

Network Update: Laboratory and Field

IMPROVE Steering Committee Meeting
October 24, 2017 | Ely, Minnesota

Katrine Gorham
University of California, Davis

Total = 158 sites

New Sites

- Forest County Potawatomi Community, WI (FCPC); November 2016
- Carlsbad Caverns, NM (CAVE); August 2017

Removed Sites

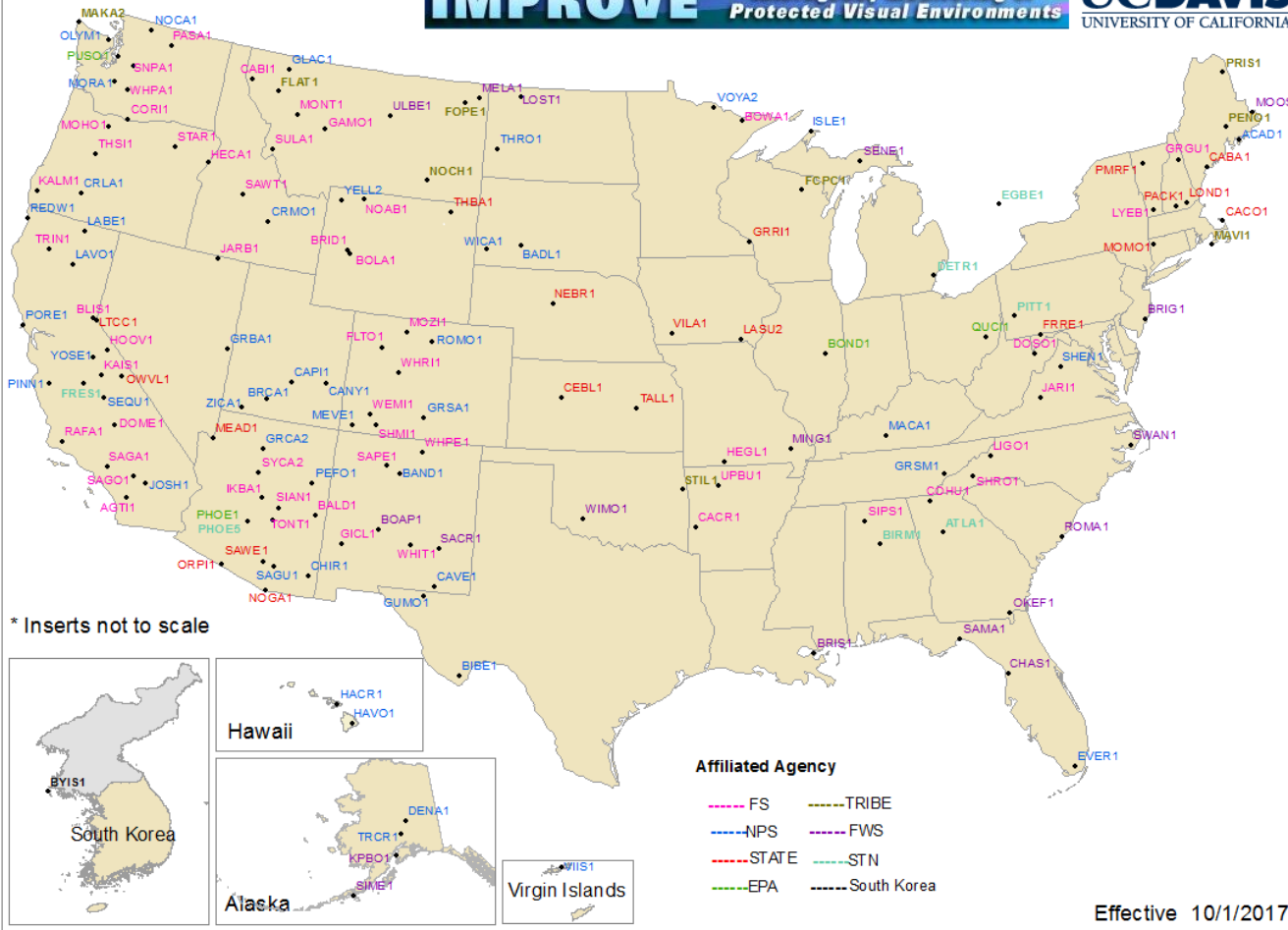
- Quabbin Reservoir, MA (QURE); October 2016
- Gates of the Arctic, AK (GAAR); June 2017

Back On-Line

- Trinity, CA (TRIN); June 2017

Dropped Off-Line

- Barrier Lake, Canada (BALA); April 2017



Analysis and Delivery Status

All 2016 data has been delivered to AQS and FED

2017	Ions*	Carbon*	Elements	Validation	Delivery (AQS & FED)
January	✓	✓	✓	✓	✗
February	✓	✓	✓	✗	✗
March	✓	✗	✓	✗	✗
April	✓	✗	✓	✗	✗
May	✓	✗	✓	✗	✗
June	✓	✗	✓	✗	✗
July	✗	✗	✓	✗	✗
August	✗	✗	✗	✗	✗
September	✗	✗	✗	✗	✗

* Data delivered to UCD from RTI (ions) and DRI (carbon)

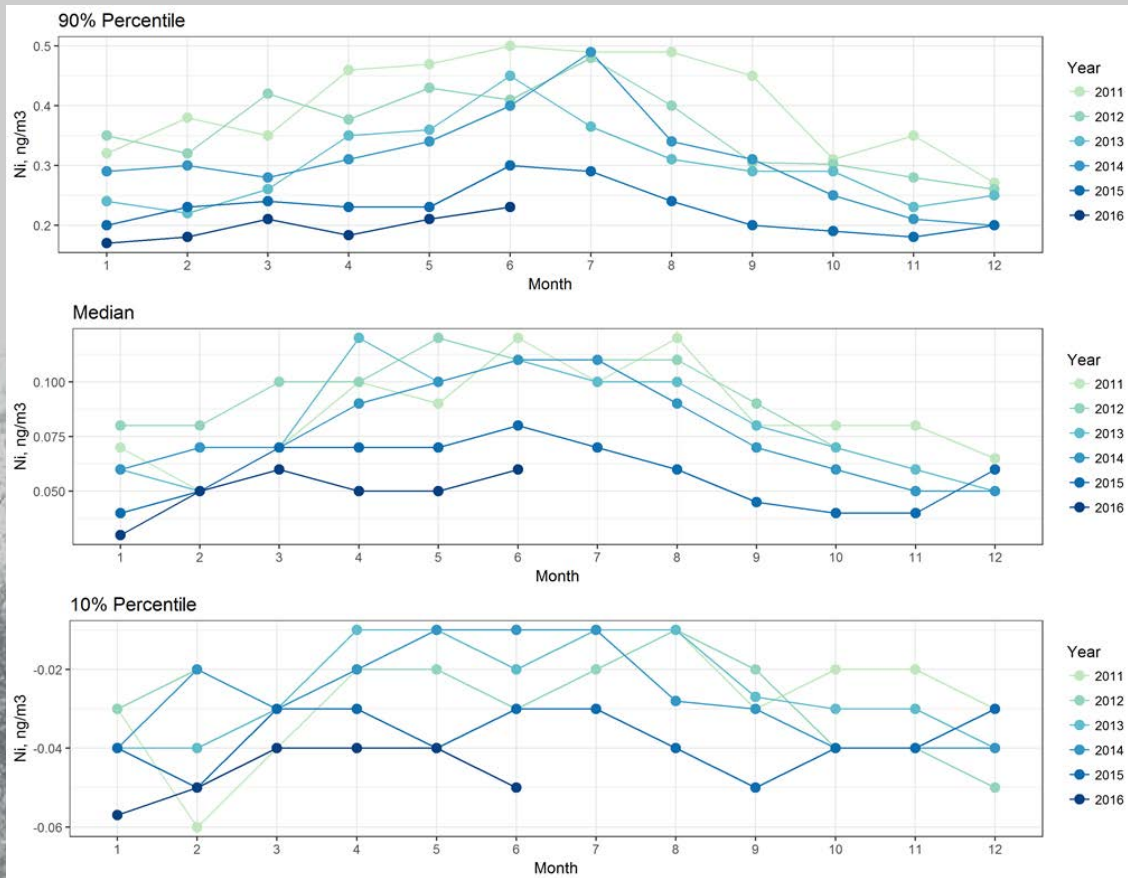
Semiannual Quality Assurance Report

First report delivered August 31, next report planned for January 31

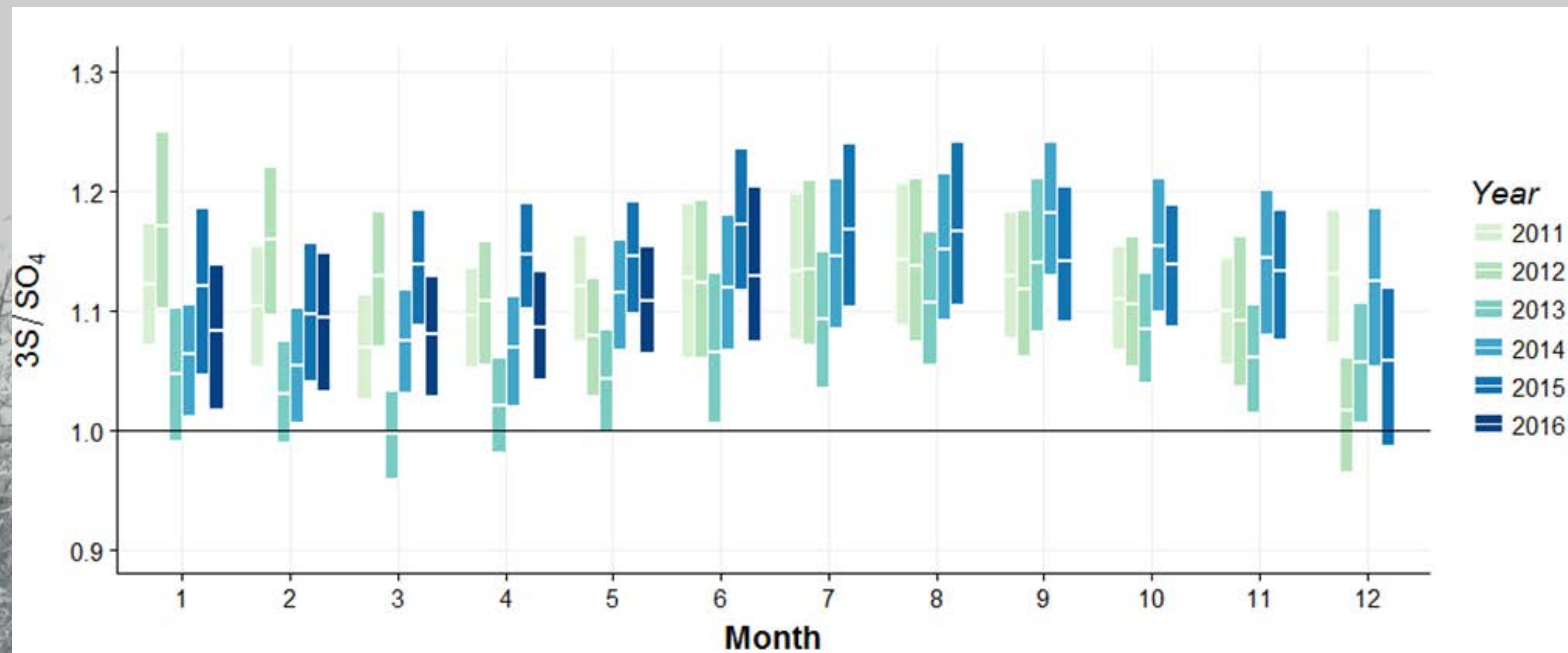
Purpose of the QA Report:

1. Provide the National Park Service (NPS) with graphical representations to illustrate key QA parameters for species measured within the network.
2. Identify and highlight observations of interest that may have short- or long-term impact on QA across the network or at particular sites.
3. Serve as a record and tool for ongoing UCD QA efforts.

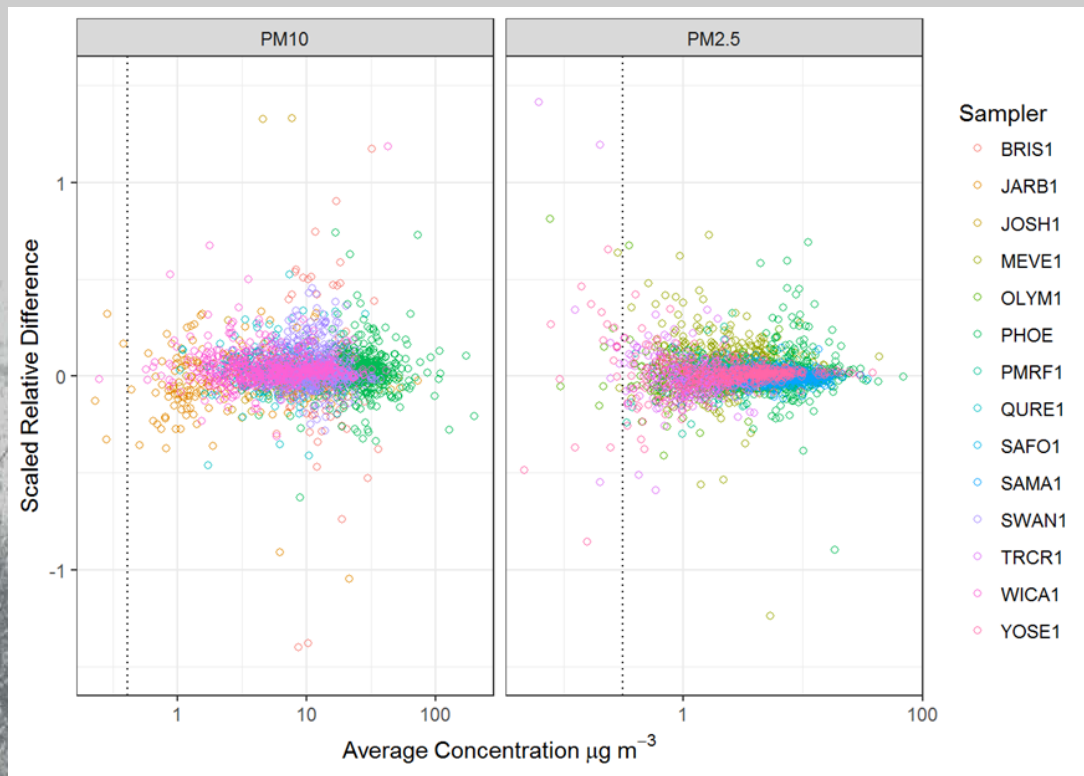
Semiannual QA Report: Multi-year time series



Semiannual QA Report: Cross-module comparison



Semiannual QA Report: Collocated data



Regional Haze Rule (RHR) Completeness Criteria

Can't exceed...

10 samples lost in a row

15 samples lost per calendar quarter (**> 50% recovery per quarter**)

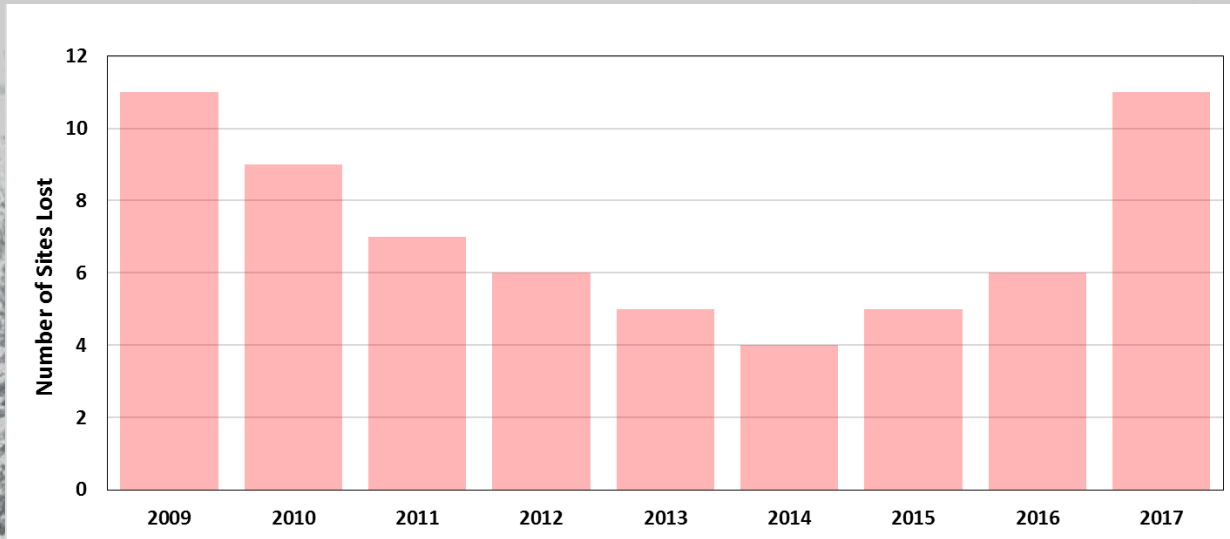
30 samples lost per year (**> 75% recovery per year**)

UCD Sample Handling Lab sends notices to at-risk sites with a breakdown of how many samples have been invalidated and a RHR reminder

2017 Site Losses and Completeness

11 sites lost so far for 2017

Plus 2 off-line because of funding/contract



Completeness

Q1 = 91%

Q2 = 91%

Q3 = 92%

Sites Not Meeting RHR Criteria: 2017



Late Sample Changes

Agua Tibia, CA (AGTI)

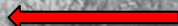
- 31 samples lost: 10 in Q1, 8 in Q2, and 1 in Q3
- History of late sample changes



Sierra Ancha, AZ (SIAN)

- 32 lost samples: 15 in Q1, 16 in Q2, and 1 in Q3
- Also failed RHR criteria in 2014, 2015, & 2016

Sites Not Meeting RHR Criteria: 2017



Equipment Problems

Guadalupe Mountains, TX (GUMO)

- 31 samples lost: 27 consecutive in Q1
- D-inlet missing; identified using UCD lab validation tools

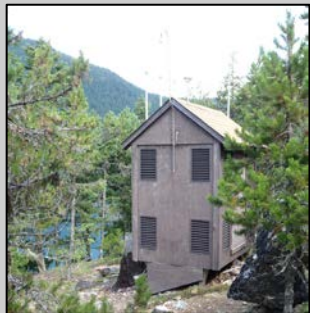
Kenai Peninsula Borough, AK (KPBO)

- 55 consecutive samples lost
- A-module T-plug missing

North Absaroka, WY (NOAB)

- 23 samples lost: 13 consecutive in Q1
- Controller failure compounded by shipping error

Sites Not Meeting RHR Criteria: 2017



Equipment Problems (cont'd)

North Cascades, WA (NOCA)

- 25 lost samples: 19 consecutive in Q2
- Series of controller failures, likely related to unstable power



Sawtooth, ID (SAWT)

- 35 lost samples: 16 consecutive in Q1
- Multiple pump malfunctions (A-module, B-module, D-module)



Sula, MT (SULA)

- 28 samples lost: 13 consecutive in Q2
- Series of controller failures, likely related to unstable power and lightening

Sites Not Meeting RHR Criteria: 2017



Equipment Problems (cont'd)

Zion Canyon, UT (ZICA)

- 10+ samples in Q1 that will likely be terminal
- Weak D-module pump compounded by failed replacement pump

Sites Not Meeting RHR Criteria: 2017



Damage from Weather Events

San Gabriel, CA (SAGA)

- 35 samples lost: 16 in Q1, 19 in Q2
- Instrument shed flipped during high wind event; site off-line 3/29 – 5/22



Virgin Islands (VIIS)

- Unknown number of samples lost
- Site damage from recent hurricanes Irma and Maria; status TBD

2017 Sites Lost from Funding/Contract Issues

Barrier Lake, Alberta (Canada, Special)

- Lost funding; site off-line 4/1 onward



Trinity, CA (FS, IMPROVE)

- Operator unavailable; back on-line 6/2



2017 Site Rescue Stories



Mitigating Site Losses



Maintenance Schedule



New Controller: Deployment

Deployed to Nine Sites

Phoenix, AZ (PHOE5), Jan.

Fresno, CA (FRES1), Mar.

Owens Valley, CA (OWVL), Apr.

Rocky Mountain, CO (ROMO), Jun.

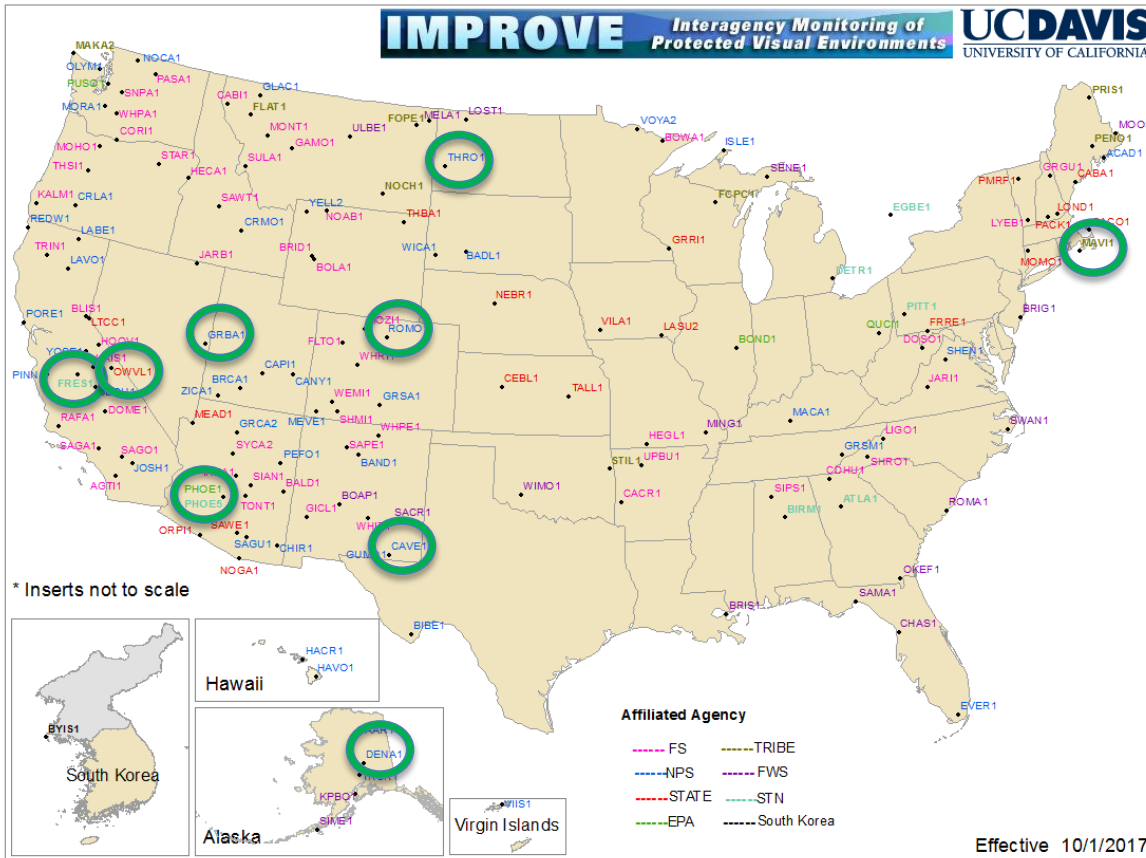
Denali, AK (DENA), Jul.

Carlsbad Caverns, NM (CAVE), Jul.

Theodore Roosevelt, ND (THRO), Aug.

Great Basin, NV (GRBA), Sep.

Martha's Vineyard, MA (MAVI), Oct.



New Controller: Development

- Continuing to address software and hardware bugs, and evaluate field performance of deployed controllers
- Acquiring hot spots and local internet access (where available) at new controller sites. Budgeted \$30/mo for each site

→ Daily data downloads

→ Faster problem identification and troubleshooting

Planning mass deployment of new controllers during 2018 maintenance season, deployment to 1/2 of network sites



Summary of Field Repair Shipments

Repair items shipped to IMPROVE sites, 1/1/2017 through 6/30/2017

Item	Quantity	Location
Controller	36	ZICA, BIRM, PACK, MAKA, LABE, NOAB, HOOV, PORE, LOND, SHRO, LTCC, STIL, FLAT, GAMO, SAGU, NOCA, CAPI, IKBA, THBA, SULA, MEVE, VIIS, SYCA, CACR, UPBU, LASU, BRIS
Pump	48	GLAC, NOCA, WICA, ORPI, KALM, NOGA, REDW, PACK, ACAD, SAWT, NOCA, AGTI, ZICA, WEMI, VIIS, GRSA, BALD, BRIS, PITT, CHIR, BOWA, CACO, RAFA, KPBO, BAND, SAMA, DOME, VILA, PRIS, THSI, BRCA, HAVO, BRIS, HOOV
Electronic Boxes	19	LYEB, SAWT, CANY, SHRO, REDW, MONT, BRIS, STIL, EGBE, CANY, MEVE, CACR, NOCA, LASU
Module Cable	9	SAWT, CRMO, PEFO, SHRO, BOND, BRIS, NOCA, LASU
Relay Box	9	ISLE, OKEF, SAWT, VIIS, STIL, PENO, HOOV
Sierra PM10 Inlet	3	BRIS, GUMO, VIIS
PM2.5 Inlet Cap	2	SULA, BRIS
Flow Check Kits	8	NEBR, NOCA, LAVO, VIIS, BIBE, BOAP, GRCA, LABE
Module	3	KPBO, SAWT, NOCA

Field Site Electrical

Goal for 2018: Evaluate and address field site electrical issues.



Field Safety: Fall Protection

UCD delivered a Fall Safety Analysis identifying eight high risk sites. Subsequent discussion, training, and planning has addressed concerns at most of these sites.

Abbreviation	Location	State	Park / District	Agency
CRLA	Crater Lake	OR		NPS
GLAC	Glacier	MT	Glacier National Park	NPS
MOHO	Mount Hood	OR		USFS
MOZI	Mount Zirkel	CO	Routt National Forest / Buffalo Pass	USFS
SAWT	Sawtooth	ID	Stanley Ranger Station Warehouse	USFS
SNPA	Snoqualmie Pass	WA	Cle Elum Ranger District	USFS
WHPA	White Pass	WA	Cowlitz Valley Ranger District	USFS
WIMO	Wichita Mountain	OK		FWS

Field Safety: Fall Protection



White Pass, WA (WHPA)

Strategy: With ski lift as an anchor, use harness and lanyard to access inlets.



Wichita Mountain, OK (WIMO)

Discussion ongoing. Preferred solution is relocation to a TuffShed.

Field Safety: Training

Wilderness First Aid



Fall Protection: Authorized Person



... Additional training is planned for Fall
Protection Competent Person

MTL: T/RH Chamber

MTL AHEC500: \$139,700

- Temperature (± 0.2 °C) and RH ($\pm 2\%$) controlled automated weighing system
- Capacity to hold 600 filters
- Barcode scanning
- Programmable for different weighing requirements



MTL: Filters

Unable to purchase chamber until an appropriate filter is developed.

The Good...

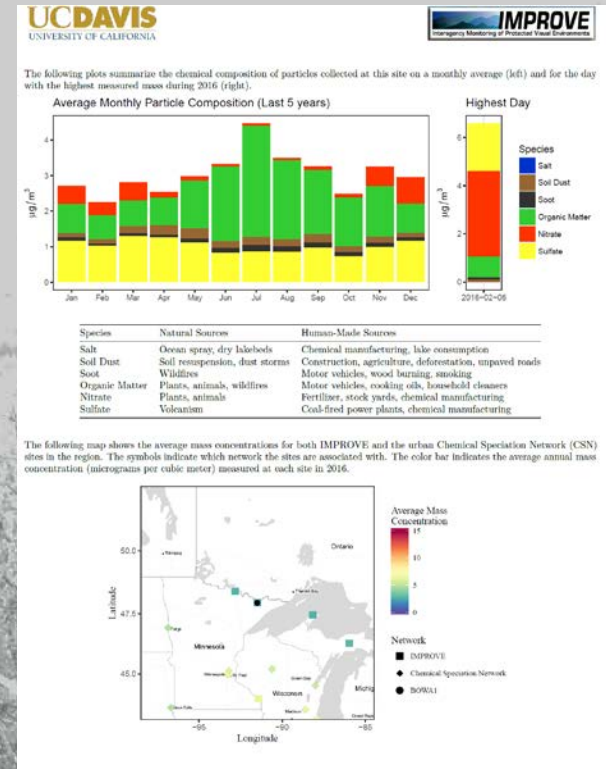
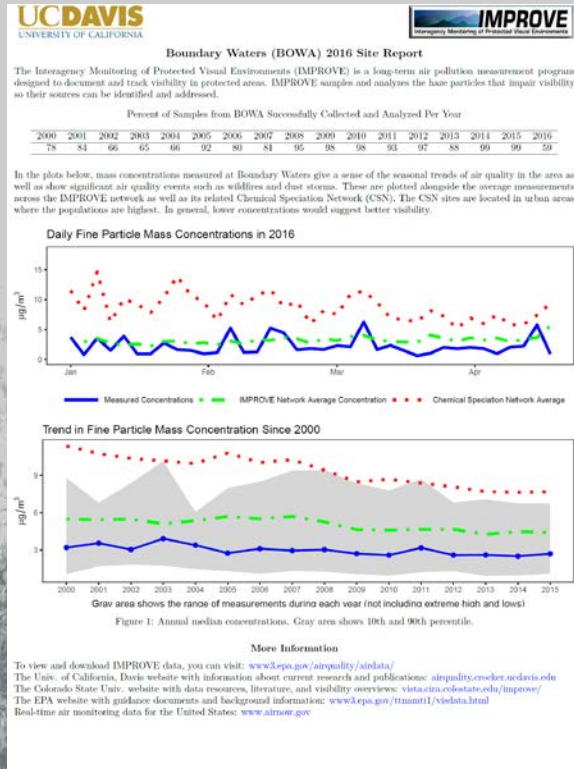
- MTL AHEC500 requires filters that stay very flat; 'pringling' causes problems with auto handler. MTL double support ring prevents 'pringling'.
- MTL offers PTFE membrane filters with hydro-inert support rings (perfluoroalkoxy alkane polymer), which are less susceptible to moisture fluctuation.


The Bad...

- MTL has provided four sets of test filters. Earlier batches had thickness and Si contamination issues. Recent batch had K, Ca, and Sr contamination.



End-of-Year Communication with Operators





Thanks!