



Building Tribal Partnerships with Low-Cost Small-footprint Ambient Monitoring Sites

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Outline

- Background & Purpose
- Network Overview
- Monitoring on Tribal Lands
 - Operating stations
 - Small Footprint Design
 - Installation
- Questions



Alabama-Coushatta, TX CASTNET site (ALC188).
Filter pack, O₃ and temperature is collected by EPA.

Network Overview

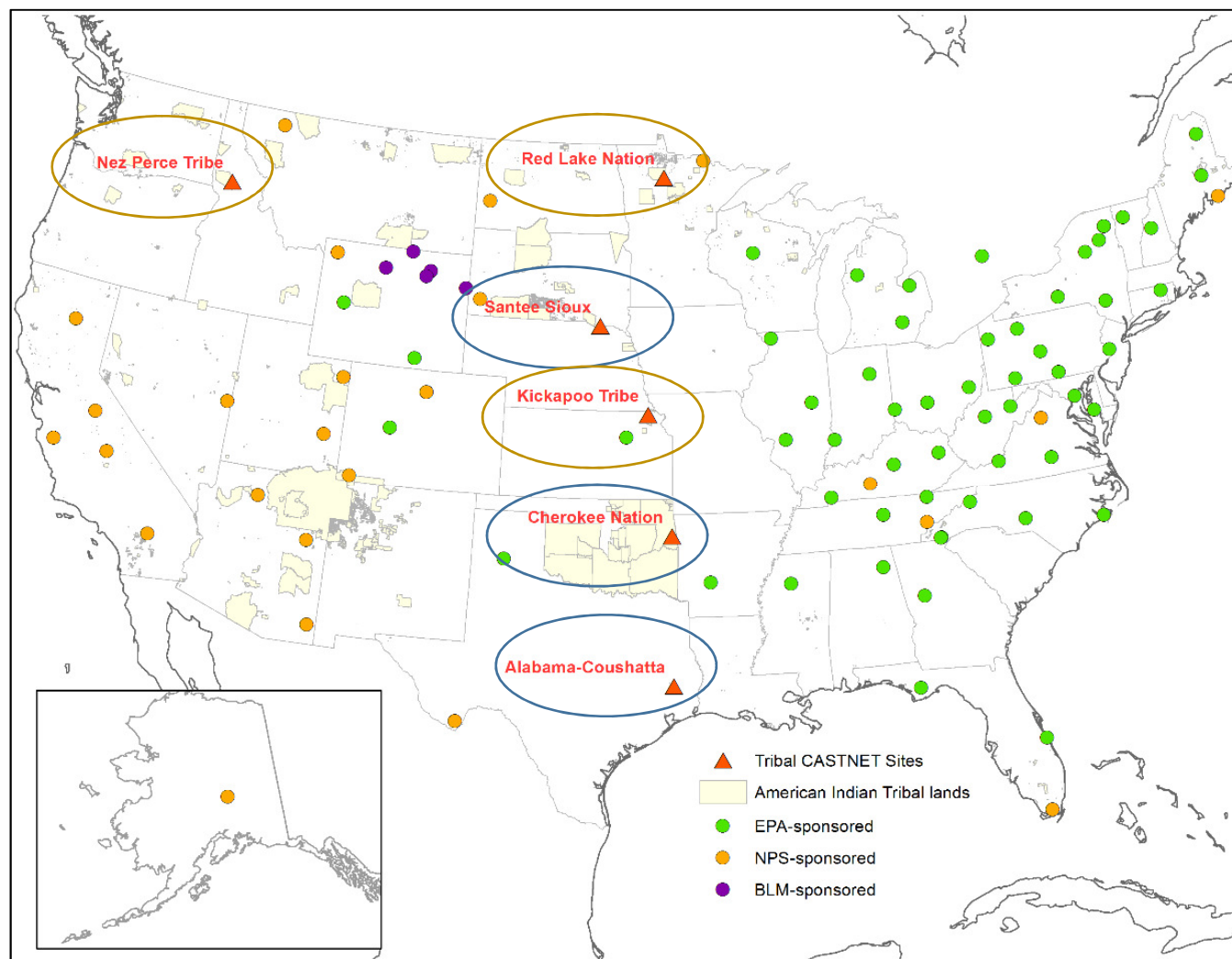
- Established in 1990 under the Clean Air Act Amendments (CAAA) to assess long-term trends and reductions of atmospheric deposition due to emission reduction programs (ARP).
- Long-term rural monitoring network
 - designed to provide ambient concentrations and estimates of dry deposition
- Sixty-eight CASTNET sites co-located with AMoN
- Most sites are co-located with NADP/NTN. CASTNET reports dry and total deposition fluxes.
- Ambient data, quality assurance data and documentation are routinely posted to EPA's public website (www.epa.gov/castnet)



Sumatra, FL (SUM156)

Monitoring Sites

- Ninety-five (95) monitoring sites sponsored by EPA, NPS, BLM-WY, NY DEC/NYSERDA
- 6 Tribal partners
- More than 50 partners support the network
- Sites are located in rural areas away from emissions sources

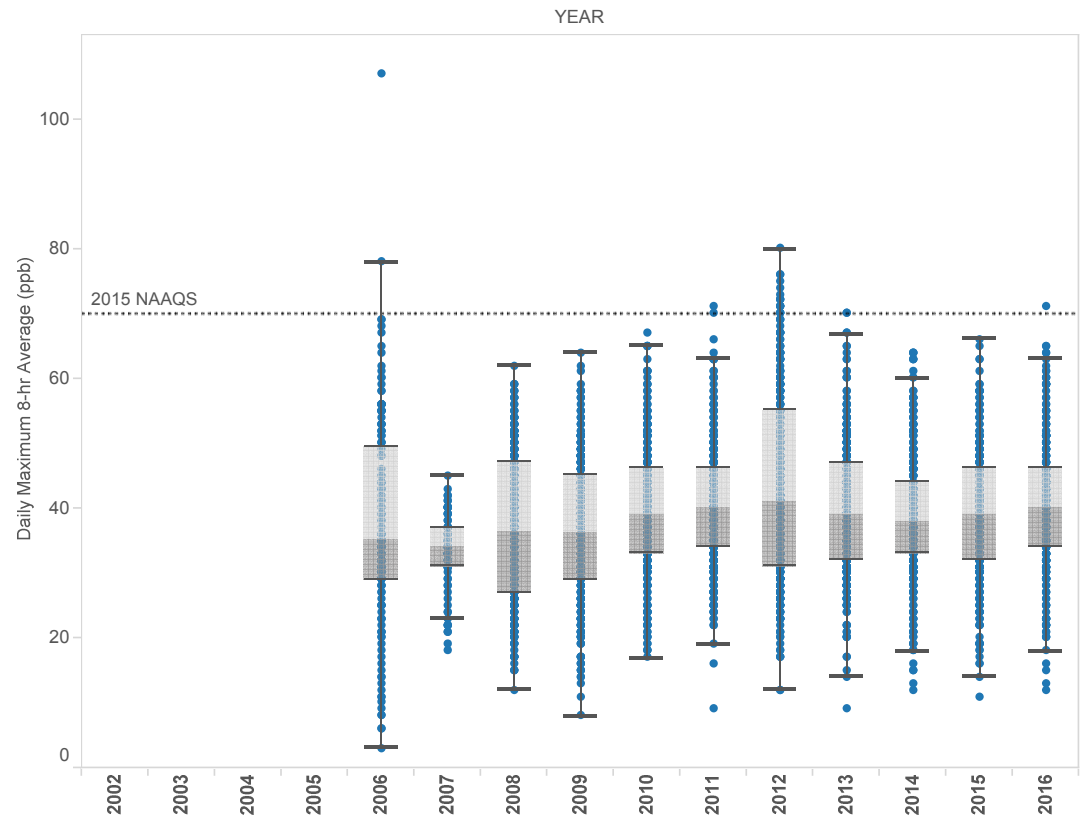


<https://www.epa.gov/castnet>

CASTNET Measurements

- Each site measures weekly concentrations of SO_2 , SO_4^{2-} , NO_3^- , NH_4^+ , HNO_3 , Cl^- and base cations
- Provide estimates of dry deposition
- Additionally, most sites measure hourly O_3 . Ozone data are compared to the NAAQS (70 ppb)
- 8 sites measure hourly concentrations of NO_y

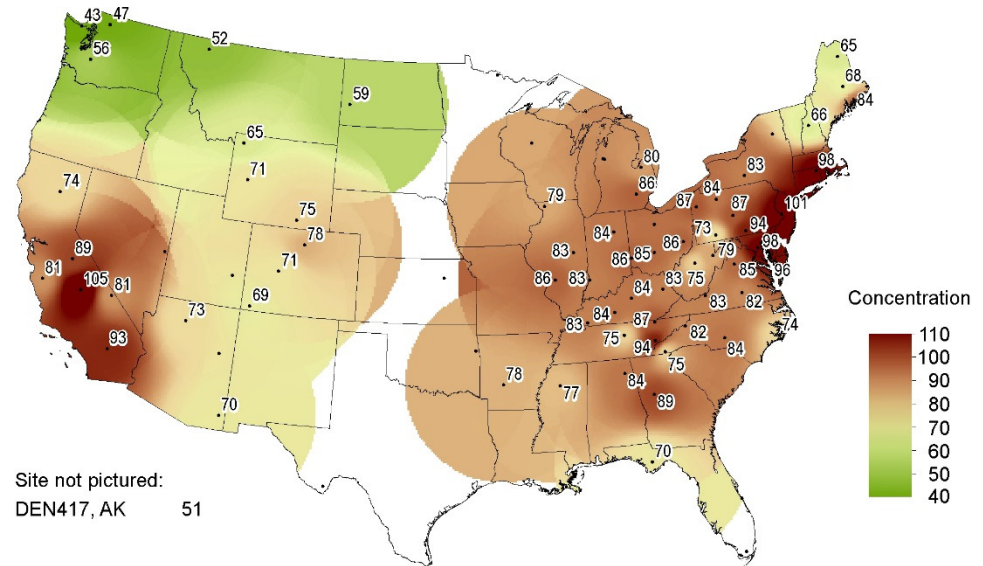
Ozone DMAX - SAN189



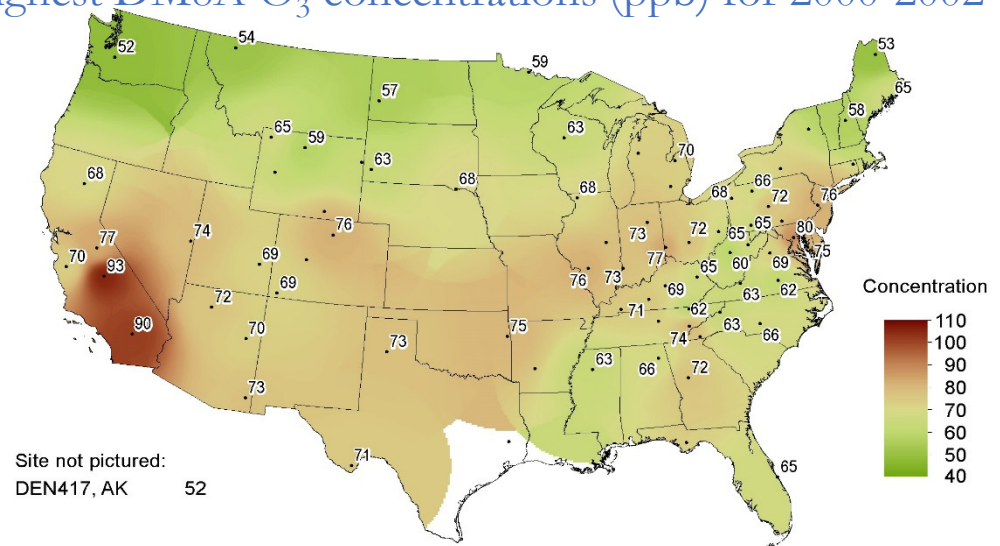
Mutual Benefits for Tribal Partners and CASTNET

EPA/CASTNET

- Partnerships are important for operating a consistent, long-term monitoring network
- Spatial coverage
- Interest in oil/gas development and impacts on ozone exceedances
- In-kind support provided by tribes



3-year 4th highest DM8A O₃ concentrations (ppb) for 2000-2002



3-year 4th highest DM8A O₃ concentrations (ppb) for 2011-2013

Mutual Benefits for Tribal Partners and CASTNET

Tribes

- Participation in an established national network provides credibility
- Public information can be referenced and used for public outreach
 - Documentation
 - Map products
- Atmospheric pollutant and deposition impacts to areas important to tribes
 - Negative effects to land and water quality
 - Health effects due to ozone and/or PM formation due to agricultural burns, wildfires, combustion sources
- Training availability
 - EPA provided training to Cherokee in 2002
 - Cherokee has provided training to many tribal partners

Tribal Monitoring Program

- Three tribal sites have been in operation for more than 10 years
 - These sites deploy weekly filter packs, measure hourly ozone and temperature
- Recently, through EPA's OAR tribal program, CAMD's outreach to tribes and the design of a low-cost, small footprint site, CASTNET has been able to expand the tribal network
 - EPA has 8 small-footprint sites



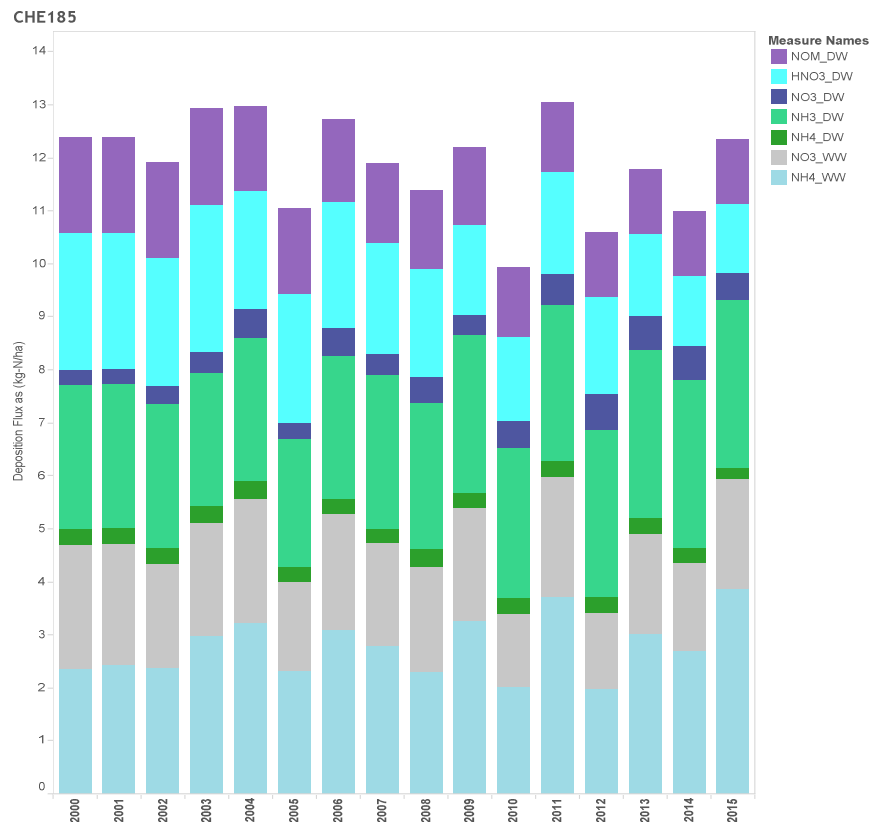
Red Lake, MN (RED004)

Cherokee Nation (CHE185, OK)



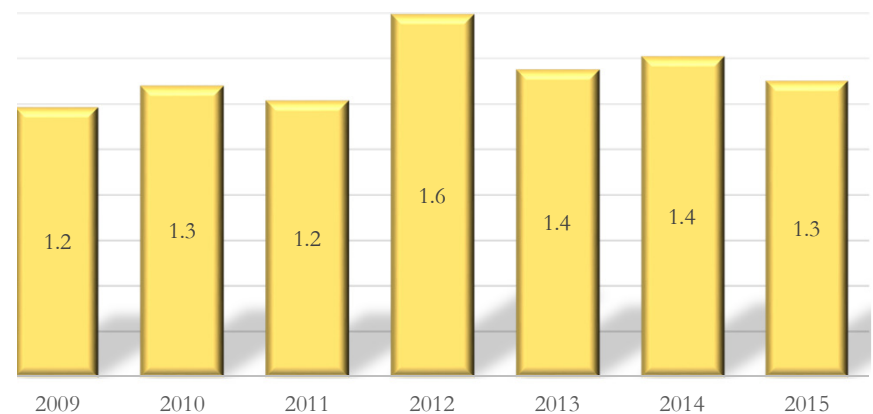
- CASTNET site deployed in 2002
- Co-located with NCore
 - CASTNET collects meteorological data
 - Cherokee Nation collects O₃, PM and trace gas measurements

- Co-located with National Atmospheric Deposition Program:
 - Mercury Deposition Network (MDN)
 - Atmospheric Mercury Network (AMNet)
 - Ammonia Monitoring Network (AMoN)



NOM_DW, HNO3_DW, NO3_DW, NH3_DW, NH4_DW, NO3_WW and NH4_WW for each YEAR. Color shows details about NOM_DW, HNO3_DW, NO3_DW, NH3_DW, NH4_DW, NO3_WW and NH4_WW.

Annual NH₃ Concentrations





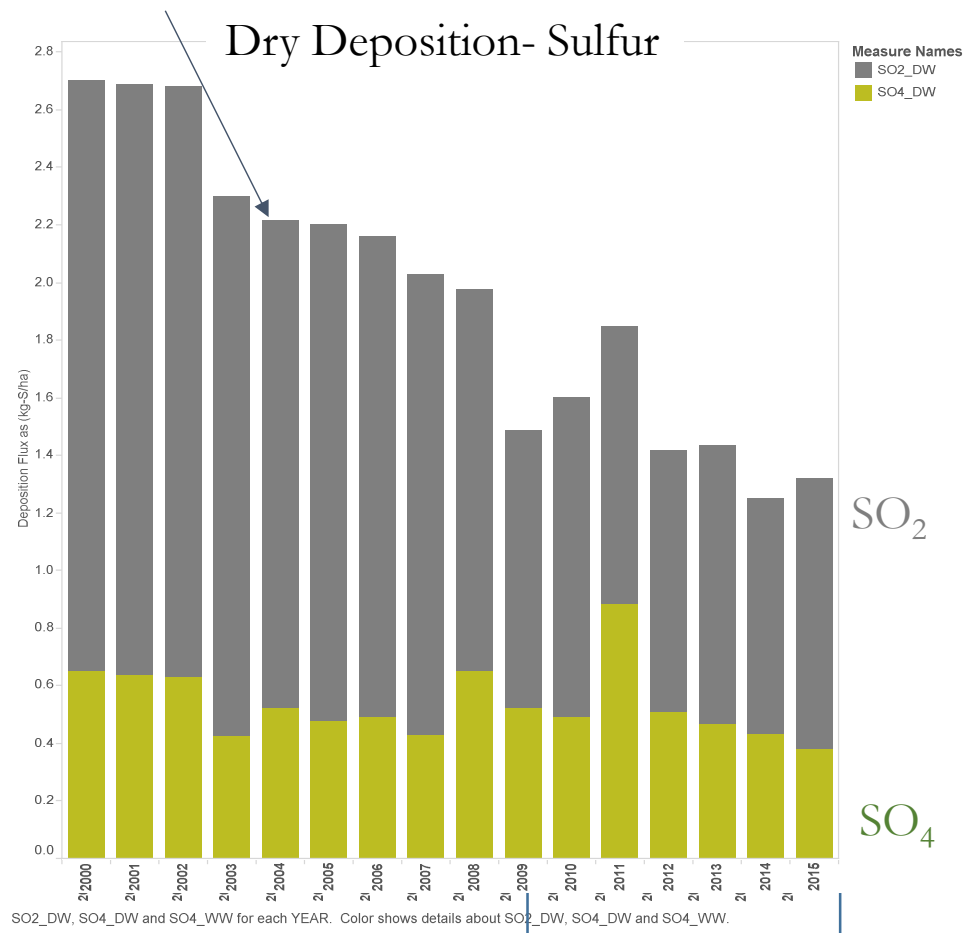
Alabama-Coushatta (ALC188, TX)

CASTNET measurements began in 2004

Ambient Concentrations - Sulfur



Dry Deposition- Sulfur



SO₂DW, SO₄DW and SO₄WW for each YEAR. Color shows details about SO₂DW, SO₄DW and SO₄WW.

Small-footprint Design

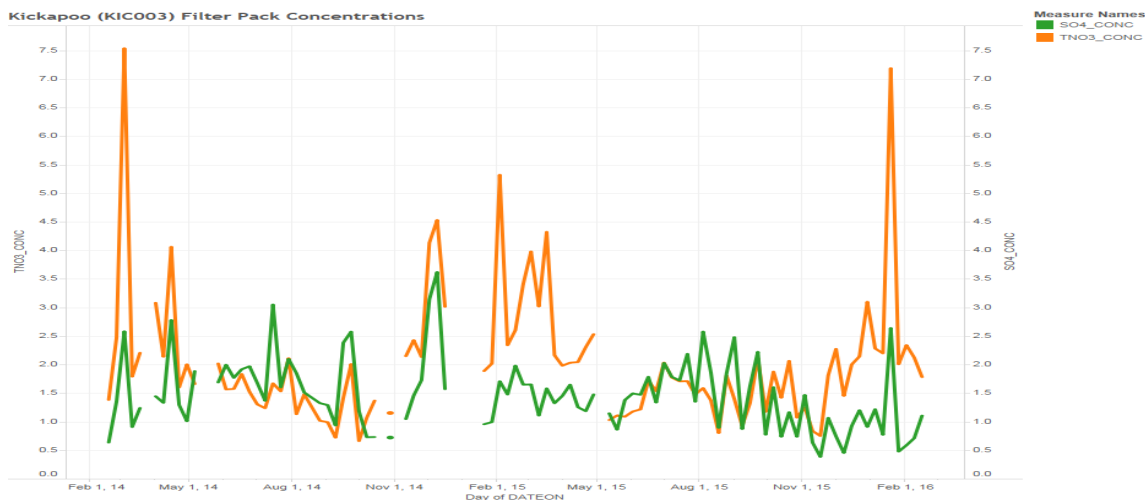
- 2012 Small footprint monitoring stations
 - Alternative power source (wind/solar)
- 11 CASNET small-footprint sites





Kickapoo Nation (KIC003)

- Small-footprint site established in February 2014
- Located in NE Kansas
- Purpose: enhance the Kickapoo Nation School awareness of science & environmental education.
- NADP wet deposition was installed in the Summer of 2014



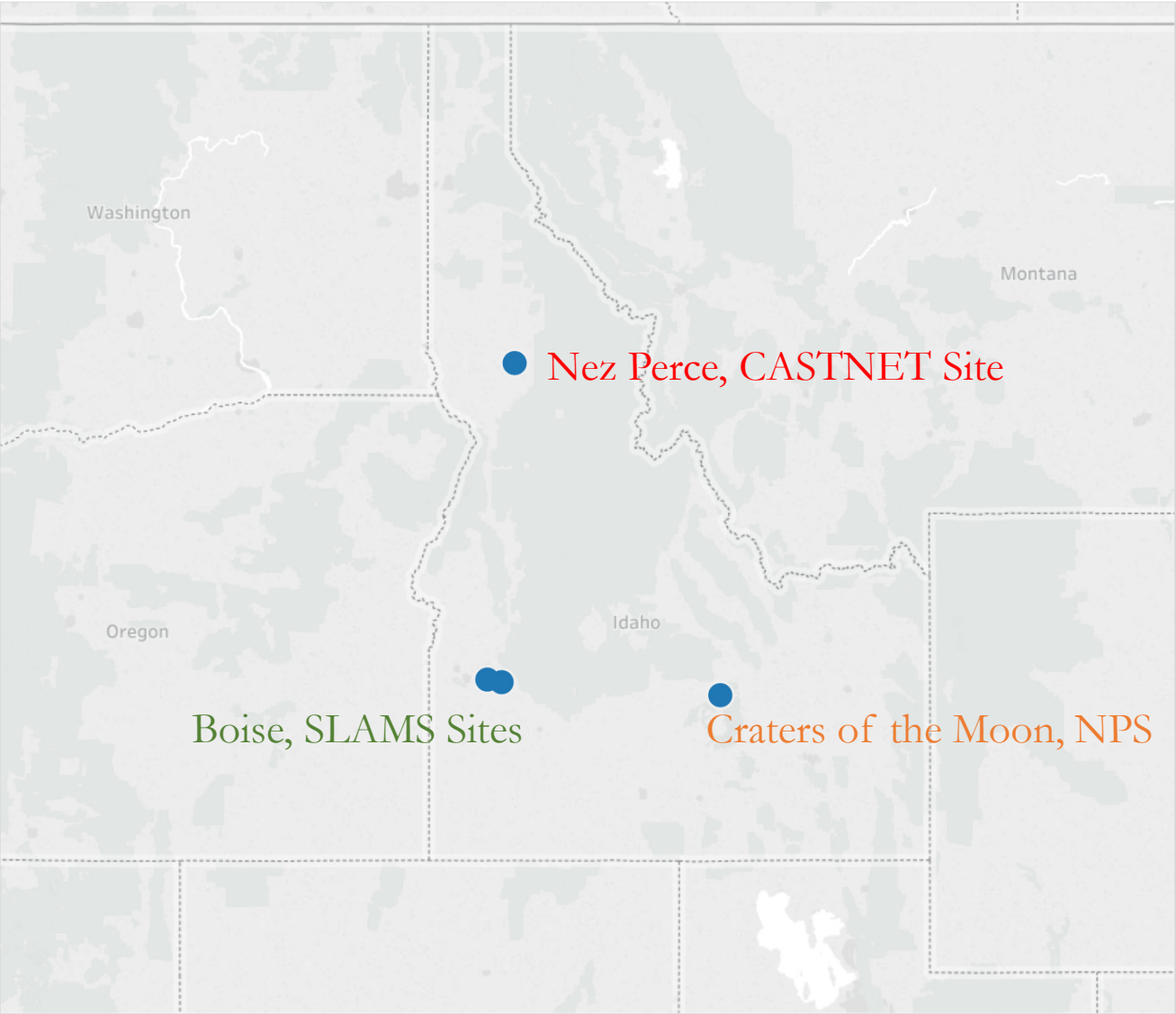


Nez Perce, ID (NPT006)

- First tribal solar/wind powered monitoring site
 - Installed December 2015
- Small enclosure houses ozone monitor and transfer standard
 - Three ozone monitors in ID reporting to AQS
- Interest in oil/gas development and impacts on ozone exceedances
- Challenge from 2016 STAR Report– funding for tribes affected by the new ozone standards



Idaho Ozone Monitors



Nez Perce, ID (NPT006)



CASTNET Siting Criteria

Traditional* CASTNET Monitoring Sites	
Potential Interference	Minimum Distance from Measurement Apparatus
Large point source of SO ₂ or NO _x	20 to 40 km
Major industrial complex	10 to 20 km
City, > 50,000 population	40 km
City, 10,000 to 50,000 population	10 km
City, 1,000 to 10,000 population	5 km
Major highway, airport, or rail yard	2 km
Secondary road, heavily traveled (> 100 ADT**)	500 m
Secondary road, lightly traveled (≤ 100 ADT**)	200 m
Feedlot operations	500 m
Intensive agricultural operations (including aerial spraying)	500 m
Limited agricultural operations	200 m
Large parking lot	200 m
Small parking lot	100 m
Tree line	50 m
Obstacles to wind	10 times obstacle height
CASTNET Monitoring Sites Initiated for Filter Pack Measurements Exclusively	
Potential Interferant	Minimum Distance from Measurement Apparatus
Tree line	10 m
Obstacles	10 m from sampling tower <u>plus</u> distance equal to 2 times any obstacle height <u>above</u> the sampling inlet†

*Sites with a full suite of meteorological measurements along with a weekly filterpack.

**Measured or modeled traffic volumes and mixes or approximations based on nearby similar roads.

† For example: An object 15 m tall must be 20 m from the sampling tower (10 m plus 2 times the 5 m measured above the sampling inlet).

Defined Responsibilities

Tasks	Funding
Site location reconnaissance	Tribe/Partner
Leasing of site land	Tribe/Partner
Purchase/receipt of equipment & materials	EPA/Amec
Infrastructure – pre install labor (tower base, fencing)	Tribe/Partner
Tower base materials (concrete, lag bolts & fencing materials)	EPA/Amec
Power drop and/or solar stand materials	EPA/Amec
Receipt and storage of 10m tower and equipment prior to installation	Tribe/Partner
Shipping costs for tower and equipment sent to site	EPA/Amec
Actual installation of tower and equipment	EPA/Amec
Field site operations training (90 minutes)	Tribe/Partner & EPA/Amec
Telemetry cost for monitoring/transferring data	EPA/Amec
Weekly site visit to change out filter pack and record data (30 minutes each Tuesday)	Tribe/Partner
Weekly filter pack shipping and analysis	EPA/Amec
Minor repairs/troubleshooting issues	Tribe/Partner
Calibration visits & major repairs	EPA/Amec
Siting area maintenance (e.g. grass mowing)	Tribe/Partner



Santee Sioux Tribe, NE

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CASTNET: <https://www.epa.gov/castnet>

NADP 2016 Science Symposium: <http://nadp.sws.uiuc.edu/nadp2016/>

CASTNET Small-Footprint Site Costs

Installation (Capital Costs)*	
Site selection/land lease	Tribe
Equipment & Shipping	\$11,500
Additional Supplies (power drop, fence, cement pad, etc.)	~\$5,000
Labor/Travel <ul style="list-style-type: none"> • Dependent on site location • Site operator training • Tower installation, telemetry & power hookups 	\$10,000
Estimated Total	\$36,500

Annual Operation*	
Filterpack <ul style="list-style-type: none"> • Laboratory analysis • Telemetry to monitor and transfer data • Data QA & validation • Site calibration & audit 2x's per year • Reporting – maps, analyses, etc. 	\$25,000
Site visit (~30 min/week)	Tribe
Site maintenance & repairs	Tribe
Estimated Total	\$25,000

*Small-footprint site