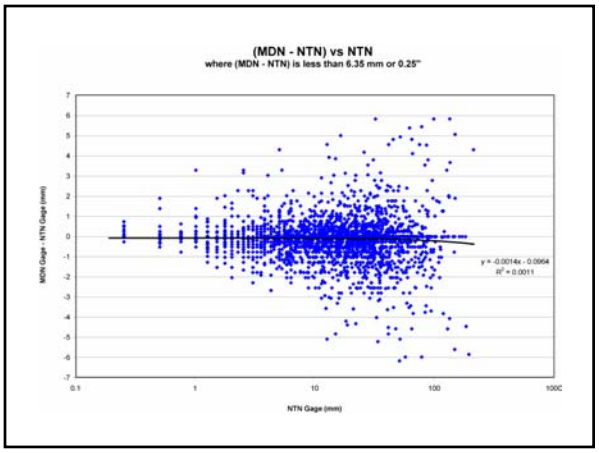


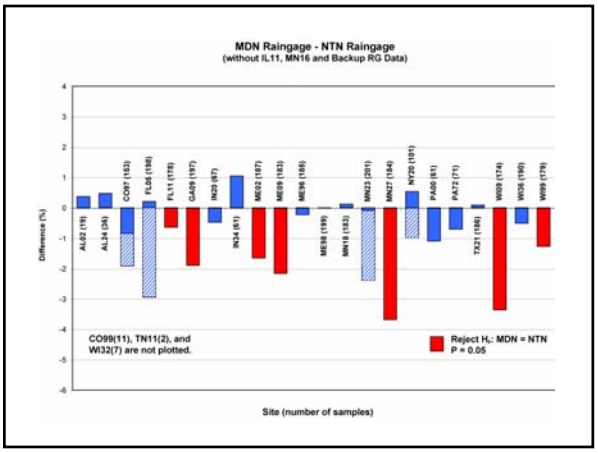
MN16

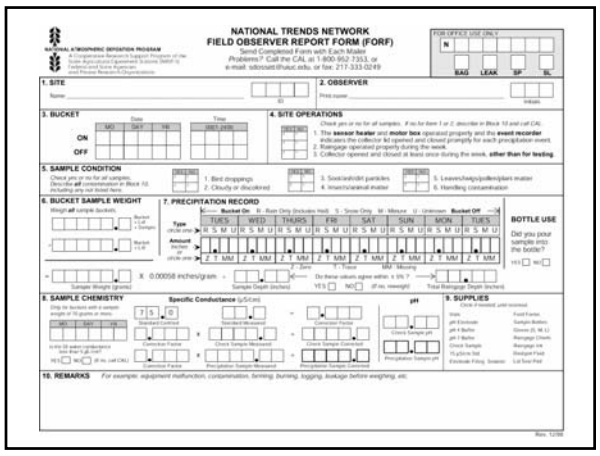
Site operated since 1978 by U.S. Forest Service technician who follows Forest Service procedure, which calls for correcting Belfort gage measurements by NWS (stick) gage measurements. Each daily total and weekly total is adjusted by the ratio:

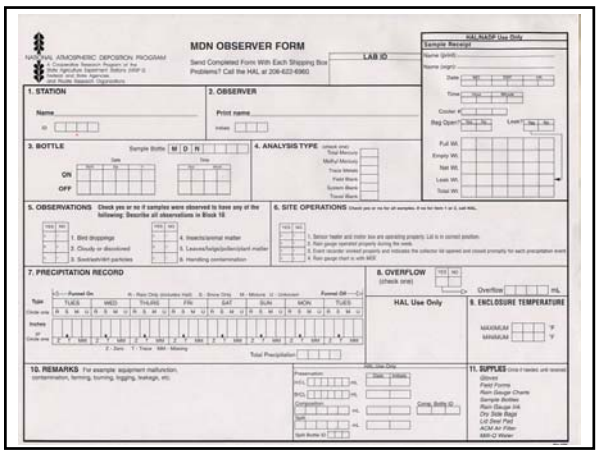
$$\frac{\text{Stick Gage Depth}}{\text{Belfort Gage Depth}}$$







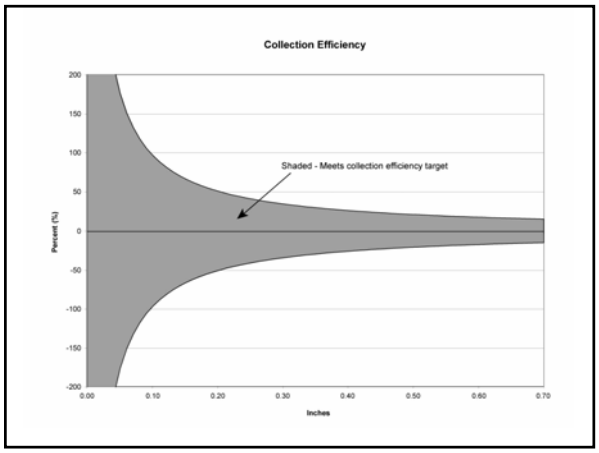

NATIONAL TRENDS NETWORK
FIELD OBSERVER REPORT FORM (FORF)


MDN OBSERVER FORM

CAL Standard Procedures
Precipitation Gage Data Review & Verification

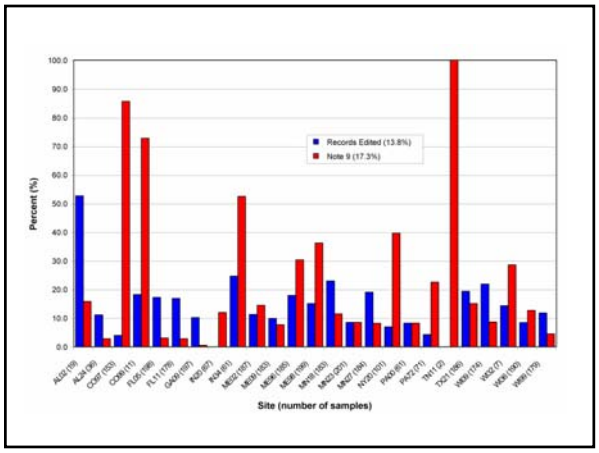
Raingage charts are not routinely read and changed, unless:

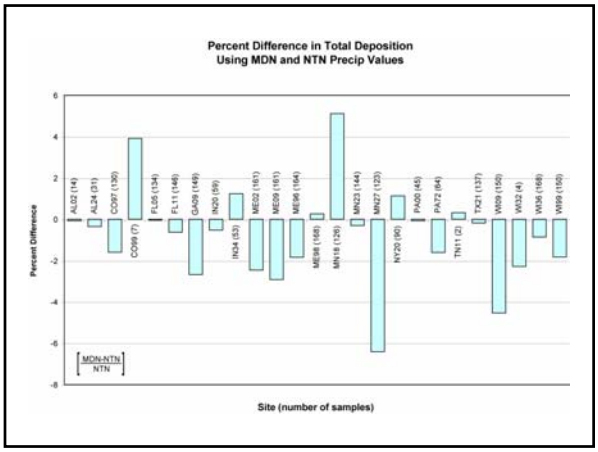
- NOTE 9 - SAMPLE DEPTH does not compare well with PRECIPITATION DEPTH.
- NOTE 25 - SAMPLE DEPTH > PRECIPITATION DEPTH for more than half samples in report. Your gage appears to be undercatching. Please refer to your INSTRUCTION MANUAL, Appendix D for calibration check procedures.



CAL Standard Procedures
Precipitation Gage Data Review & Verification

- Sum of daily amounts does not equal total
- Precipitation type is recorded but no amount
- Total is zero, sample volume > zero, and the lid opened
- Total is missing and chart is present
- Operator reports difficulty reading chart or gage malfunction.





Questions/Discussion Points

- Should the Program Office report different (NTN and MDN) precipitation amounts from the same gage?
- If NO, what should the Program Office do to reconcile the differences?
- Should MDN site operators weigh the samples and compare the sample and precipitation depths?

Comparison of NTN bucket depths and NTN & MDN raingage depths

Gage Amount	$NTN_{bktdepth} > NTN_{gagedepth}$	$NTN_{bktdepth} > MDN_{gagedepth}$
= 0	50.6%	58.5%
> 0 and ≤ 0.02	34.4%	54.1%
> 0.02	32.1%	37.2%

USGS
science for a changing world

Update
New Precipitation Gage Evaluations

Mark Nilles
U.S. Geological Survey

1930's ⟶ 2004?

USGS

Phase I &II Testing Report

- Copies distributed at this meeting
  - "Evaluation of candidate rain gages for upgrading precipitation measurement tools for the NADP", John Gordon, USGS
- Major findings
  - Ott Pluvio most reliable
  - Ott Pluvio and ETI NOAH II exhibited highest accuracy and precision

USGS

Phase III Test Report and Fact Sheet - Expect Within 8 Weeks

- Report and Fact Sheet on results from a collocated evaluation of the Ott Pluvio at 6 NTN sites for two years.
- Mary Tumbusch, USGS Nevada
  - Bottom line - Ott performed well with high reliability, accuracy and precision.
  - Problems:
    - occasional 0.01 inch false positives at several sites.
    - Significant user difficulties with DOS based laptop data transfer software and hardware.
    - Telemetry with Sutron GOES DCP did not work

USGS

Little next step

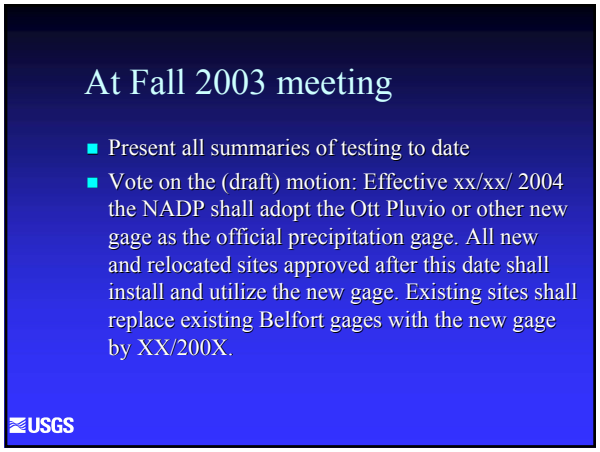
- Test GOES satellite DCP interface and new operator interface software with latest Ott gage.

USGS

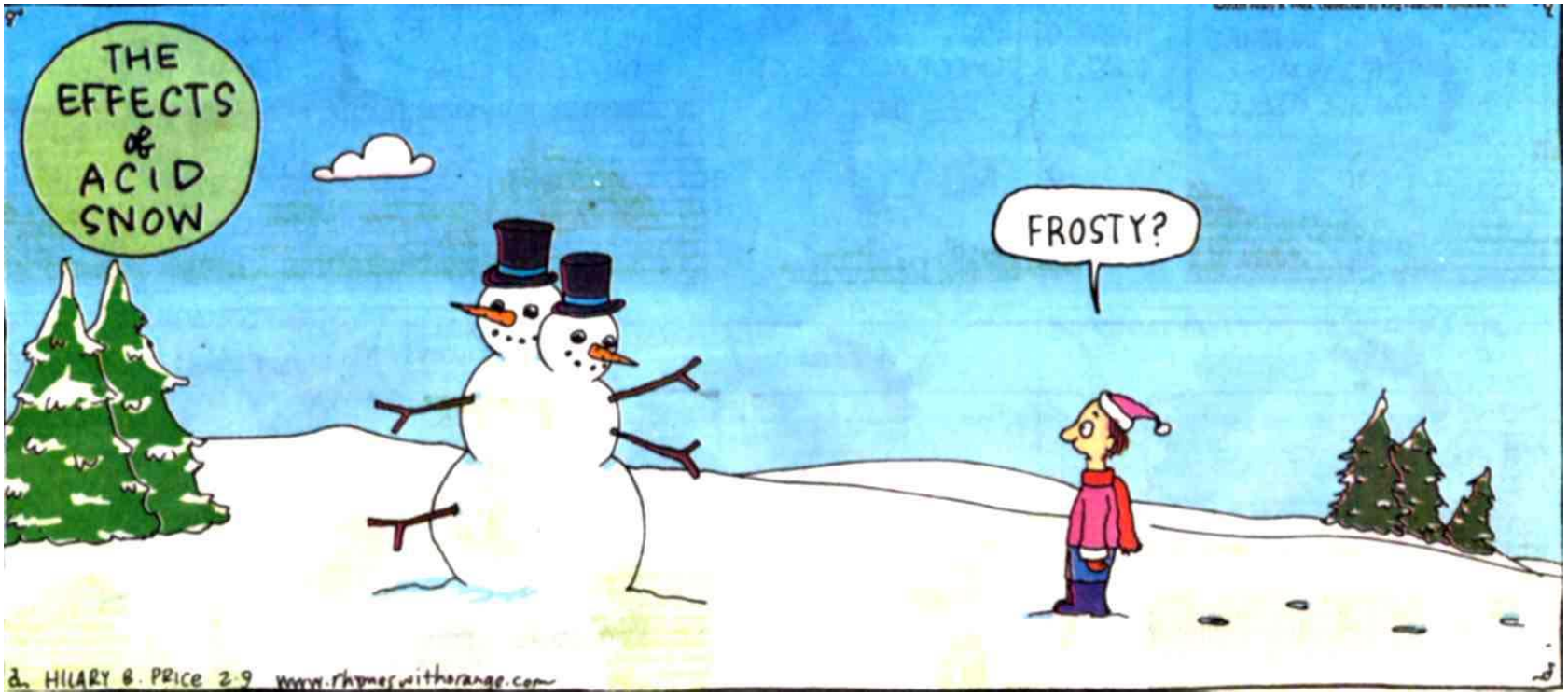
Proposed big next step (Between now and Fall meeting)

- Review Phase I-III USGS testing reports
- Evaluate GOES DCP interface and new user software
- Request ISWS prepare an independent report on the new rain gage performances at Bondville versus Belfort and stick gage

USGS


At Fall 2003 meeting
Present all summaries of testing to date
Vote on the (draft) motion: Effective xx/xx/ 2004 the NADP shall adopt the Ott Pluvio or other new gage as the official precipitation gage. All new and relocated sites approved after this date shall install and utilize the new gage. Existing sites shall replace existing Belfort gages with the new gage by XX/200X.
USGS

Environmental Effects



New Orleans
Spring 2003

Agenda

Introductions, Additions to the Agenda, Announcements

Old Business

Review review

Fall 2003 meeting

Ammonia workshop.

Issues

- Isotope network
- Ozone passive samplers
- Plant and/or animal disease agents in precipitation. (eg anthrax).
- Deposition AQRVs
- Moving towards reporting Total N-Deposition
  - Wet & dry, multi-species, point measurement – spatial allocation
  - Total N
  - Ammonia passive samplers
  - Connecting deposition to sources
- Developing mercury isopleth maps
  - Network design, dry deposition
- P – can/should we do better?

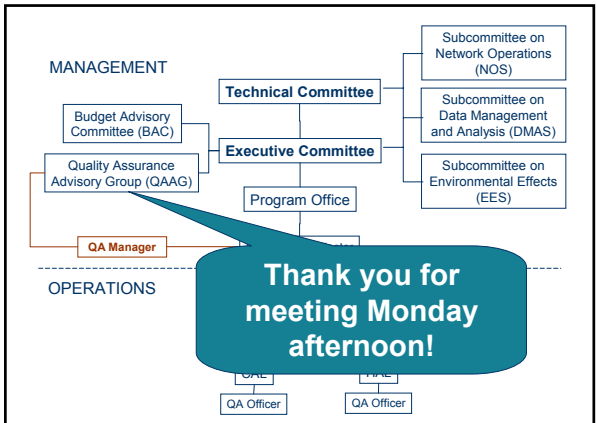
Brochures/data products

- Produce a "Mercury in the Nation's Rain" product?
- Other products?
  - Host a workshop on long-term monitoring programs – ACS option
  - Web forum for data producers and users

NADP Quality Management Program

Chris Lehmann

2003 Interim Subcommittee Meeting
Joint Session



Quality Management Report

- Quality Management
  - Quality Management Plan
  - Network Quality Assurance Plans
- Quality Assurance
  - Laboratory Operations
  - Field Operations

Quality Management Plan: Status

- Initial draft completed in December 2002
- Reviewed by QAAG, Program Chair, others
- Review comments received were discussed Monday afternoon by QAAG
- Remaining issues will be discussed by Executive Committee at July 2003 meeting.
- Final draft for approval by Fall Technical Committee meeting.

Quality Management Plan: What's in it?

- Introduction
- Management and Organization
- The NADP Quality System
  - Elements of Quality System
  - Planning (establishing Data Quality Objectives, etc.)
  - Documents and Records
  - Assessment and Response
  - Personnel Qualification and Training

Quality Management Plan: What else is in it?

- Procurement of Items, Services, and External Information
  - Items and Services
  - Computer Hardware and Software
- Implementation of Work
- Quality Improvement

Changes proposed by QAAG: SOP Review and Approval

- Network SOPs (operations manuals) distributed for review by NOS 3 months before final approval
- Approved by Associate Coordinator and/or the Assistant Coordinator, the site liaison, and the QA Manager (remove laboratory manager, Program Coordinator, and the NOS chair)

Changes proposed by QAAG: SOP Review and Approval (2)

- Laboratory SOPs made available for review by the QA Manager
- Approved by the laboratory manager, laboratory QA officers, designated laboratory staff (remove approval of QA Manager)
- SOP changes must be submitted to the QA Manager

Changes proposed by QAAG: Confidentiality

- Remove any reference to confidentiality in NADP operations.
  - Provisional data handling policy in Network QA Plan

Changes proposed by QAAG: Assessments

- Assessment programs will be handled by QAAG.
- Does not change current programs:
  - Laboratory reviews
  - Quality Systems reviews
  - Data quality assessments
  - Site Systems & Performance Surveys
  - External QA Programs

Changes proposed by QAAG: Laboratory Reviews

- Schedule
  - External review every three years (CAL '02/HAL '03)
  - Internal review within one year after review report is received.
- Review Team
  - Team leader
  - Lab review (2 members appointed by NOS chair)
  - Data review (2 members appointed by DMAS chair)
  - QA Manager (observer)

Changes proposed by QAAG: Laboratory Reviews (2)

- Review Format
  - Are laboratory practices documented in the laboratory QAP and SOPs?
  - Do laboratory activities comply with QAP and SOPs?
  - Are procedures outlined in QAP and SOPs implemented effectively?
  - Do laboratory practices ensure that the data are of sufficient quality to meet DQOs and meet requirements outlined in SOW?
  - QAAG will propose checklist

Changes proposed by QAAG: Laboratory Reviews

- Review Reports
  - Report from review team: 30 days after review
  - Response from lab: 60 days after receiving report
- NOS and DMAS will approve the response within one month from date report received.
- Conflicts resolved by the QA Manager and Program Chair, in consultation with subcommittee chairs

Changes proposed by QAAG: Quality Improvement

- Responsibility for continued quality improvement in the NADP resides with the QAAG.
- NADP shall seek continued improvement of Data Quality Indicators (precision, bias, comparability, completeness, representativeness)

Changes proposed by QAAG: General Comments

- Statements of Work (SOW) should be reviewed to make sure that they comply with QA documentation.
- Evaluate structure ensuring that SOW requirements are met.
- Emphasis should include field operations, not just laboratory operations.

Network Quality Assurance Plans

- Revise current NTN, AIRMoN & MDN Plans
- Combine three existing network quality assurance plans (NTN, AIRMoN, MDN) into one NADP Network Quality Assurance Plan?
  - Maintain consistency across networks
  - Networks have common structure within NADP, avoid repetition
  - Separate parts discussing aspects unique to each network

Network Quality Assurance Plans: Goals

- Outline document by July 2003 Exec. Committee meeting
- Discuss and resolve inconsistencies in network procedures and quality assurance protocols in NOS at October 2003 meeting
- Prepare initial draft in time for 2004 Interim Subcommittee Meeting

Quality Assurance: Laboratory Operations

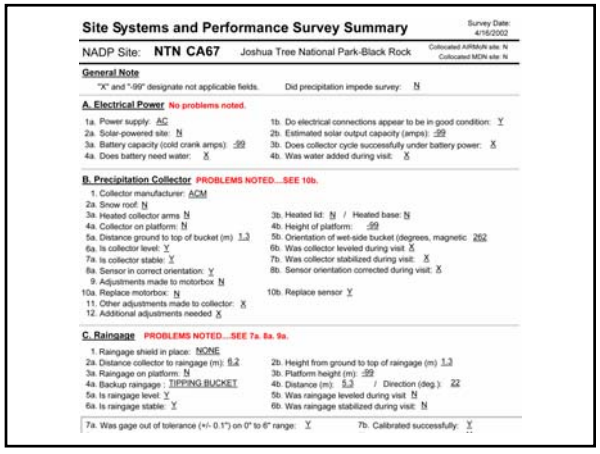
- 2003 CAL Followup Review
  - Completed by October 2003 Technical Committee meeting.
- 2003 HAL Review: June 10 – 12
  - Team leader: Mark Peden (retired)
  - Lab: Brooke Connor (USGS), Steve Lindberg (Oak Ridge NL)
  - Data: Chris Rogers (Harding ESE), Jim Lynch (Penn State)
  - Observer: Chris Lehmann (ISWS/NADP)

Quality Assurance: Field Operations

- Expansion of External QA Programs for MDN and AIRMoN
  - Discussed by QAAG
  - Exploring opportunities

Site Systems and Performance Surveys: Remedial Actions

- Program Office has received all reports from sites visited in 2002: 67 NTN, 20 MDN, 3 AIRMoN
- Electronic site sketches will be posted to NADP Internet site (31 prepared)
- Survey summary generated at Program Office from ATS database. Will be sent to site operators, supervisors, and sponsors.



Site Systems and Performance Survey Summary

Survey Date: 4/16/2002

NADP Site: **NTN CA67** Joshua Tree National Park-Black Rock

Collocated AIRMoN site: N
Collocated MDN site: N

General Note

"X" and "-99" designate not applicable fields. Did precipitation impede survey: N

A. Electrical Power No problems noted.

1a. Power supply: AC
2a. Solar-powered site: N
3a. Battery capacity (cold crank amps): -99
4a. Does battery need water: X
1b. Do electrical connections appear to be in good condition: Y
2b. Estimated solar output capacity (amps): -99
3b. Does collector cycle successfully under battery power: X
4b. Was water added during visit: X

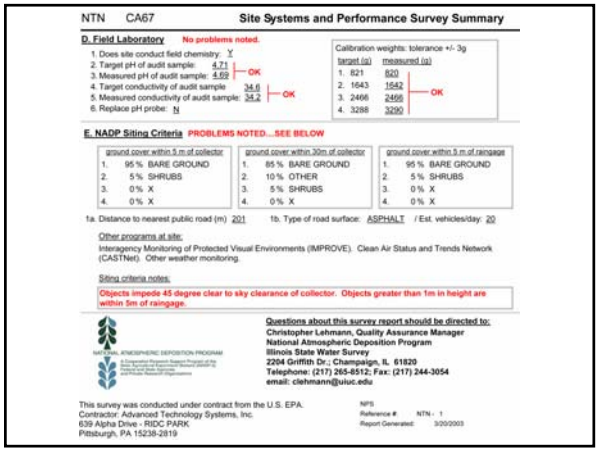
B. Precipitation Collector PROBLEMS NOTED...SEE 10b.

1. Collector manufacturer: ACM
2a. Snow roof: N
3a. Heated collector arms: N
4a. Collector on platform: N
5a. Distance ground to top of bucket (m): 1.3
6a. Is collector level: Y
7a. Is collector stable: Y
8a. Sensor in correct orientation: Y
9. Adjustments made to motorbox: N
10a. Replace motorbox: N
11. Other adjustments made to collector: X
12. Additional adjustments needed: X
3b. Heated lid: N / Heated base: N
4b. Height of platform: -99
5b. Orientation of wet-side bucket (degrees, magnetic: 262
6b. Was collector leveled during visit: X
7b. Was collector stabilized during visit: X
8b. Sensor orientation corrected during visit: X
10b. Replace sensor: Y

C. Raingage PROBLEMS NOTED...SEE 7a. 8a. 9a.

1. Raingage shield in place: NONE
2a. Distance collector to raingage (m): 0.2
3a. Raingage on platform: N
4a. Backup raingage: TIPPING BUCKET
5a. Is raingage level: Y
6a. Is raingage stable: Y
2b. Height from ground to top of raingage (m): 1.3
3b. Platform height (m): -99
4b. Distance (m): 5.3 / Direction (deg.): 22
5b. Was raingage leveled during visit: N
6b. Was raingage stabilized during visit: N

7a. Was gage out of tolerance (+/- 0.1") on 0" to 6" range: Y
7b. Calibrated successfully: Y



NTN CA67 Site Systems and Performance Survey Summary

D. Field Laboratory No problems noted.

1. Does site conduct field chemistry: Y
2. Target pH of audit sample: 4.71
3. Measured pH of audit sample: 4.69 — OK
4. Target conductivity of audit sample: 34.6
5. Measured conductivity of audit sample: 34.2 — OK
6. Replace pH probe: N

Calibration weights: tolerance +/- 3g

	target (g)	measured (g)	
1.	821	820	
2.	1643	1642	OK
3.	2466	2466	
4.	3288	3290	

E. NADP Siting Criteria PROBLEMS NOTED...SEE BELOW

ground cover within 5 m of collector		ground cover within 30m of collector		ground cover within 5 m of raingage	
1.	95 % BARE GROUND	1.	85 % BARE GROUND	1.	95 % BARE GROUND
2.	5 % SHRUBS	2.	10 % OTHER	2.	5 % SHRUBS
3.	0 % X	3.	5 % SHRUBS	3.	0 % X
4.	0 % X	4.	0 % X	4.	0 % X

1a. Distance to nearest public road (m): 201 1b. Type of road surface: ASPHALT / Est. vehicles/day: 20

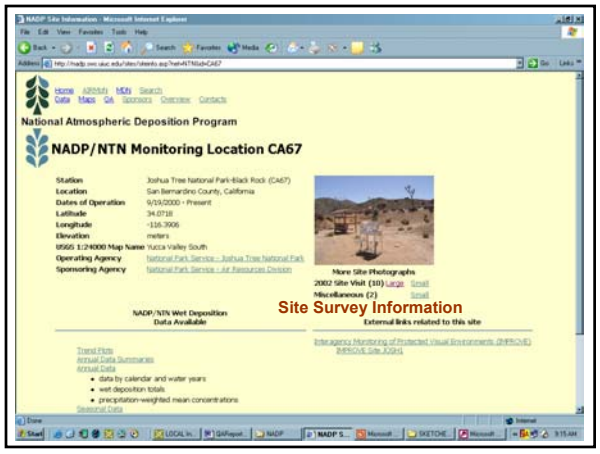
Other programs at site:
Interagency Monitoring of Protected Visual Environments (IMPROVE). Clean Air Status and Trends Network (CASTNet). Other weather monitoring.

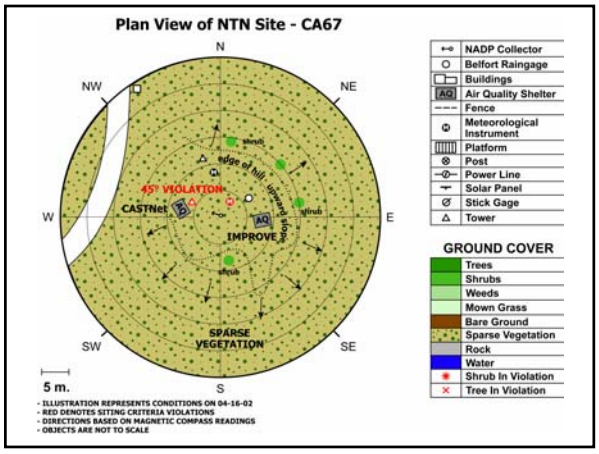
Siting criteria notes:
Objects impede 45 degree clear to sky clearance of collector. Objects greater than 1m in height are within 5m of raingage.

Questions about this survey report should be directed to:
Christopher Lehmann, Quality Assurance Manager
National Atmospheric Deposition Program
Illinois State Water Survey
2204 Griffith Dr.; Champaign, IL 61820
Telephone: (217) 265-8512; Fax: (217) 244-3054
email: clehmann@uiuc.edu

This survey was conducted under contract from the U.S. EPA.
Contractor: Advanced Technology Systems, Inc.
639 Alpha Drive - RIDC PARK
Pittsburgh, PA 15238-2819

NPS
Reference # NTN - 1
Report Generated: 3/20/2003





Site Inventory Ordered with Siting Criteria Violations

Distance	Azimuth	Description	Violation
12.4	8	EDGE OF HILL	
3.5	21	MET INSTRUMENT	Object is greater than 1m in height and within 5m of collector/raingage.
12	34	EDGE OF HILL	
6.3	56	BELFORT	
11.9	56	EDGE OF HILL	
12.4	83	EDGE OF HILL	
6.9	109	MET SHELTER (IMPROVE)	
15.9	109	EDGE OF HILL	
13.6	131	EDGE OF HILL	
16.9	145	EDGE OF HILL	
8	146	EDGE OF HILL	
5.7	163	EDGE OF HILL AND BUSH	
8.5	200	EDGE OF HILL	
5.5	278	CORNER SHELTER (8' x 8')	
18.4	295	EDGE OF ACCESS ROAD	
23.7	295	EDGE OF ACCESS ROAD	
28.6	327	SERVICE BOX	
11.4	344	TOWER	Object impedes 45 degree clear to sky clearance of collector/raingage.
8.3	353	MET INSTRUMENT	

Other Issues

- Changes to External QA Programs (NOS)
- Establishing Data Quality Objectives (DMAS)
- CAL Data Minimum Reporting Limits (DMAS)
- Stick gage tolerance at AIRMoN sites (NOS)
- MDN/NTN raingage reporting discrepancies (NOS)
- Siting criteria changes (NOS)

Performance and Acceptance Criteria (PAC)
/
Data Quality Objectives (DQOs)

for the

NADP/NTN
USGS EXTERNAL QUALITY ASSURANCE PROJECT

Greg Wetherbee: wetherbe@usgs.gov

Objectives of the USGS External QA Project

1. Estimate total error associated with NADP chemical measurements?
2. Determine portion of total error attributed to each step in the data-collection process?
3. Determine whether known and measurable sources of error are controlled to acceptable levels?
4. Determine what unmeasured sources of error can be identified, measured, and controlled?

USGS QUALITY ASSESSMENTS

1. Document past performance of laboratories, site operators, and field equipment in terms of absolute and relative error.
2. Document "trends" in performance from one year to next.
   Improving? No change?
3. Never state whether performance meets expectations. ~~Good?~~ ~~Bad?~~

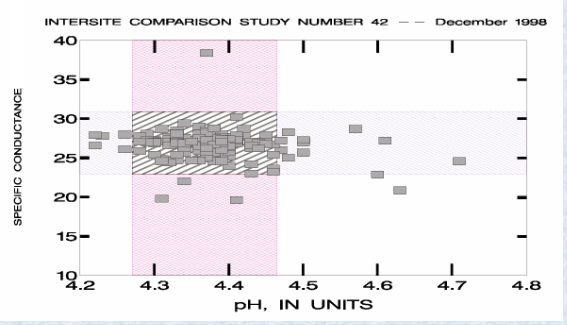
The Performance and Acceptance Criteria Process (PAC)

1. State the Problem
2. Identify the Study Questions
3. Identify Types of Information Needed
4. Establish Study Design Constraints
5. **Specify Information Quality**
6. Develop a Strategy for Information Synthesis
7. Optimize the Design for Collecting Information

USEPA, October 2002, EPA QA/G-4A, Peer Review Draft

Example PAC for Intersite Program

Data Quality Indicator	Measurement Quality Objectives for Performance Criteria	Acceptance Criteria
Precision	100% within .02 pH Units, 1 µS/cm	>90% within .05 pH Units, 2 µS/cm
Bias	Less Than +/- 5%	Less Than +/- 10%
Representativeness	4.0<pH<6.0 Sc < 50	3.5<pH<6.5 Sc < 100
Comparability	0.02 pH Units 2 µS/cm	0.04 pH Units 4 µS/cm
Completeness	100% Sites Respond	95% Sites Respond
Sensitivity	0.02 pH Units, 1 µS/cm	0.04 pH Units, 2 µS/cm



Example PAC for Interlaboratory Program

Data Quality Indicator	Measurement Quality Objectives for Performance Criteria	Acceptance Criteria
Precision	2 f-psuedosigma	3 f-psuedosigma
Bias	0%	+/- 5%, No Trends
Representativeness	25th-75th NTN Percentile	10th-90th NTN Percentile
Comparability	Median Values 95% Accurate Compared to Target Values.	Median Values 90% Accurate Compared to Target Values.
Completeness	100% Lab Analyses	95% Lab Analyses
Sensitivity	No ultrapure D.I. detections	≤ 2 ultrapure D.I. detections

Example PAC for SHE and Field Audit Programs

Data Quality Indicator	Measurement Quality Objectives for Performance Criteria	Acceptance Criteria
Precision	5% Absolute Error	<10% Absolute Error
Bias	0%	Less than +/-5%
Representativeness	Protocol performed correctly by all site operators.	Greater than 90 percent site operators perform protocol correctly.
Comparability	2 f-pseudosigma of median concentration	3 f-pseudosigma of median concentration
Completeness	100% Samples Processed	>90% Samples Processed
Sensitivity	0.02 mg/L Absolute Difference	0.05 mg/L Absolute Difference

Example PAC for Collocated-Sampler Program

Data Quality Indicator	Measurement Quality Objectives for Performance Criteria	Acceptance Criteria
Precision	<10% Absolute Error	<25% Absolute Error
Bias	0%	Less than +/-10%
Representativeness	Less than 5 percent difference in sample volumes.	Less than 10 percent difference in sample volumes.
Comparability	Data for 2 samplers correlated & within historic site data range .	Data within range of historic data for site.
Completeness	100%	75% - Less than 13 weeks missed
Sensitivity	Precipitation Depth: 0.02 inches, Concentrations: 0.02 mg/L Absolute Difference	Precipitation Depth: 0.05 inches, Concentrations: 0.05 mg/L Absolute Difference

The Data Quality Objectives (DQO) Process

7 Steps for DQO Planning Team

1. State the Problem
2. Identify the Decision
3. Identify the Inputs to the Decision
4. Define the Boundaries of the Study
5. Develop a Decision Rule
6. Specify Tolerable Limits on Decision Errors
   (e.g. α= 0.05, β=0.20)
7. Optimize the Design for Obtaining Data
   (e.g. cost effectiveness)

How are DQOs different from PAC?

…specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions. (USEPA, 2002)

How are DQOs and PAC related?

DQOs define the performance and acceptance criteria that limit the probabilities of making decision errors by considering the purpose of collecting the data; defining the appropriate type of data needed; and specifying tolerable probabilities of making decision errors. (USEPA, 2002)

Step 2: Identify the Decision(s)

Potential Decisions:

A) Constituent concentrations in precipitation are decreasing [or increasing].

B) NTN data quality is "acceptable."

C) Others?

Step 5: Develop Decision Rule(s)

…if, then statements

Potential Decision Rules:

A) If a Seasonal Kendall Test detects a negative [or positive] slope, then constituent concentrations in precipitation are decreasing [or increasing].

B) If median collocated-sampler [or substitute other program] absolute error is less than or equal to *X%* percent, then data quality is "acceptable."

Step 6: Specify Tolerable Limits on Decision Errors

Step 6 determines:

A) How many samples need to be collected (N)

…generally, N becomes larger as α and β get smaller

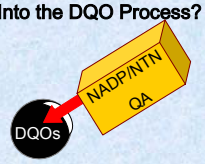
B) Spatial distribution of samples (e.g. grid spacing)

…generally, grid spacing tighter as α and β get smaller

C) Temporal distribution of samples (e.g. seasonality)

Does the NADP/NTN Fit Into the DQO Process?

No:



DQOs:

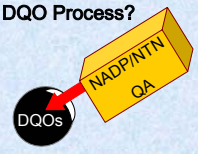
DQOs define number (N), quality, and spatial/temporal distribution of samples required to make decisions with a pre-specified level of statistical confidence.

NADP/NTN:

Natural environment and funding control the number and spatial distribution of NTN samples. Therefore, α and β would have to vary geographically. This complexity would limit spatial interpretation of the data.

Does the NADP/NTN Fit Into the DQO Process?

No:



DQOs:

DQOs are for making decisions about two clear alternatives (e.g. whether action levels are exceeded or not; clean precipitation vs dirty; etc.).

NADP/NTN:

Data analysis not always conducive to making yes/no decisions. Lots of "gray areas." Probability of Type II error (β) would likely be high.

Data Quality Objectives: What do the Trends Show?

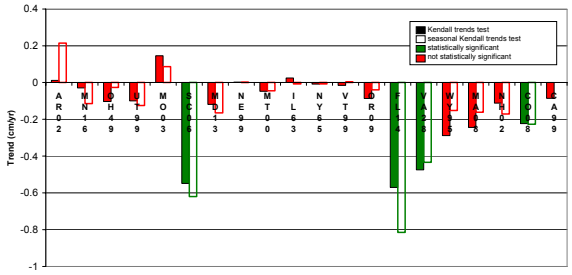
C. Lehmann

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

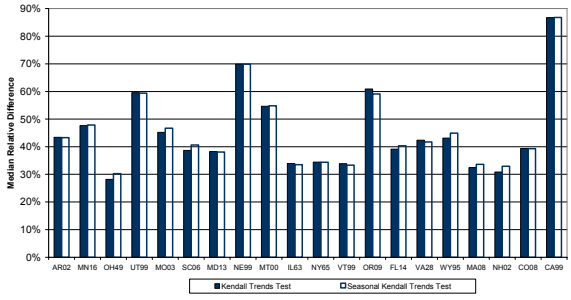
Objective

- Compare variability in data trends with measurement variability.
- Indicator of measurement system performance

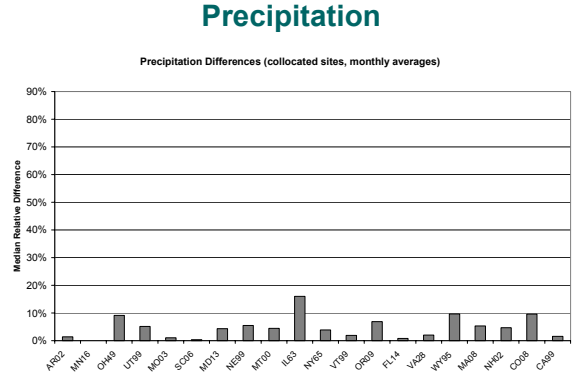
Precipitation



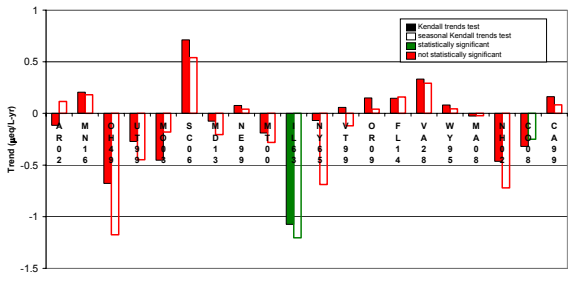
Precipitation

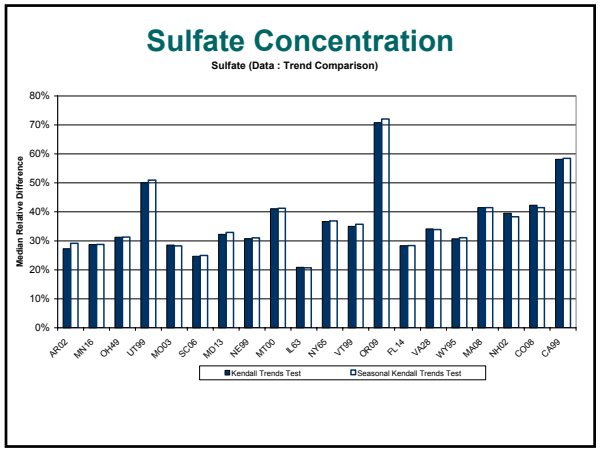


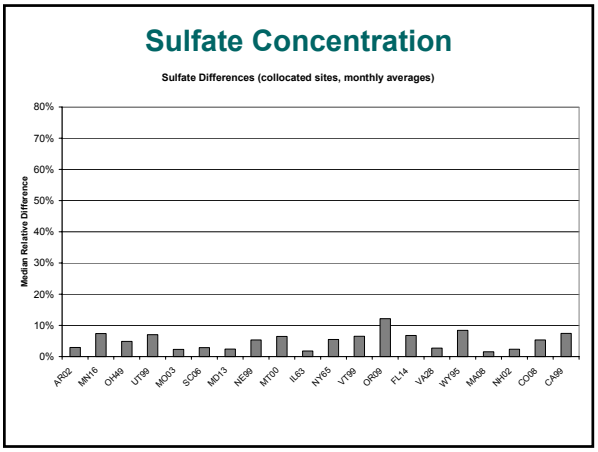
Precipitation

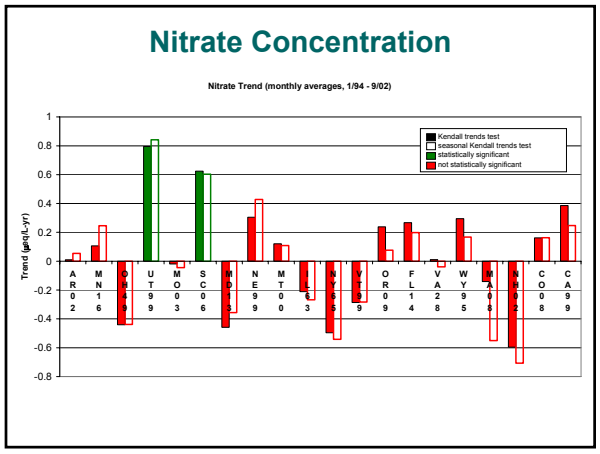


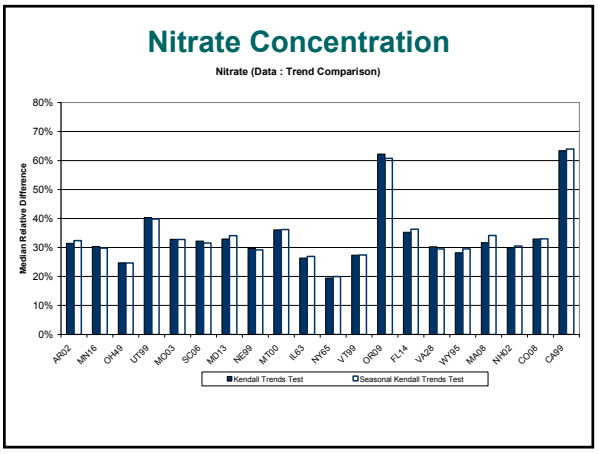
Sulfate Concentration

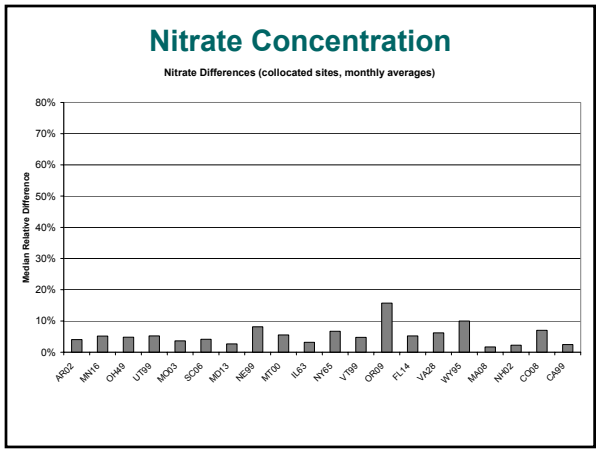


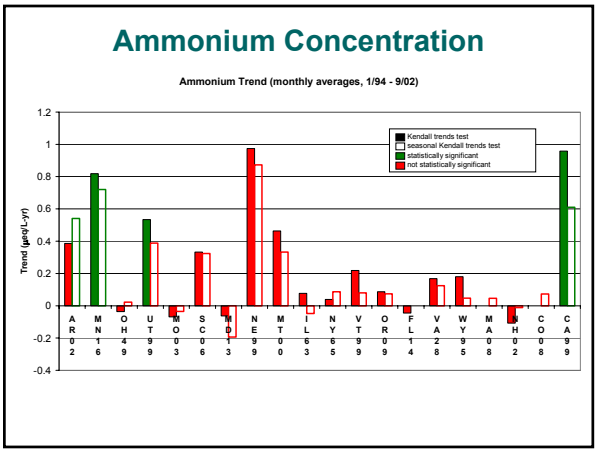

Sulfate Concentration
Sulfate (Data : Trend Comparison)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99
Kendall Trends Test
Seasonal Kendall Trends Test

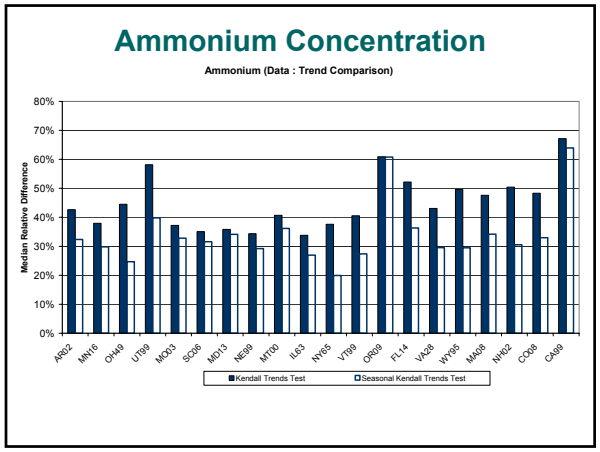

Sulfate Concentration
Sulfate Differences (collocated sites, monthly averages)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99

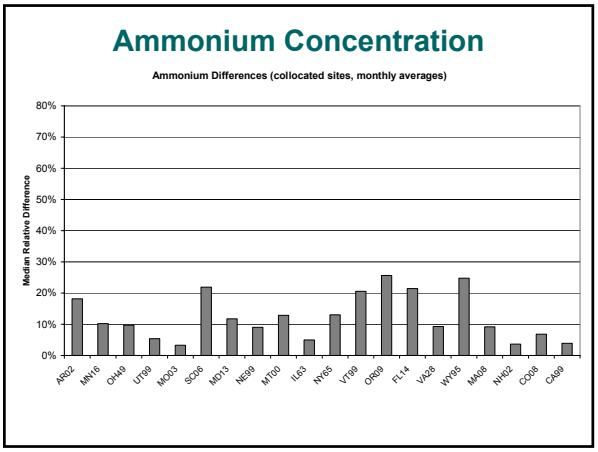

Nitrate Concentration
Nitrate Trend (monthly averages, 1/94 - 9/02)
Trend (µeq/L-yr)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Kendall trends test
seasonal Kendall trends test
statistically significant
not statistically significant
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99

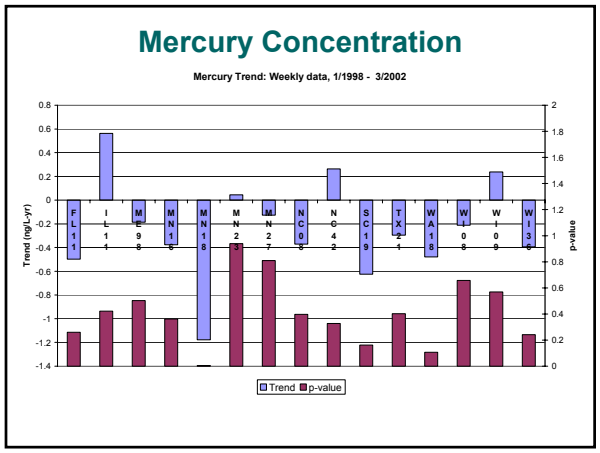

Nitrate Concentration
Nitrate (Data : Trend Comparison)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99
Kendall Trends Test
Seasonal Kendall Trends Test


Nitrate Concentration
Nitrate Differences (collocated sites, monthly averages)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99


Ammonium Concentration
Ammonium Trend (monthly averages, 1/94 - 9/02)
Trend (µeq/L-yr)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Kendall trends test
seasonal Kendall trends test
statistically significant
not statistically significant
AR02 MN16 OH49 UT99 MO03 SC06 MD13 NE99 MT00 IL63 NY65 VT99 OR09 FL14 VA28 WY95 MA08 NH02 CO08 CA99


Ammonium Concentration
Ammonium (Data : Trend Comparison)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02
MN16
OH49
UT99
MO33
SC06
MD13
NE99
MT00
IL63
NY65
VT99
OR09
FL14
VA28
WY95
MA08
NH02
CO08
CA99
Kendall Trends Test
Seasonal Kendall Trends Test


Ammonium Concentration
Ammonium Differences (collocated sites, monthly averages)
Median Relative Difference
80%
70%
60%
50%
40%
30%
20%
10%
0%
AR02
MN16
OH49
UT99
MO33
SC06
MD13
NE99
MT00
IL63
NY65
VT99
OR09
FL14
VA28
WY95
MA08
NH02
CO08
CA99


Mercury Concentration
Mercury Trend: Weekly data, 1/1998 - 3/2002
Trend (ng/L-yr)
p-value
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
FL11
IL11
ME98
MN16
MN18
MN20
MN27
NC05
NG42
SC19
TX21
WA12
WI08
WI09
WI36
Trend
p-value

Review of NADP Siting Criteria

NOS Ad Hoc Committee

Rick Artz, Natalie Latysh, Chris Lehmann, Preston Lewis, Gary Stensland (chair)

Purpose of Committee

- Review and comment on the scientific foundation for the NADP siting criteria
- Suggest siting criteria changes to reflect the Quality Assurance needs of the NADP

Review

1. Looked at development of NADP criteria since 1978
2. Considered scientific foundation of NADP criteria
   - Made distinction between criteria and operating procedures
   - Noted some criteria only relevant to select analytes

Review

3. Articulated *NADP Site Selection & Installation Manual* into 33 separate criteria.
   - A Criteria - To Minimize Influence of Anthropogenic Emission Sources to Air: Regional Requirements, > 10 km
   - B Criteria - To Minimize Influence of Anthropogenic Emission Sources to Air: Local Requirements, < 10 k
   - C Criteria - On-site Requirements, < 30 m, To Minimize Splash and Wind Flow Alterations
   - D Criteria - Other Criteria Affecting Sample Representativeness

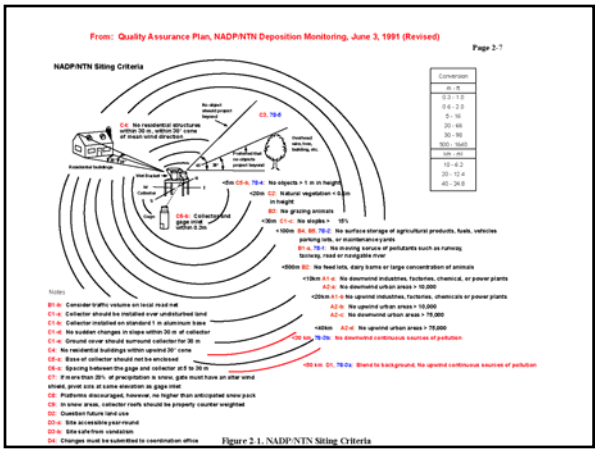


Figure 2.1. NADP/NTN Siting Criteria

Progress

4. Reviewed 33 criteria
   (a) for changes in wording
   (b) to omit some of the 33 from the list
   (c) distinguishing criteria as
   - siting rules
   - siting guidelines

Issue #1: Distinguish Siting Rules from Siting Guidelines

RULE – Required compliance.
- Supported by scientific evidence of compromised data.
- New sites must seek exceptions from NOS
- Exceptions at new and existing sites shall be reported to data users (remedial action).

GUIDELINE – Desired, but not required, compliance.
- Implemented for general guidance
- Exceptions at new and exiting sites may be reported to data users

MOTION #1

The siting committee moves that NADP siting criteria be classified either as "rules" or as "guidelines."

MOTION #2

The siting committee moves that new sites shall comply completely with all rules or seek exception by majority vote in NOS.

Issue #2: Upwind/Downwind Separation from Sources

- Omit upwind/downwind distinction for separation from industrial sources and population centers, taking largest distance.
- Uses wind rose data, which varies with season and may not reflect precipitation events.
  - (A1) Industrial sources, 10 km if site upwind, 20 km if site downwind
  - (A2) Urban areas, pop < 10,000, 10 km/20 km
  - (A2) Cities, pop > 75,000, 20 km/40 km

MOTION #3

The siting committee moves that separation requirements for industrial sources and urban areas, outlined in Section 2.3.1 of the *NADP/NTN Site Selection and Installation Manual,* be changed to remove reference to wind direction. The separation shall be the largest distance indicated.

Revised wording

"Industrial operations such as power plants, chemical plants and manufacturing facilities should be at least 20 10 kilometers (km) away from the collector. If the emission sources are located in the general upwind direction (i.e., the mean annual west-east flow in most cases) from the COLLECTOR, then this distance should be increased to 20 km."

Revised Wording

"This same criteria also applies to suburban/urban areas whose population approximates 10,000 people. For larger population centers (i.e., greater than75,000) the COLLECTOR should be no closer than 40 20 km. This distance is doubled, to 40 km, if the population is upwind from the COLLECTOR."

Issue #3: Criteria to Omit

Items that are general statements or that refer to procedures and not specific siting criteria.

MOTION #4

The siting committee moves to omit the following from the NADP Siting Criteria

- (D1) "Beyond 50 km both industrial and urban sources are generally assumed to blend in with the typical characteristics of the region." (Section 2.3.1)
- (D2) "…consideration should be given to alternate sites in the event that the original site is no longer representative of the region."
- (D4) "Changes or modifications to established or approved sites or to its equipment must be submitted to the Program Coordinator's Office prior to implementation."
- (B1-b) "The local road net around the site is of particular concern. Traffic volume and type will largely determine the impact of these types of sources on the site."

Issue #4: Discussion of Wording Changes

- The siting committee proposes wording changes outlined on the handout for discussion in NOS

Issue #5: Rooftop Sampling

- Issues to Consider
  - Increased wind speed with height
  - Wind flow heterogeneity
  - Temperature fluctuations
  - Roof splash
  - Contamination (roof sewer vents, HVAC)
  - Data Heterogeneity

Rooftop Sampling--Impacts

- Wind effects influence raingage and collector catch efficiency
  - Rainfall reported not representative
  - Chemistry not representative
- Contamination

Rooftop Sampling Discussion

- Add wind shielding?
- Ways to control splash/contamination?

Future Direction of Committee

1. Finish rewording of siting criteria.
2. Propose if rules or guidelines
3. Study rooftop sampling further
4. Prepare new siting criteria list as part of NADP Network QA Plan, with separate section discussing technical basis for each criterion (Fall 2004).

Regionally Representative Sites

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

Two questions

- How do determine which sites are regionally representative?
- What do we do with data from sites that are not regionally representative?

8/0

CONDENSED SITING CRITERIA FOR ESTABLISHING REGIONALLY REPRESENTATIVE NADP/NTN SITES

Critical distances(see Section 2.3 for more details)

Sources	Distance from the collector: Minimum	Becomes background[1]
Regional Requirements:		
Heavy industry (chem plants, power plants)	10 km (20 km if upwind)	50 km
Suburban/urban populations if population >75,000	10 km (20 km if upwind) 20 km (40 km if upwind)	50 km 50 km
Local Requirements:		
Moving sources	100 m	10 km
Feedlots/dairy barns, etc.	500 m	1000 m
Grazing animals	20 m	
Surface storage	100 m	1000 m
Parking lots	100 m	200 m

On-Site Requirements:	Minimum	Maximum
Raingage (must be in same plane as the collectors:1 ft)	5 m	30 m
Critical angles		
Buildings	Outside 30° cone of mean wind direction	
Projection angle	45°	
Slope	level	15%

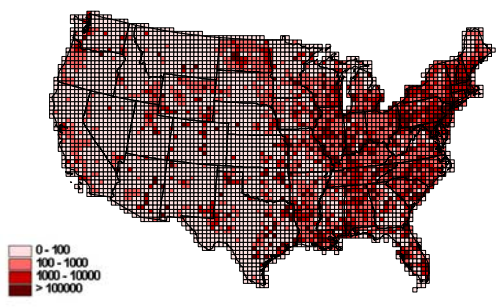
Siting Criteria

- Sites meeting all siting criteria are assumed to be regionally representative
- However:
  - variances allowed
  - regional criteria difficult to interpret
  - does not reflect differences between regions

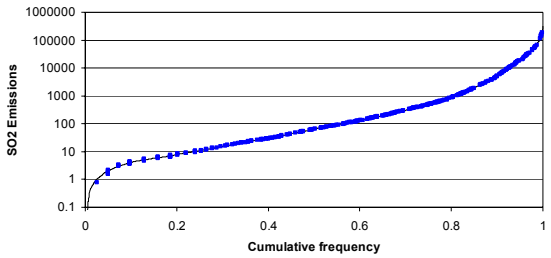
Site Classification

- S-78-67-43-35-N
  - S = Suburban site
  - 78 = Population density within 15 km is greater than 78% of the continental US
  - 67 = Road density within 5 km is greater than 67% of the continental US
  - 43 = SO2 emission within 25 km is greater than 43% of the continental US
  - 35 = NOX emissions within 25 km is greater than 35% of the continental US
  - N = not within 100 km of an ocean

SO_2 Emissions



SO_2 Emissions



Site Classification

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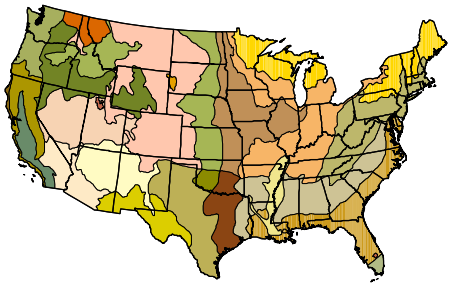
  - 43 = SO2 emission within 25 km is greater than 43% of the continental US
  - 35 = NOX emissions within 25 km is greater than 35% of the continental US
  - N = not within 100 km of an ocean

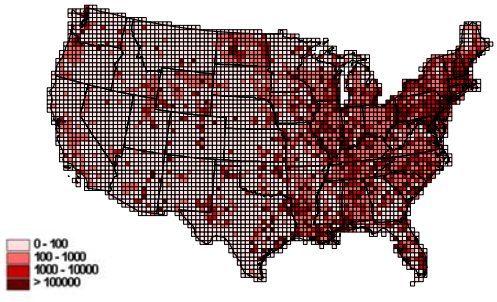
Regional Approach

- Criteria for regional representative sites vary by the region
- Criteria can include
  - Population density
  - SO_2 Emissions
  - NOx Emissions
  - ??

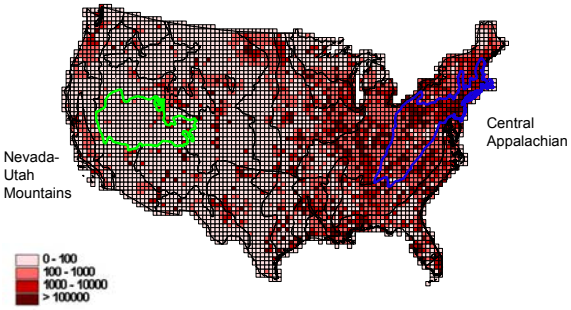
Bailey's Ecoregions

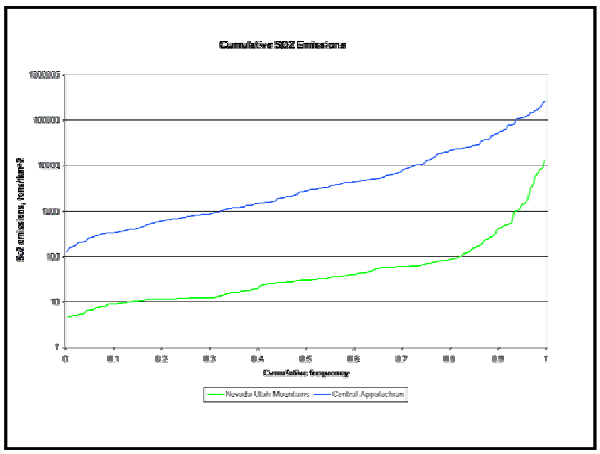


SO_2 Emissions



SO_2 Emissions





National vs Regional

Site	SO_2	National %	Ecoregion %
MA13	15048	97	76
NY99	3693	94	56
PA00	1242	89	37
PA42	659	88	23
CT15	558	83	19
NC25	256	68	5
WV05	86	56	< 1

Proposal

- Site Classification – National comparison
- Regional Representative – Regional comparison
- Continue development
- Report at Fall meeting with suggested criteria

Sites not meeting regional criteria

- Flag all sites as being regional representative or not
- Sites that are not regionally representative
  - Show on isopleth map with a different symbol
  - not used for spatial interpolation

Minimum Reporting Levels for NADP Data

C. Lehmann, J. Rothert, B. Larson

Definitions

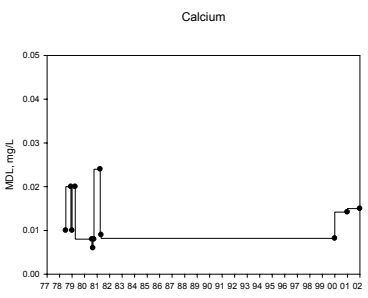
- Method Detection Limit (MDL)
  Limit at which measured concentration of a particular compound that can be distinguished from zero using a given analytical method
- Minimum Reporting Level (MRL)
  Level at which concentration of a particular compound can reliably be reported
- MRL > MDL

ISSUE

The NADP has traditionally set MRLs (Minimum Reporting Levels) at approximately the MDL (Method Detection Limit) values for the NTN and AIRMoN.

- If MDL values did not vary significantly from year-to-year, MRLs were not changed.
- Values were called "MDLs," even though really "MRLs"

Calcium	
Jul-78	0.01
Dec-78	0.02
Jan-79	0.01
Apr-79	0.02
Aug-80	0.008
Sep-80	0.006
Oct-80	0.008
Apr-81	0.024
May-81	0.009
Jan-00	0.0082
Jan-01	0.0142
Jan-02	0.015
AVERAGE	0.0127
MEDIAN	0.01
MAX	0.024
MIN	0.006



Discussion and Possible Motions…

- CAL should determine MDLs based on EPA Method 40 CFR Part 136 at least annually (more often, as necessary)
- Long-Term MDL (LT-MDL) calculated annually based on 3-year average of bimonthly unfiltered FR10 measurements (blind to analysts).
- MRL be set at 2 to 3 times the LT-MDL, and re-evaluated annually by DMAS.

Continued Discussion….

- Beginning with 2003 NTN Data posted on the NADP web site either:
  - data shall be censored below the determined MDL (indicate <MDL)
  - all data will be reported, including negative numbers, with data below the MDL flagged
- Data between MDL and MRL be flagged

Long-term MDL (LT-MDL) calculated as average of FR10 blind analyses from 2000 - 2002

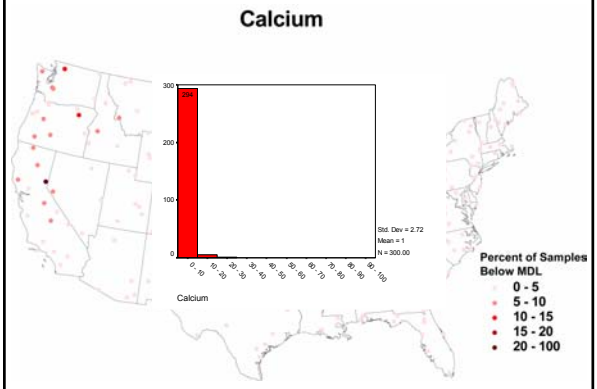
	Official "MDL"	LT-MDL	2xLT-MDL	3xLT-MDL
Cl	0.005	0.009	0.018	0.027
NO_3	0.010	0.012	0.024	0.036
SO_4	0.010	0.018	0.036	0.054
NH_4	0.02	0.018	0.036	0.054
Ca	0.009	0.021	0.042	0.063
Mg	0.003	0.003	0.006	0.009
Na	0.003	0.006	0.012	0.018
K	0.003	0.006	0.012	0.018

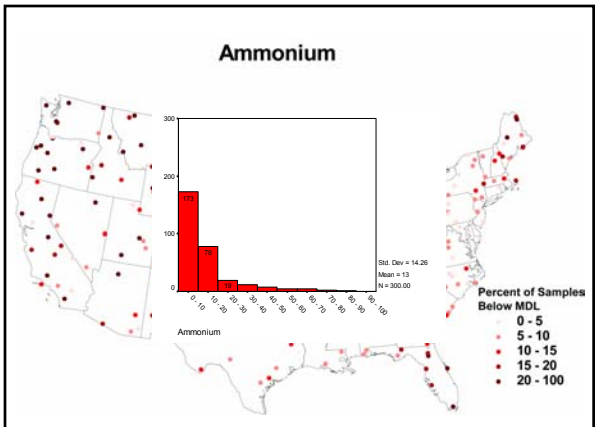
Issues to address

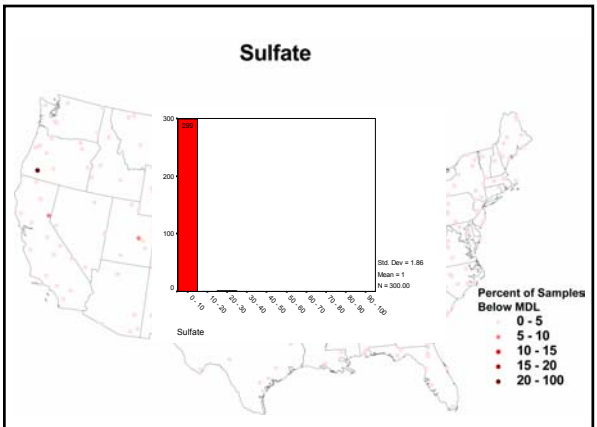
- Historical data—Flag at MRL that is 3x MDLs indicated in 2000 CAL QA report?
- What to do about phosphate? Not part of FR10 matrix.

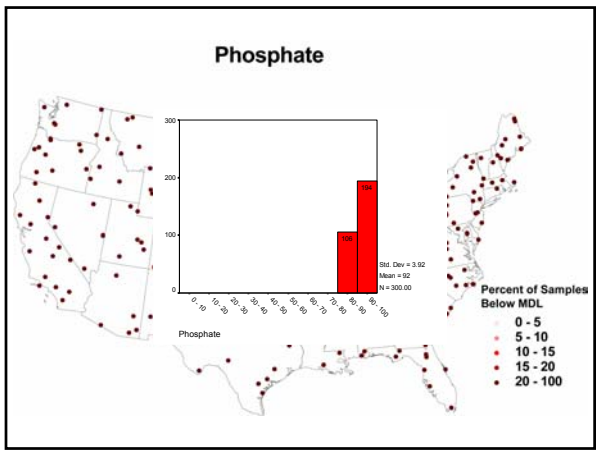
Data Censoring Discussion

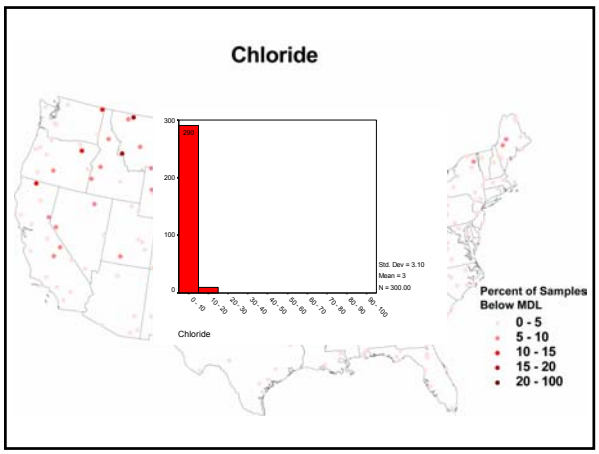
- Percent of samples that fall below MDL

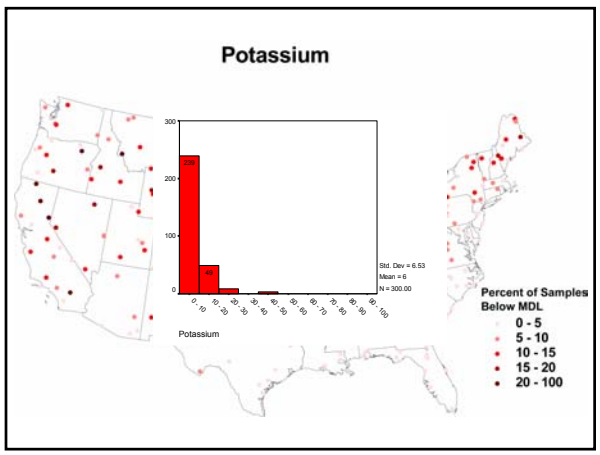


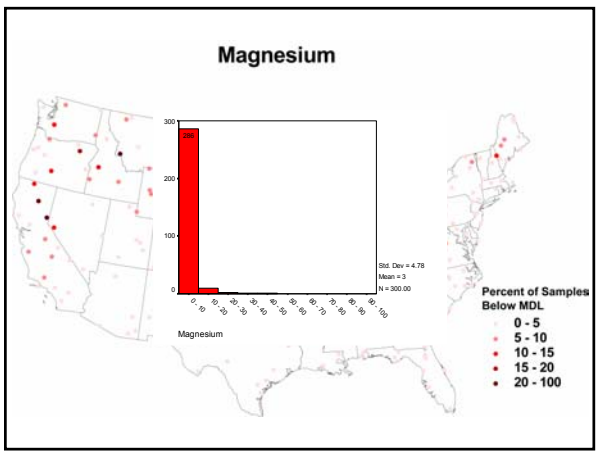


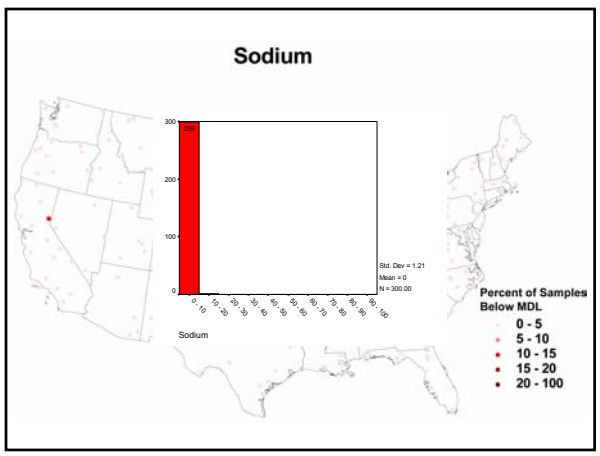


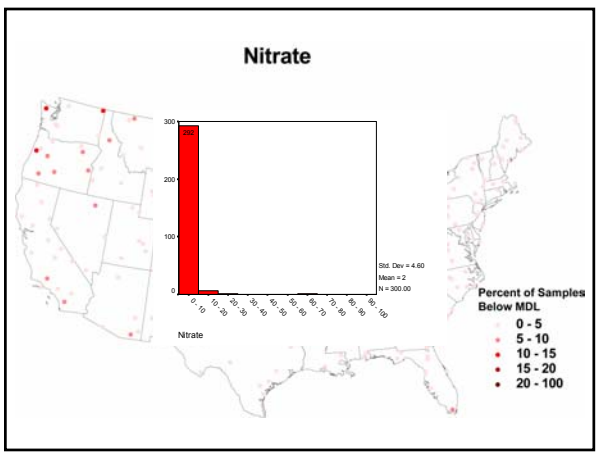

Phosphate
Std. Dev = 3.92
Mean = 92
N = 300.00
Phosphate
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100


Chloride
Std. Dev = 3.10
Mean = 3
N = 300.00
Chloride
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100


Potassium
Std. Dev = 6.53
Mean = 6
N = 300.00
Potassium
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100


Magnesium
Std. Dev = 4.78
Mean = 3
N = 300.00
Magnesium
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100


Sodium
Std. Dev = 1.21
Mean = 0
N = 300.00
Sodium
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100


Nitrate
Std. Dev = 4.60
Mean = 2
N = 300.00
Nitrate
Percent of Samples Below MDL
0 - 5
5 - 10
10 - 15
15 - 20
20 - 100