Building Federal-Tribal Partnerships: EPA's Rural and Tribal Air Quality Monitoring Program

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Timothy Sharac
David Schmeltz
Melissa Puchalski
U.S. EPA, Office of Air and Radiation,
Office of Atmospheric Protection, Clean Air & Power Division

Acknowledgements

- **Tribal Partners/Site Operators** – Alabama-Coushatta Tribe of Texas; Cherokee Nation; Confederated Tribes of the Umatilla Indian Reservation; La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation; Nez Perce Tribe; Red Lake Band of Chippewa Indians; Santee Sioux Nation
- **WSP** – Kevin P Mishoe, Christopher M. Rogers, Marcus Stewart
- **National Atmospheric Deposition Program** – David Gay, Richard Tanabe
- **U.S. EPA, Office of Air and Radiation** – Rick Haeuber*, Pat Childers

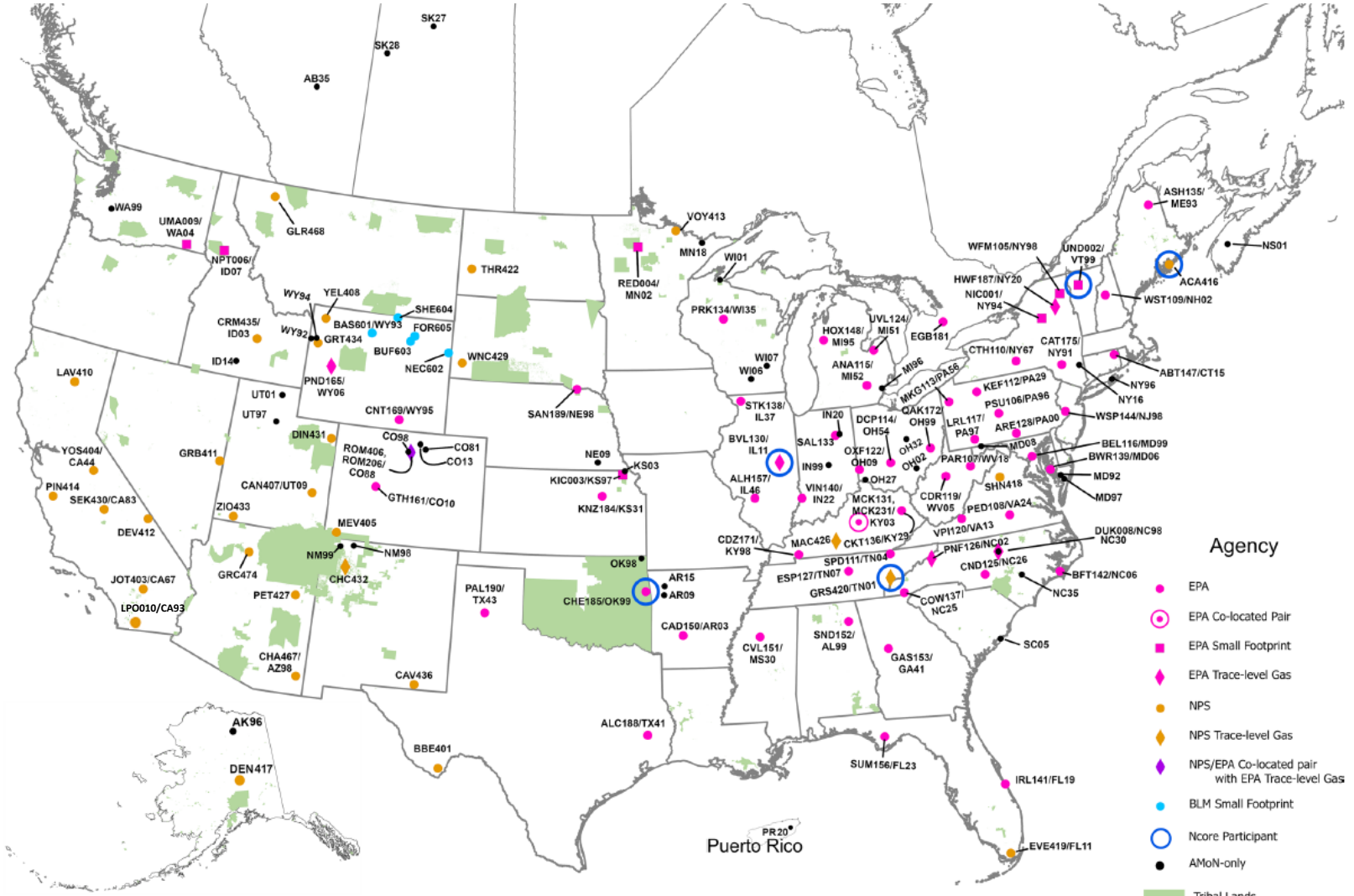
Outline

- CASTNET overview
- Air quality and deposition monitoring on tribal lands
- Partnership benefits
- Near-term plans

Nez Perce (NPT006, ID) small-footprint CASTNET site includes filter pack, ozone, NADP/AMoN. The tribe recently added PollenSense and a Purple Air sensor to the monitoring site.

CASTNET Overview

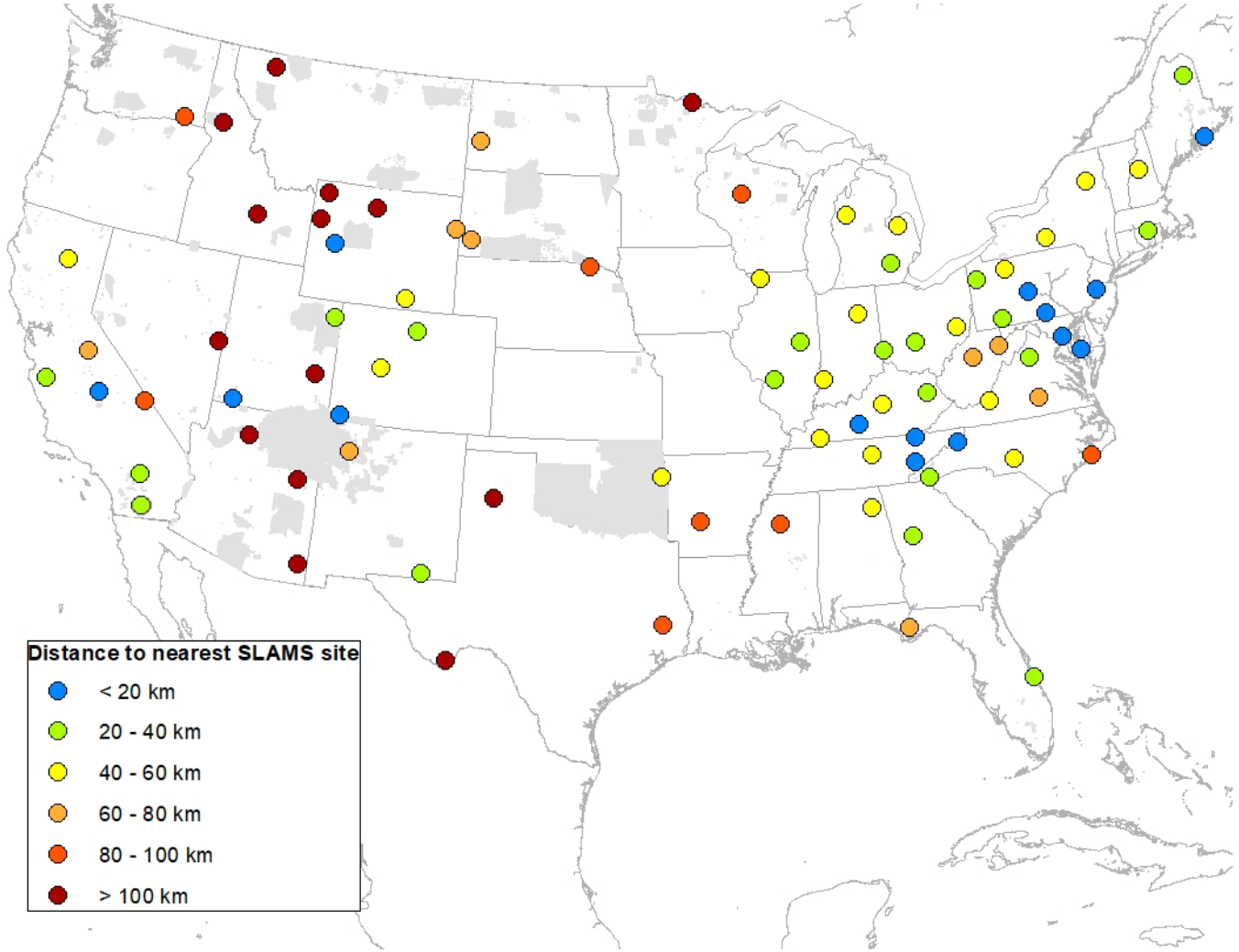
- Long-term, rural multipollutant air quality and atmospheric deposition monitoring network
- ~90 monitoring sites sponsored by EPA, NPS, BLM-WY, NY DEC
- Sites in regionally representative locations away from stationary emissions sources
- Most sites co-located with National Atmospheric Deposition Program: NTN and AMoN sites
- Sites are operated by individuals (e.g., Tribes, state agencies, universities, individual landowners) but field, lab, and data management is supported by a contractor



Note: CASTNET site IDs use three letters followed by three numbers. AMoN site IDs use the two-letter state abbreviation followed by two numbers.

Source: EPA/CAPD

Rural Multipollutant Monitoring Sites

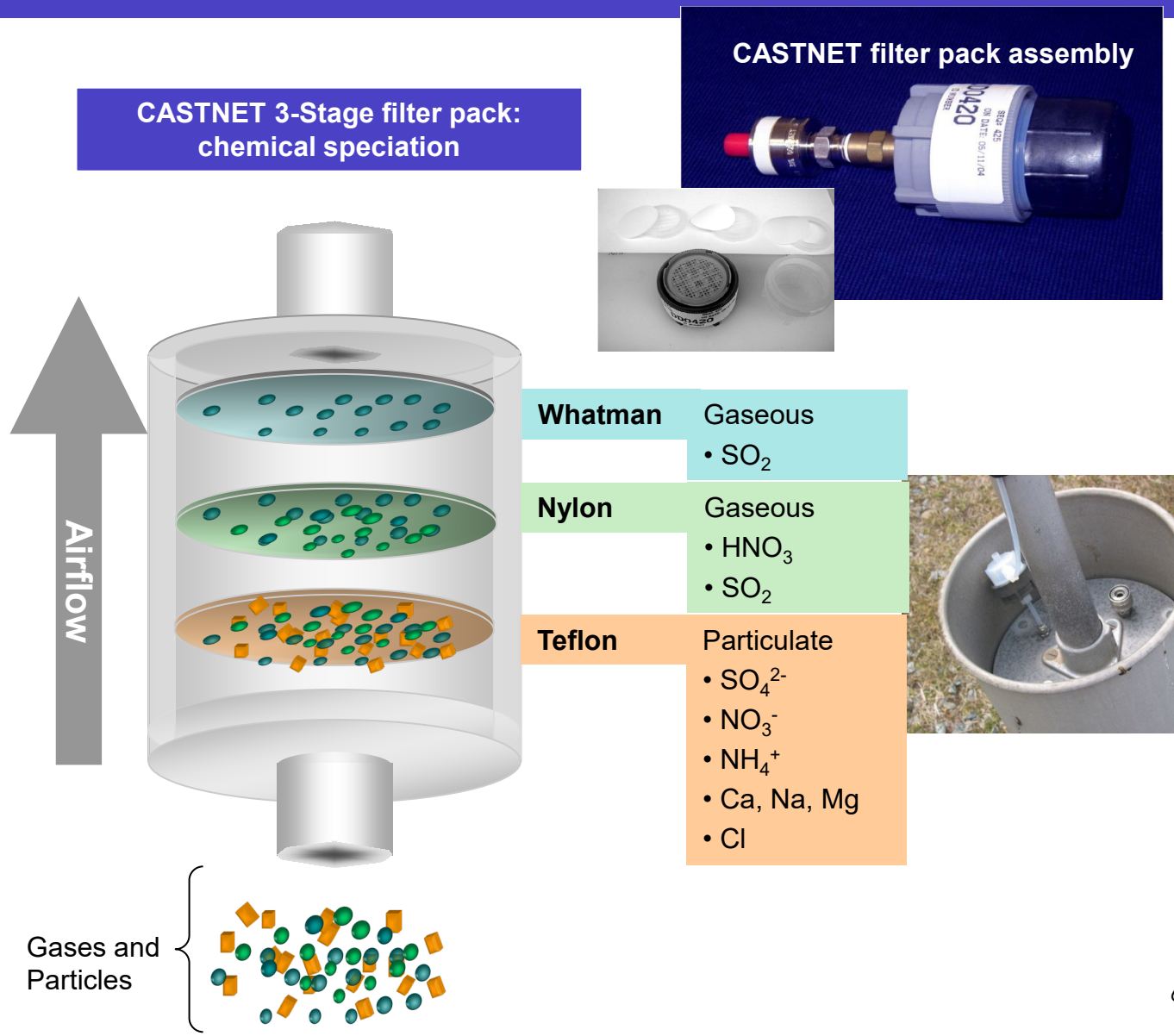


- CASTNET represents large, regional scale airsheds
- Monitoring regulations require ozone monitoring in urban areas (population > 350K), however, 1 out of 5 residents (60M people) live in rural America*
- CASTNET sites provide data where air quality information is often sparse
  - Most CASTNET monitors are > 40km away from a State, Local or Tribal (S/L/T) site
  - 97% of US land is considered rural
- Pollutant emissions from sources such as wildfires, dust, cookstoves, and agricultural activities may inequitably affect rural communities
- Data and information on local and regionally transported pollution

* US Census Bureau, 2011-2015 ACS

CASTNET Measurements

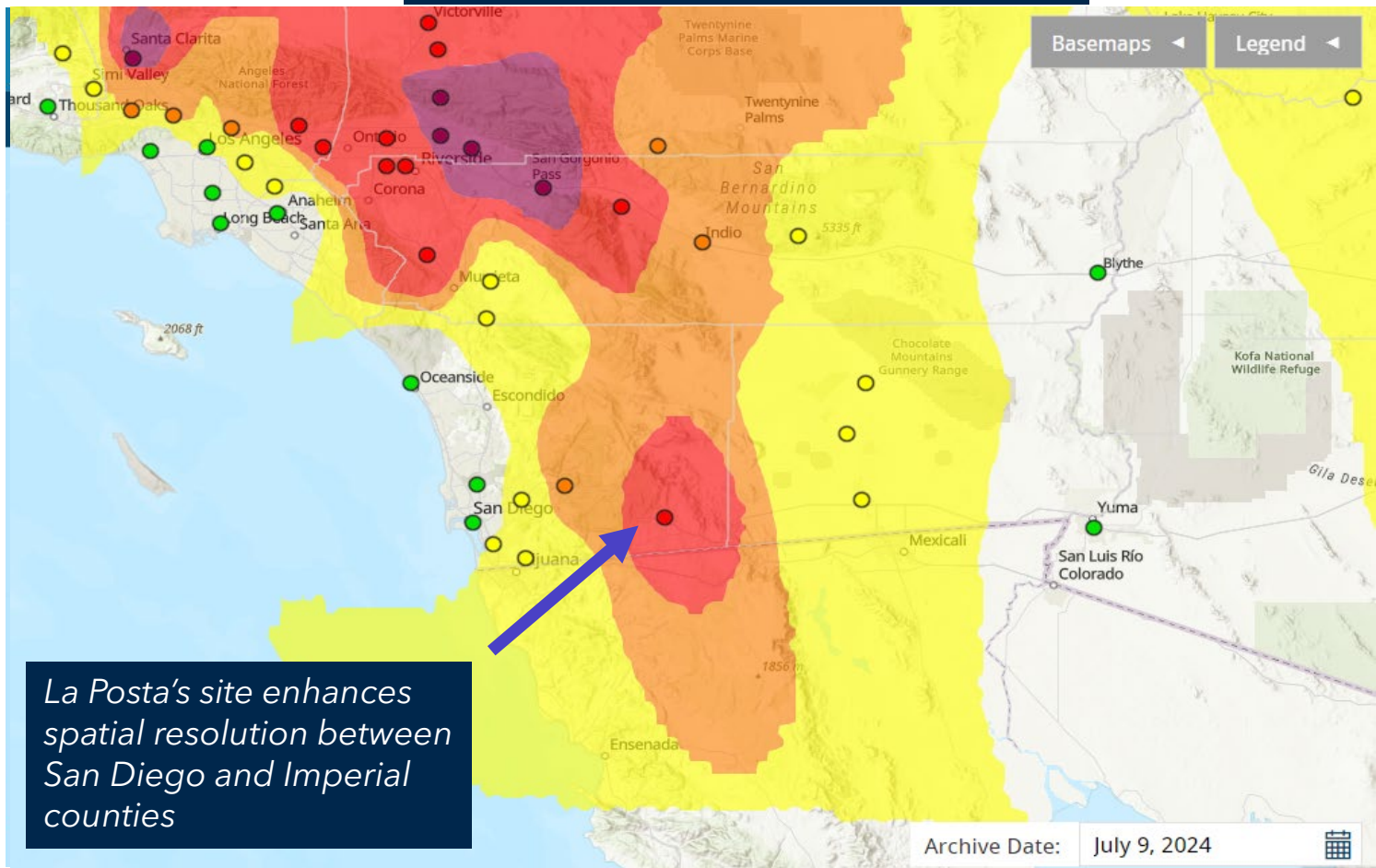
- Each site measures weekly concentrations of SO_2*, SO_4^{2-}, NO_3^-, NH_4^+, HNO_3, Cl^- and base cations
  - 2 or 3-stage filter pack located on a 10-m tower
  - Filter packs are prepared, shipped, and analyzed at the network lab
- Most sites measure hourly O_3 concentrations
- Monitoring data, quality assurance data, and documentation publicly available
- Dry and total deposition estimated using measurement model fusion techniques



Ozone Monitoring

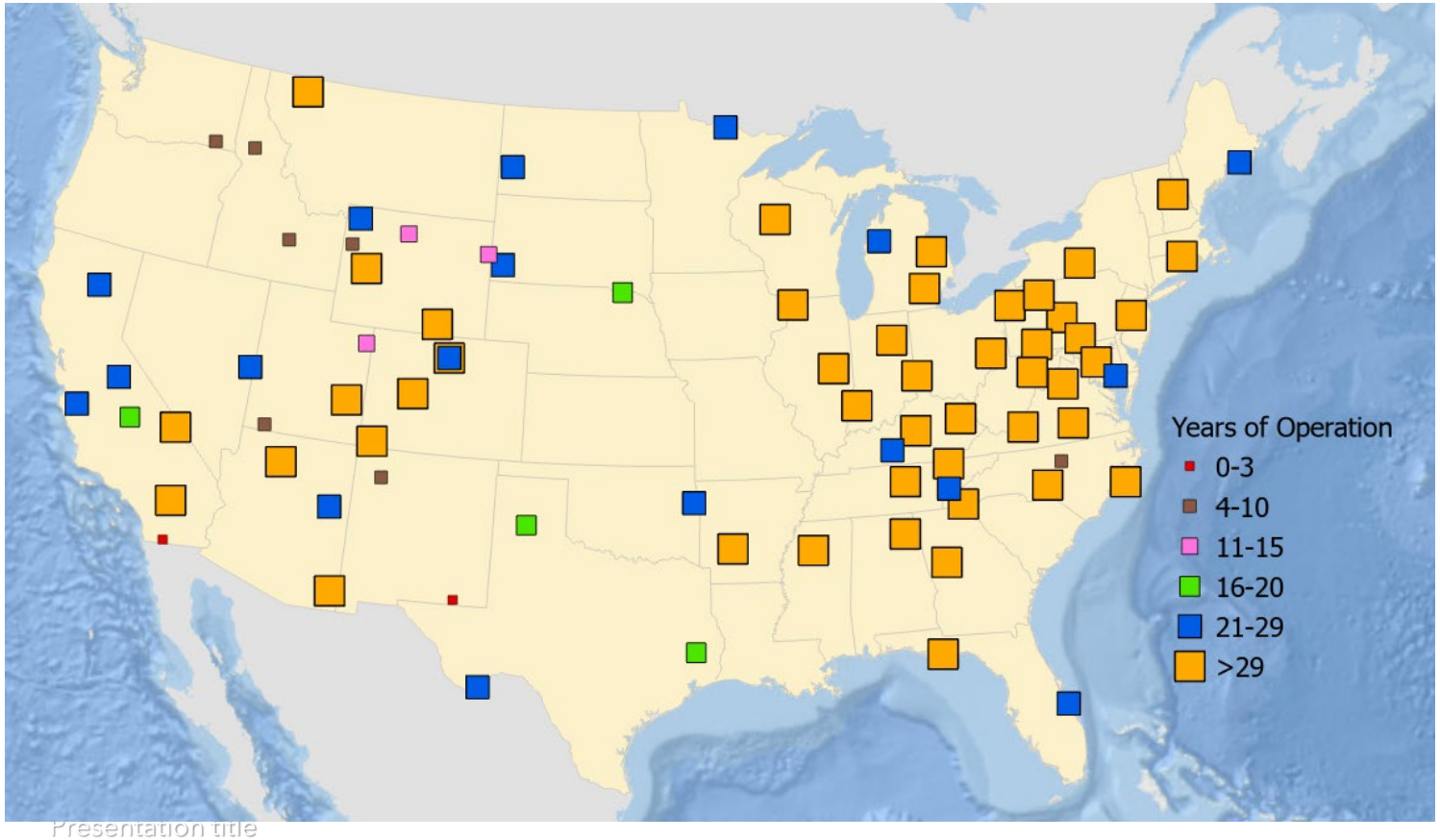
- Real-time data allows public to make decisions about daily activities based on their health risks
- Fills spatial gaps in primarily urban/population-based networks (e.g.,SLAMS, NCore)
- Data are used to assess compliance with the National Ambient Air Quality Standards (NAAQS)
- CASTNET ozone monitors and methods meet federal requirements for regulatory monitoring
- Long-term records to detect trends and help explain climate-driven impacts on air quality

La Posta's 8-hour daily maximum ozone reached 89 ppb on July 9, 2024

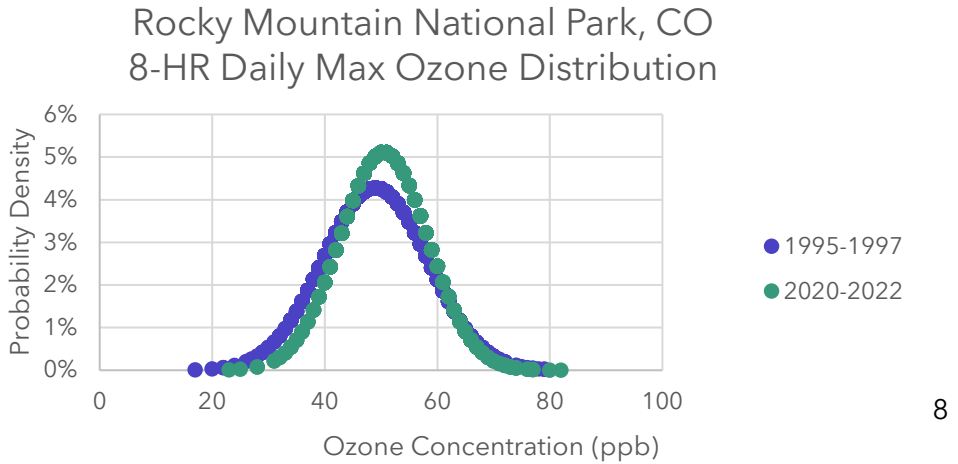


La Posta's site enhances spatial resolution between San Diego and Imperial counties

Climate and Trends

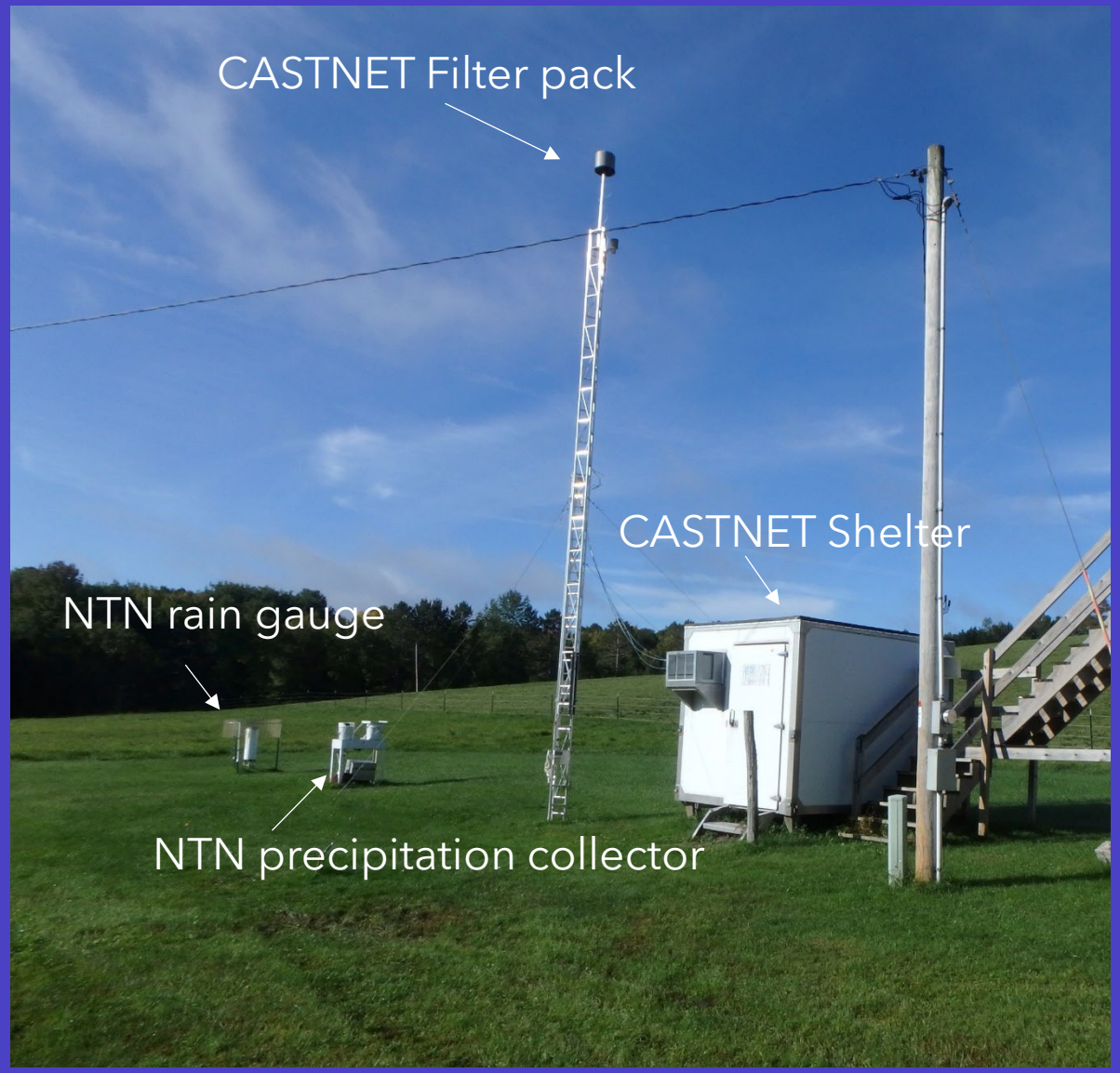


- 47 sites have a 30-year record of ozone measurements
  - Evaluate effectiveness of air regulations
  - Assessment of climate impacts on air quality
  - What levels of protection can be achieved under warming conditions, droughts, wildfires?



Collocated network measurements

	NADP National Trends Network (NTN)	NADP Ammonia Monitoring Network (AMoN)	CASTNET
Measurements	pH, SO_4^{2-}, NO_3^-, NH_4^+, Cl^-, base cations, specific conductance (weekly, in precipitation)	NH_3 (bi-weekly, air)	SO_2, HNO_3, SO_4, NH_4, NO_3, Cl^-, base cations (weekly, air) O_3 (hourly, air) Temperature (hourly)
Operations	Sponsors + UW Madison/ Wisconsin State Lab of Hygiene (WSLH)	Sponsors + UW Madison/WSLH	EPA + Contractor
Laboratory	WSLH	WSLH	Contract (WSP)
Established	1978	2007	1987



CASTNET & NADP Tribal Partners

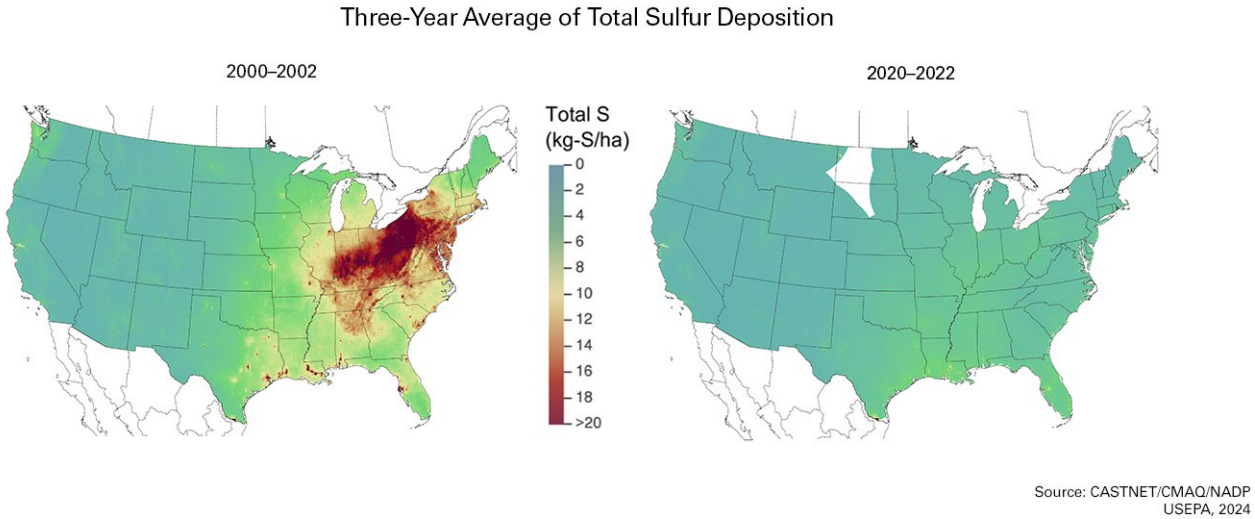
Tribal Partners	CASTNET	AMON	NTN	MDN	MLN	PFAS
Akwesasne Mohawk-Fort Covington						
Alabama-Coushatta						
Cherokee Nation Environmental Programs						
Choctaw						
Confederated Tribes of the Umatilla Indian Reservation						
EPD Winnebago Tribe						
Forest County Potawatomi Community						
Fort Peck Tribes						
Grand Portage Band of Chippewa						
Kickapoo Tribe in Kansas*						
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation						
Leech Lake Band of Ojibwe						
Little Traverse Bay Bands of Odawa Indians						
Makah Tribe						
Nez Perce Tribe						
Northern Cheyenne Tribe						
Passamaquoddy Tribe						
Penobscot Indian Nation						
Quapaw Tribe of Oklahoma						
Red Lake Band of the Chippewa Nation						
Santee Sioux Nation of Nebraska						
Sault Tribe						
The Bad River Band of Lake Superior Chippewa Tribe						

Data Dashboard

Maps and Site Profile

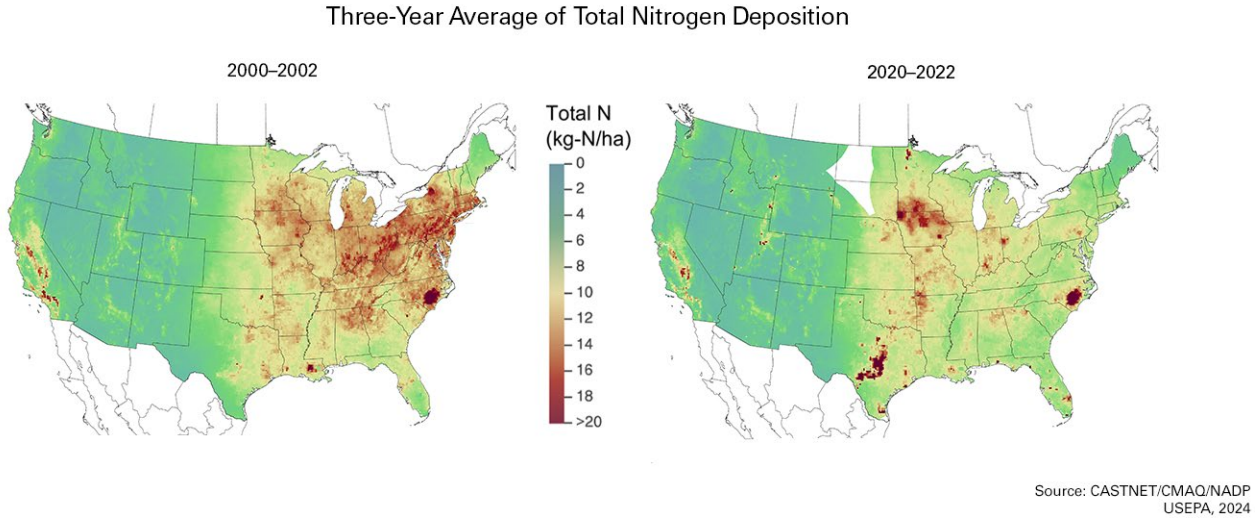
Examples

Total Sulfur and Nitrogen Deposition



Source: CASTNET/CMAQ/NADP
USEPA, 2024

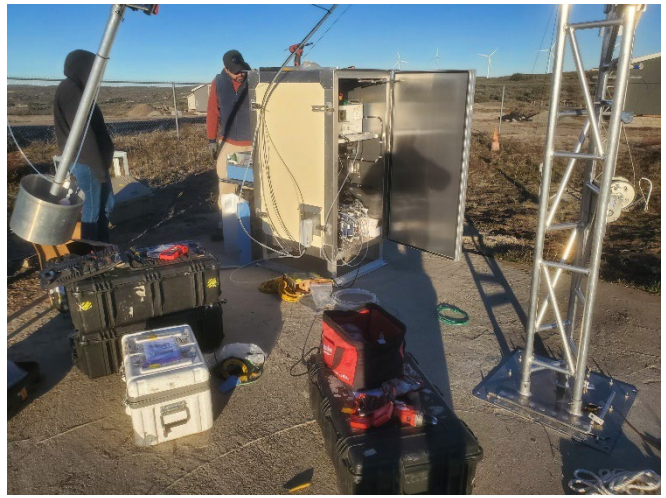
The reduction in total sulfur deposition (wet plus dry) in the eastern U.S. was 82% from 2000–2002 to 2020–2022, a value of similar magnitude to that of wet sulfate deposition.

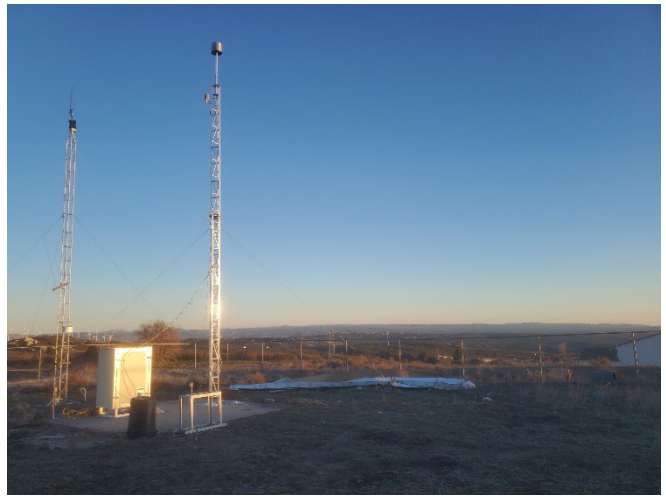


Source: CASTNET/CMAQ/NADP
USEPA, 2024

Decreases in oxidized nitrogen (NO_X) have generally been greater than that of reduced nitrogen (NH_X) deposition. Total oxidized nitrogen deposition decreased 59% in the East. In contrast, total deposition of reduced nitrogen increased by an average of 43% in the East from 2000–2002 to 2020–2022.

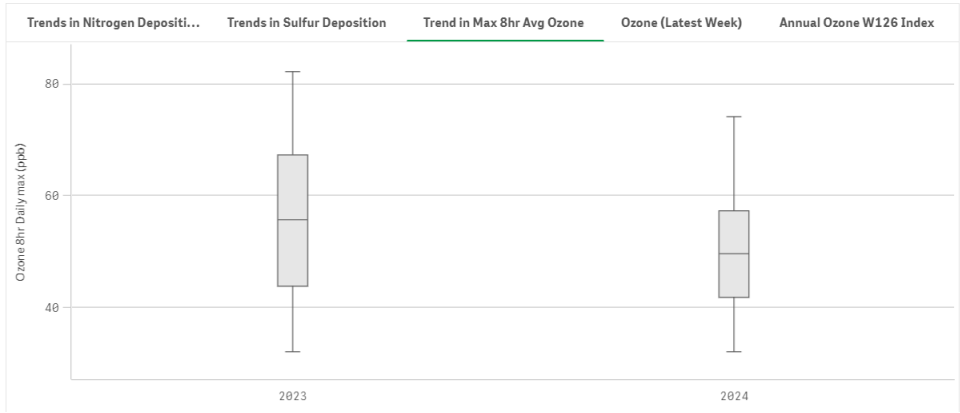
La Posta Tribe



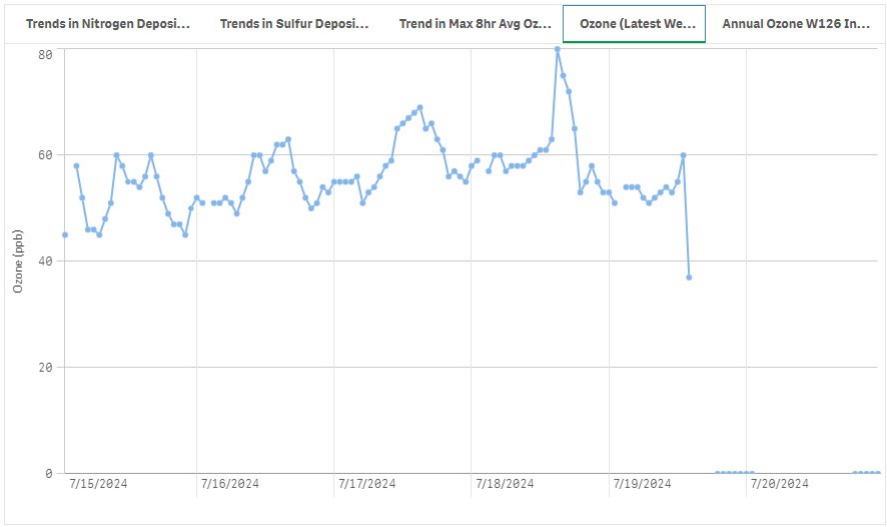


- Located in Southern California
- Established 2023
- Small footprint site with temperature-controlled shelter for ozone analyzer
- Established in partnership with the Tribe, EPA Region 9, and OAR
- Interest in building capacity by adding mercury and/or PFAS monitoring

Trends in max 8hr average ozone



Ozone concentrations (recent)

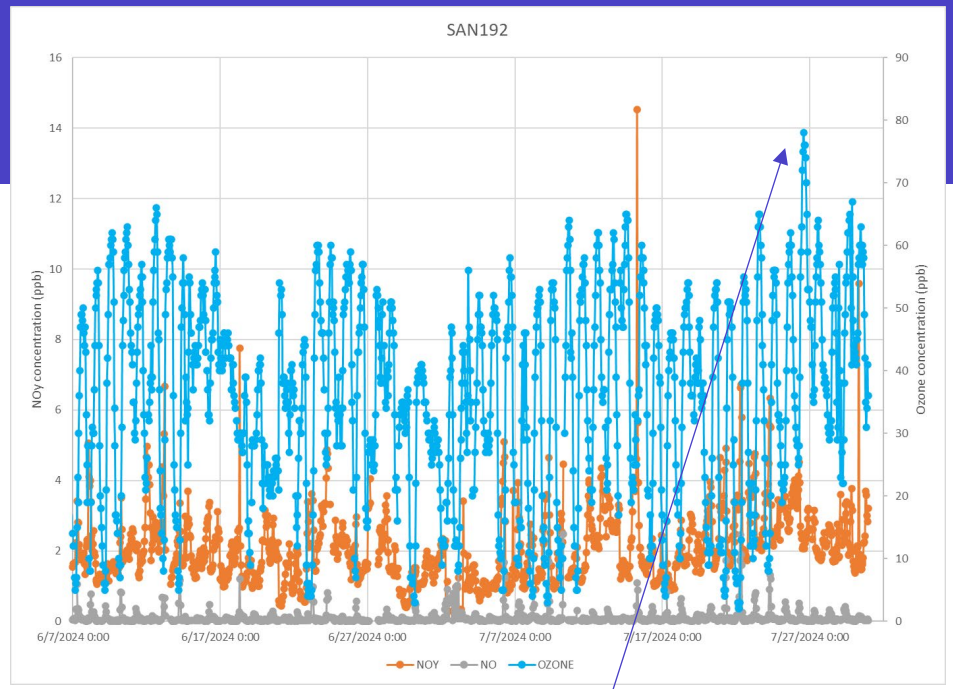


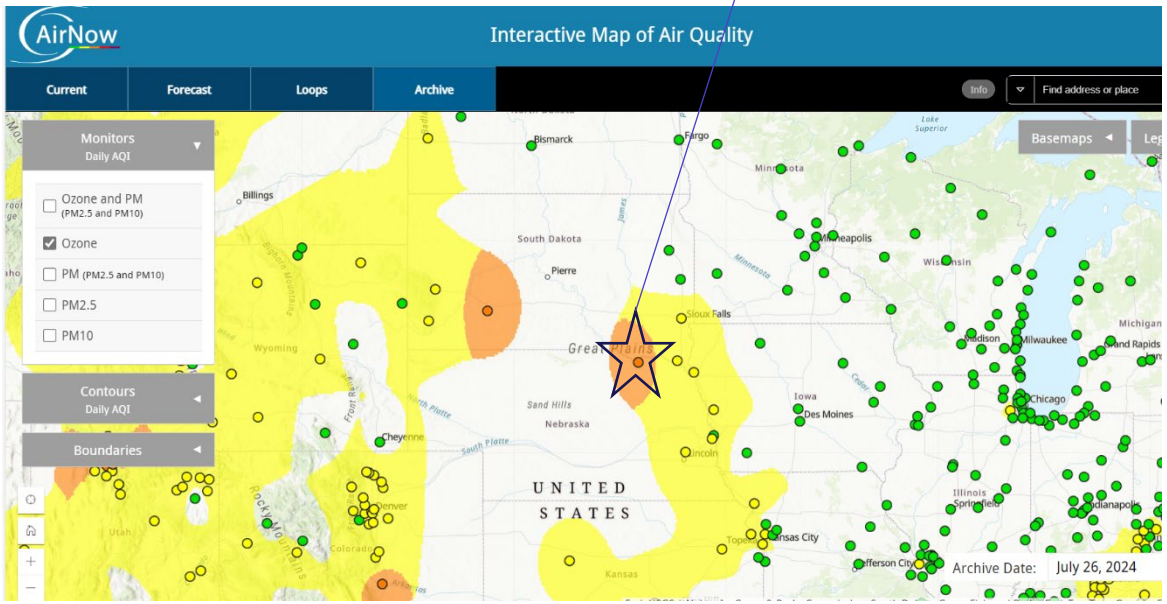
Mutual benefits

- Many benefits participating in CASTNET
  - Access to high quality measurements and data
  - “Apples to Apples” comparisons with other network sites
  - Scientific and technical training and equipment troubleshooting
  - CASTNET/NADP quarterly calls
  - Research opportunities, particularly when CASTNET hosts ITEP interns
  - Reduced burdens associated with owning and operating monitoring equipment, establishing quality management plans, and developing IT infrastructure to flag and validate data
  - Part of a long-term data collection effort that has been featured in thousands of research articles
- Fill network gaps in the central and western US

Long-term Support

- The Santee Sioux (SAN189, NE) site was established in 2006. The site was difficult to access in extreme weather.
- The tribe was awarded IRA funding to move the site to a more accessible location
- The CASTNET contractor assisted the tribe in moving the monitoring site in Summer 2024
- EPA/ORD is supporting a research project to evaluate the cause of increasing ozone exceedances in the upper Midwest
  - A continuous NO/NOy monitor was installed at the new site and the operator was trained





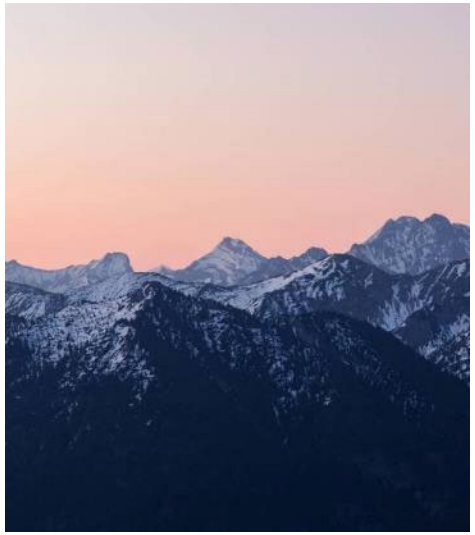
In the near future…

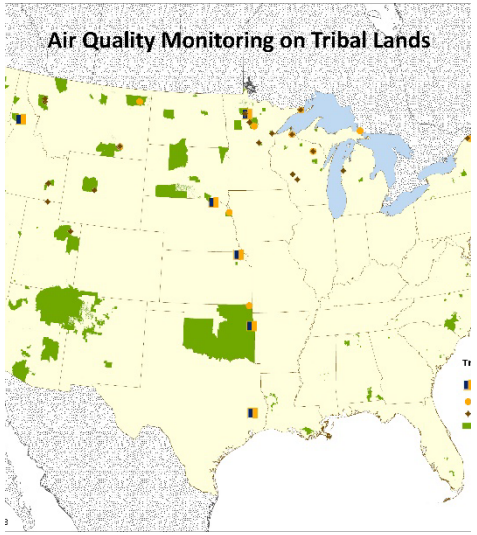
- Expand tribal partnerships – more partners, more sites, greater network coverage
- Improve communications
  - What can we do to make sure we are receiving input and feedback from the Tribes?
  - What information is important to you?
    - EPA and NADP are developing training material specifically for existing and new tribal partners
    - Why are the pollutants measured?
    - How can Tribes effectively use the data to communicate with the public/community members?
  - How can we improve our messages about the effects of air pollution on rural communities?
    - Relationship to human health effects (PM formation)
    - Eutrophication of terrestrial and aquatic systems
    - Mercury contamination
    - Invasive species, loss of biodiversity
    - Acidification

What suggestions do you have for CASTNET, NADP and/or EPA monitoring programs?

Summary

- CASTNET team has been successful in growing the tribal air monitoring program, building tribal monitoring capacity through support with other existing networks, supporting research and advocating for funding
- CASTNET and NADP are standardized rural, long-term monitoring programs
- Consistency and collaboration have been keys to success
- Mutual benefits
- Platform to address emerging data needs
- What's important to you?





CTUIR, WA small-footprint with ozone site

Thank you!

Timothy Sharac

David Schmeltz

Melissa Puchalski

schmeltz.david@epa.gov

https://www.epa.gov/castnet