ADEC's Community-Based Air Sensor Network

Quarterly Call
March 11, 2025
10:00 AM AKST

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Housekeeping Items

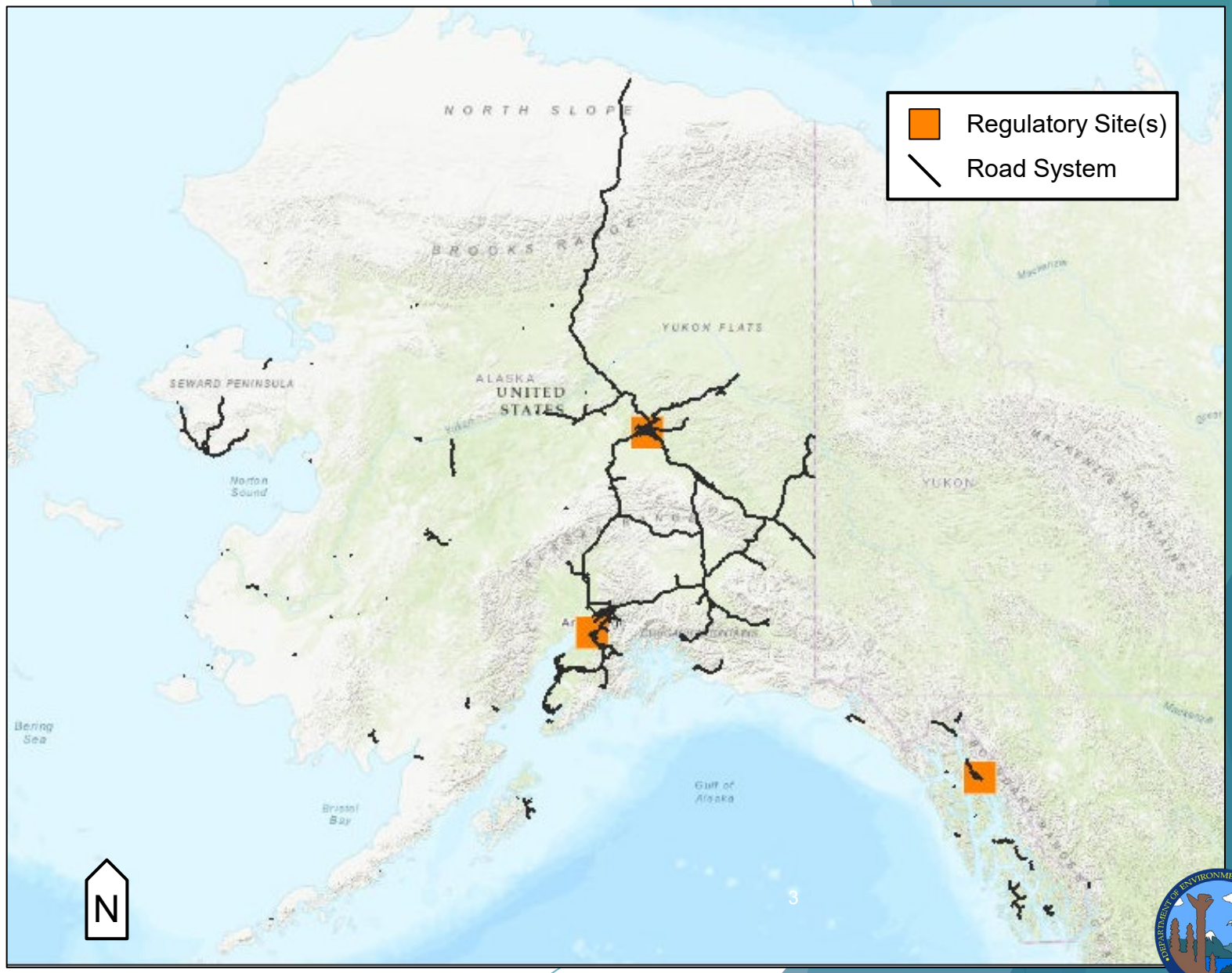
- Mute – Please mute yourself for presentations.
- Please use chat during presentation as you have questions/comments.
- 20-30 minutes of planned discussion time at end
- Mark your calendar for next call! June 10th 10-11am

Agenda

- Welcome!
- Sensor network overview and progress
- Data findings
- Next steps
- Questions and discussion

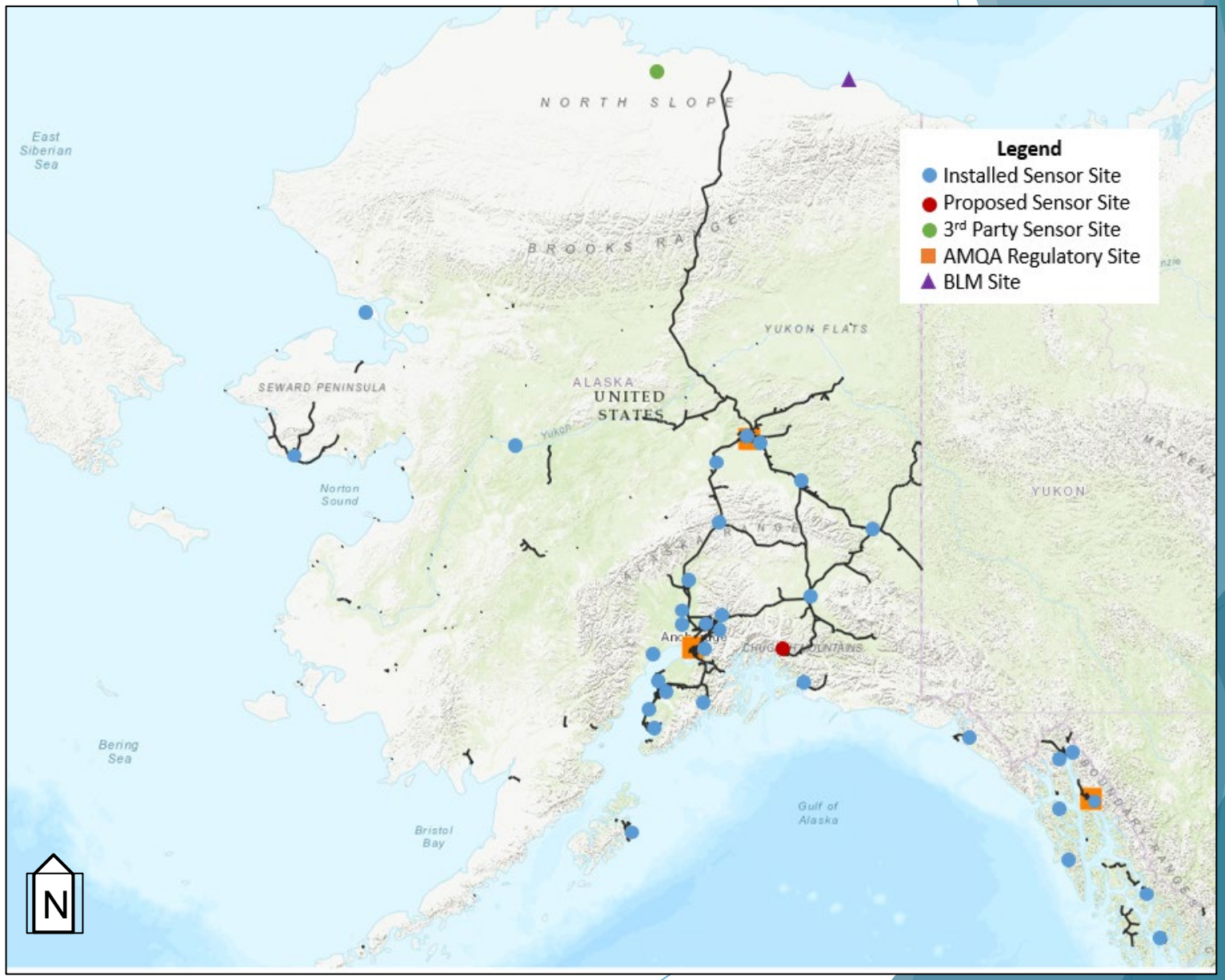
DEC's Regulatory Network

- Regulatory stations in 3 Metropolitan Statistical Areas (MSAs)
  - Anchorage / Mat-Su (4 sites)
  - Fairbanks (3 sites)
  - Juneau (1 site)
- Monitor criteria pollutants:
  - Particulate matter ($PM_{2.5}$ and PM_{10})
  - Gases:
    - Carbon monoxide (CO)
    - Nitrogen dioxide (NO_2)
    - Ozone (O_3)
    - Sulfur dioxide (SO_2)



DEC's Low-Cost Sensor Network

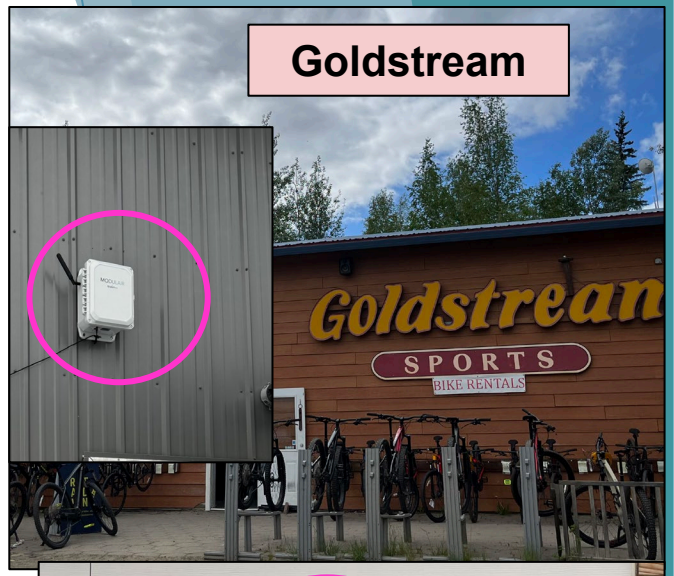
- 40 sensors currently deployed in 34 communities
- QuantAQ Modulair sensors:
  - PM_{10} and $PM_{2.5}$, CO, NO, NO_2, O_3, temp, relative humidity
- Non-regulatory data
  - Trend analysis
- Network Coverage Limitations
  - Plans for expansion



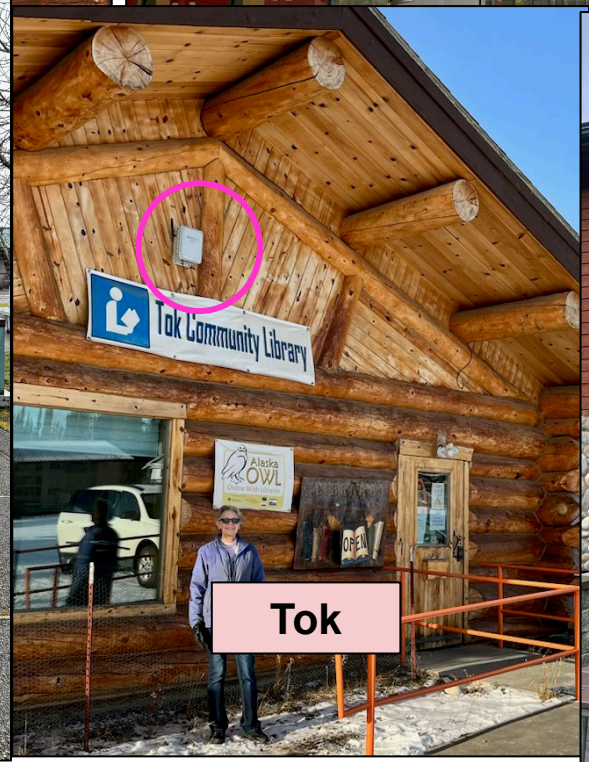

Tyonek


Alaska State Museum

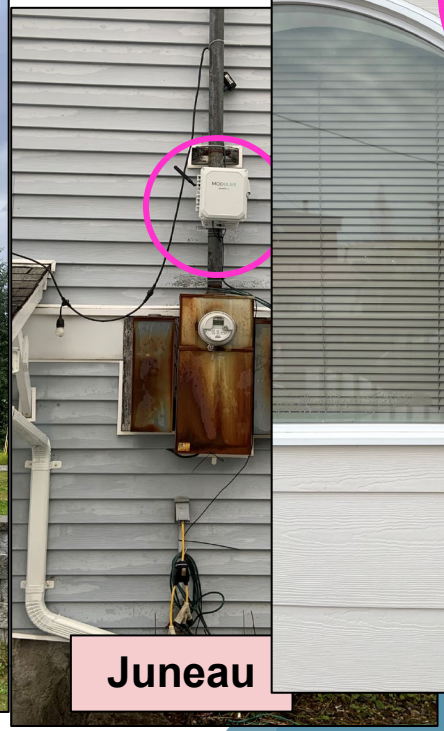

Wasilla


Goldstream
Goldstream
SPORTS
BIKE RENTALS

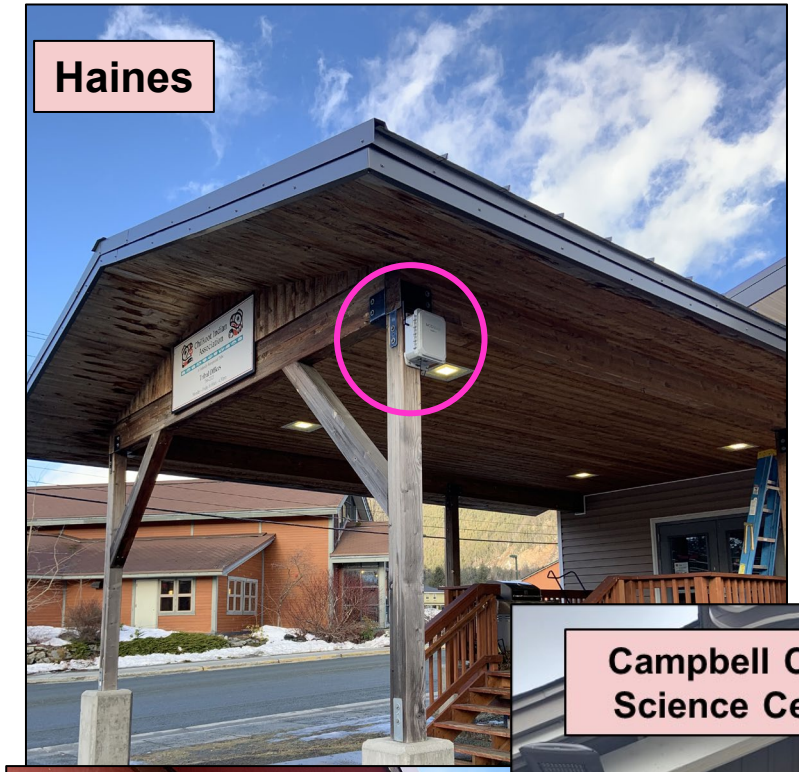

Wrangell


Tok Community Library
Tok


Chickaloon


Juneau


MODULAIR
Galena


Haines


Ketchikan

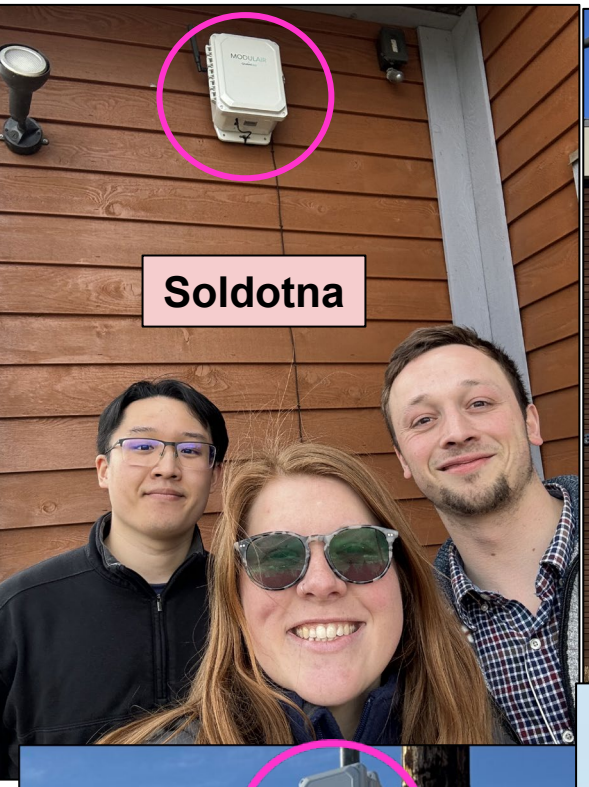

Skagway

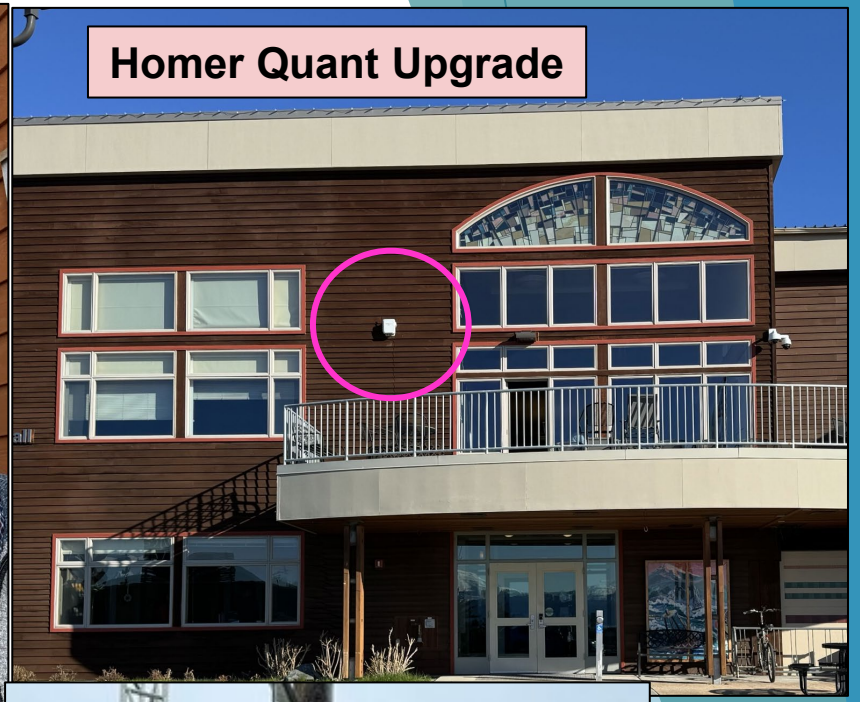

Campbell Creek
Science Center


Delta Junction

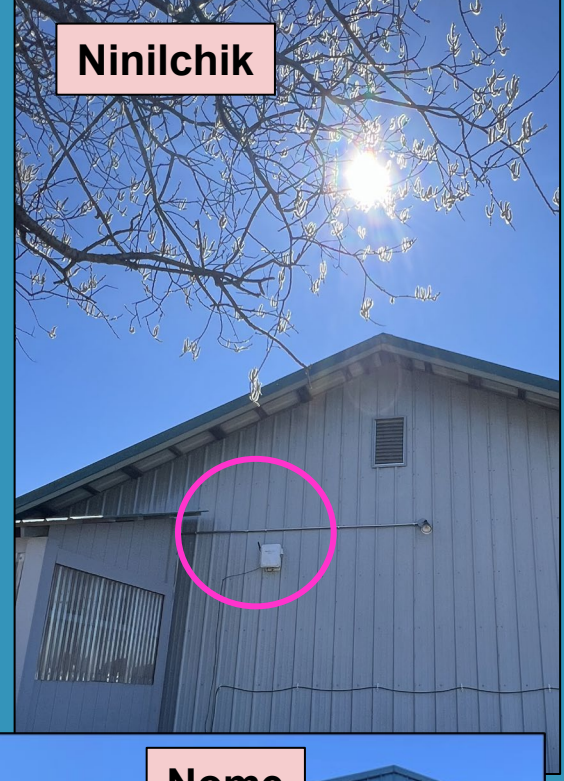

Sitka


TOBACCO
FREE ZONE
Hoonah

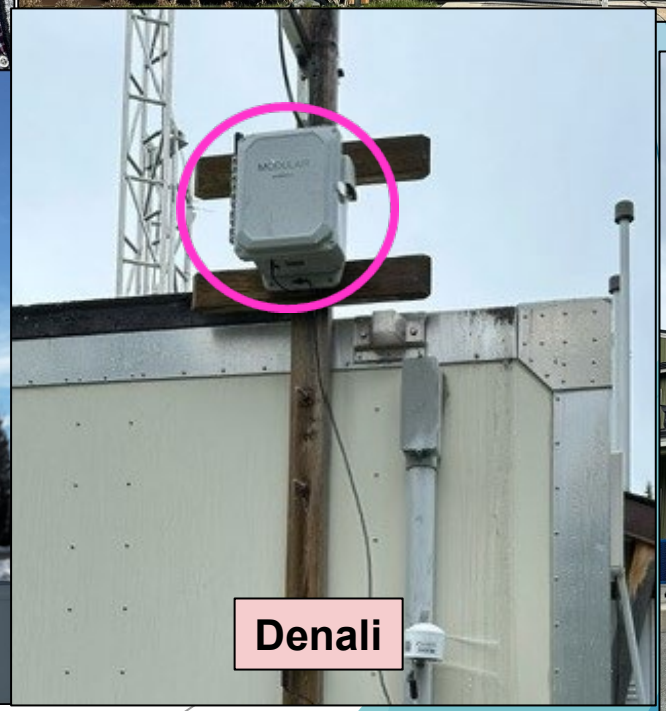

Soldotna


Homer Quant Upgrade

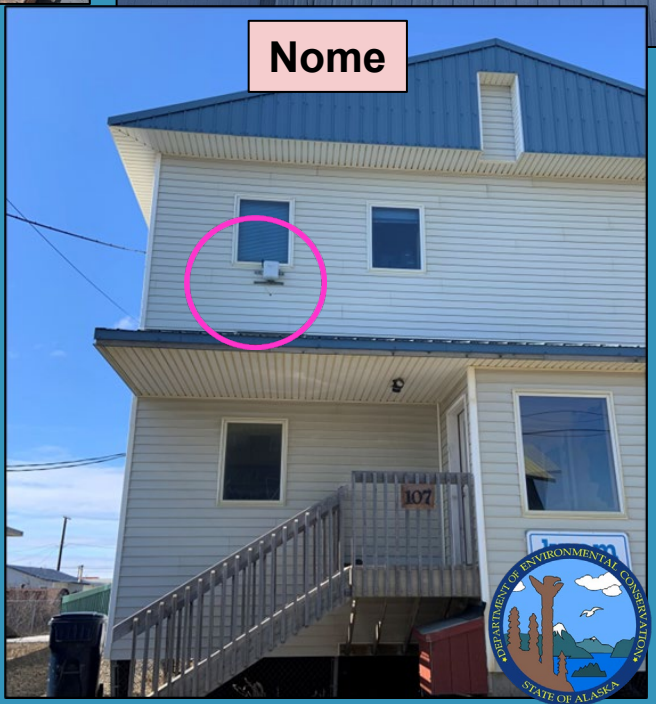

Seward Quant Upgrade


Ninilchik

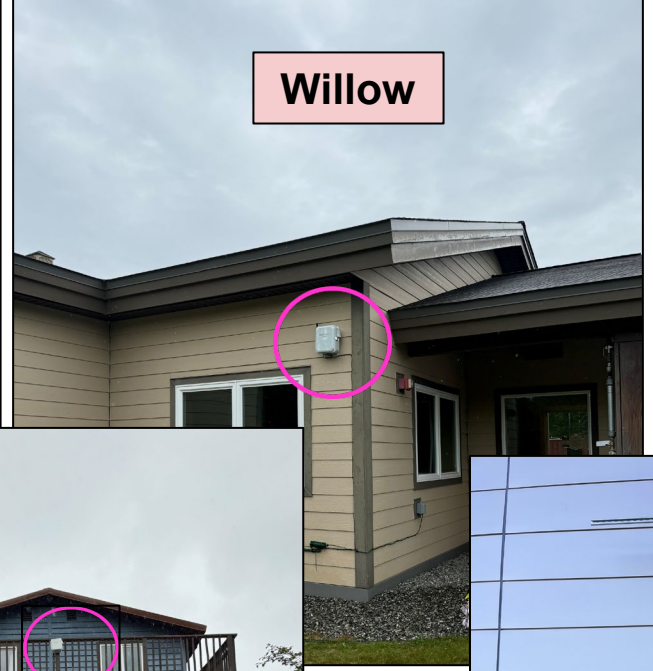

Badger

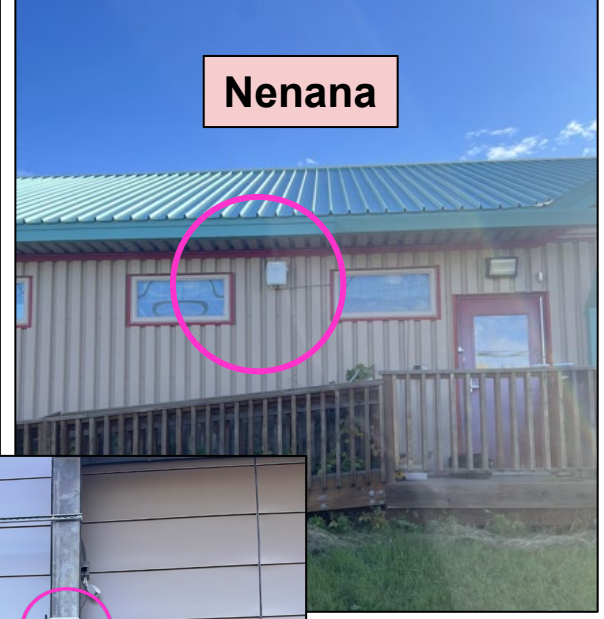

Denali


Palmer

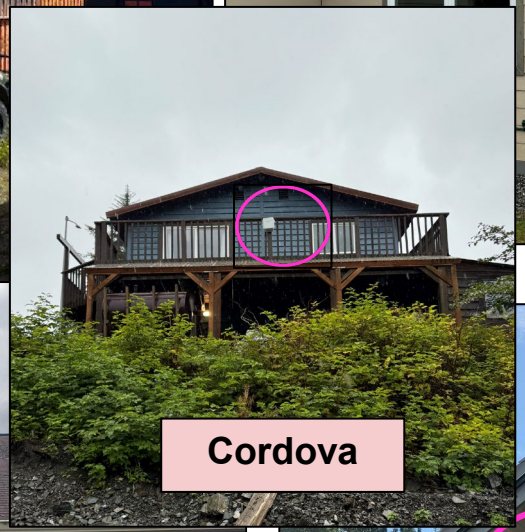

Nome


Kotzebue


Willow

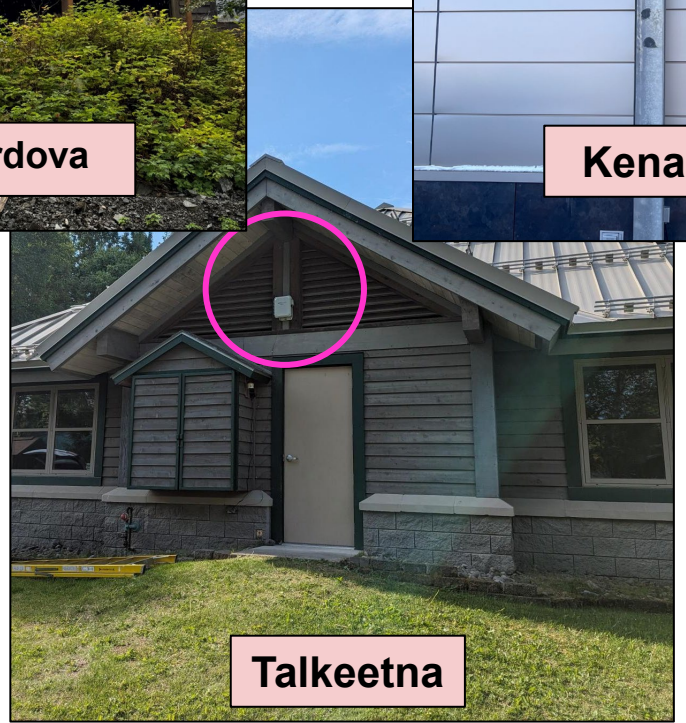

Nenana


Glennallen


Cordova


Kenai


Big Lake

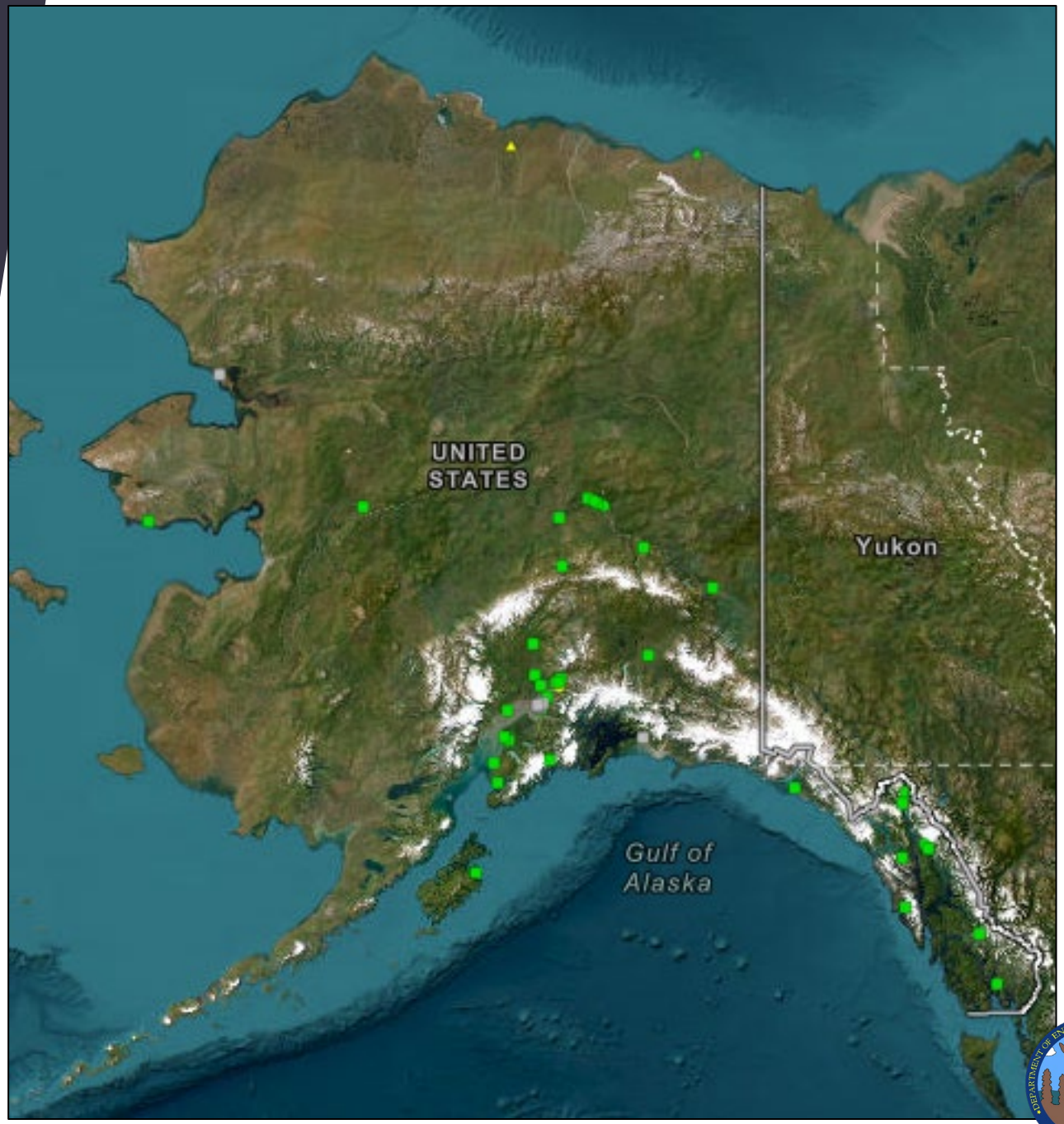

Talkeetna


JV02093
Yakutat


Kodiak

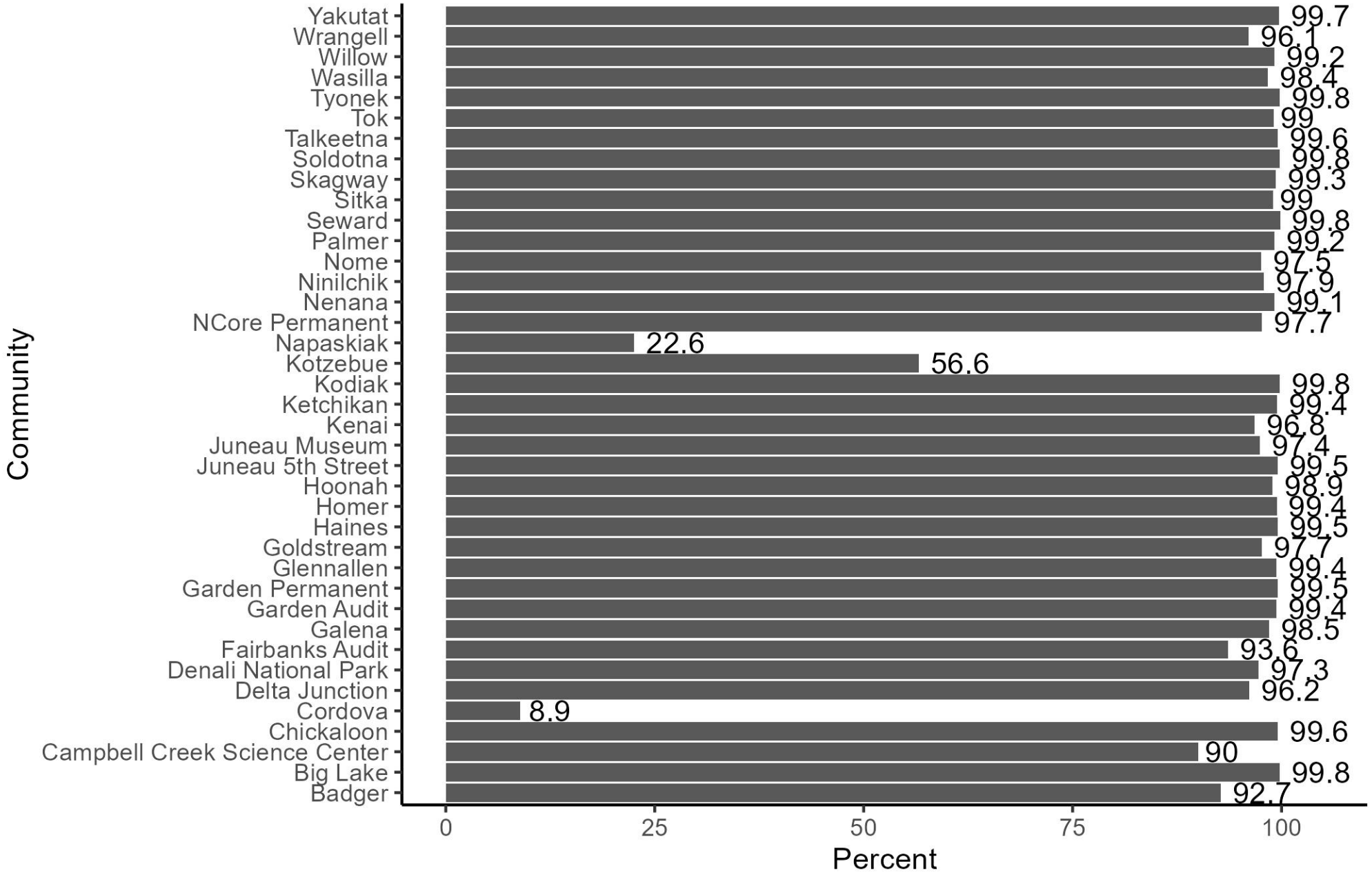
We are growing!

- Map as of March 2025
- Continued expansion as we…
  - Integrate new communities
  - Deploy sensors with wi-fi capabilities
  - Develop sub-networks
    - Interior wildfire monitoring network
    - Municipality of Anchorage network



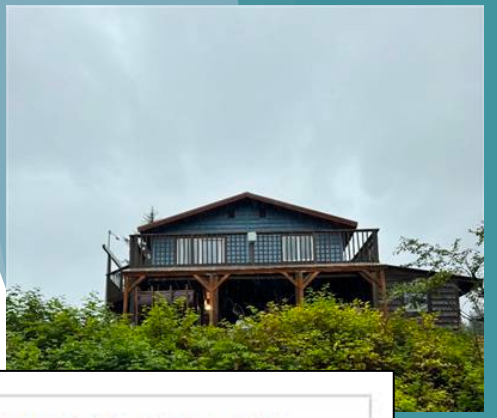
Data Capture Percentage

Percent of Hours with Data After Installation

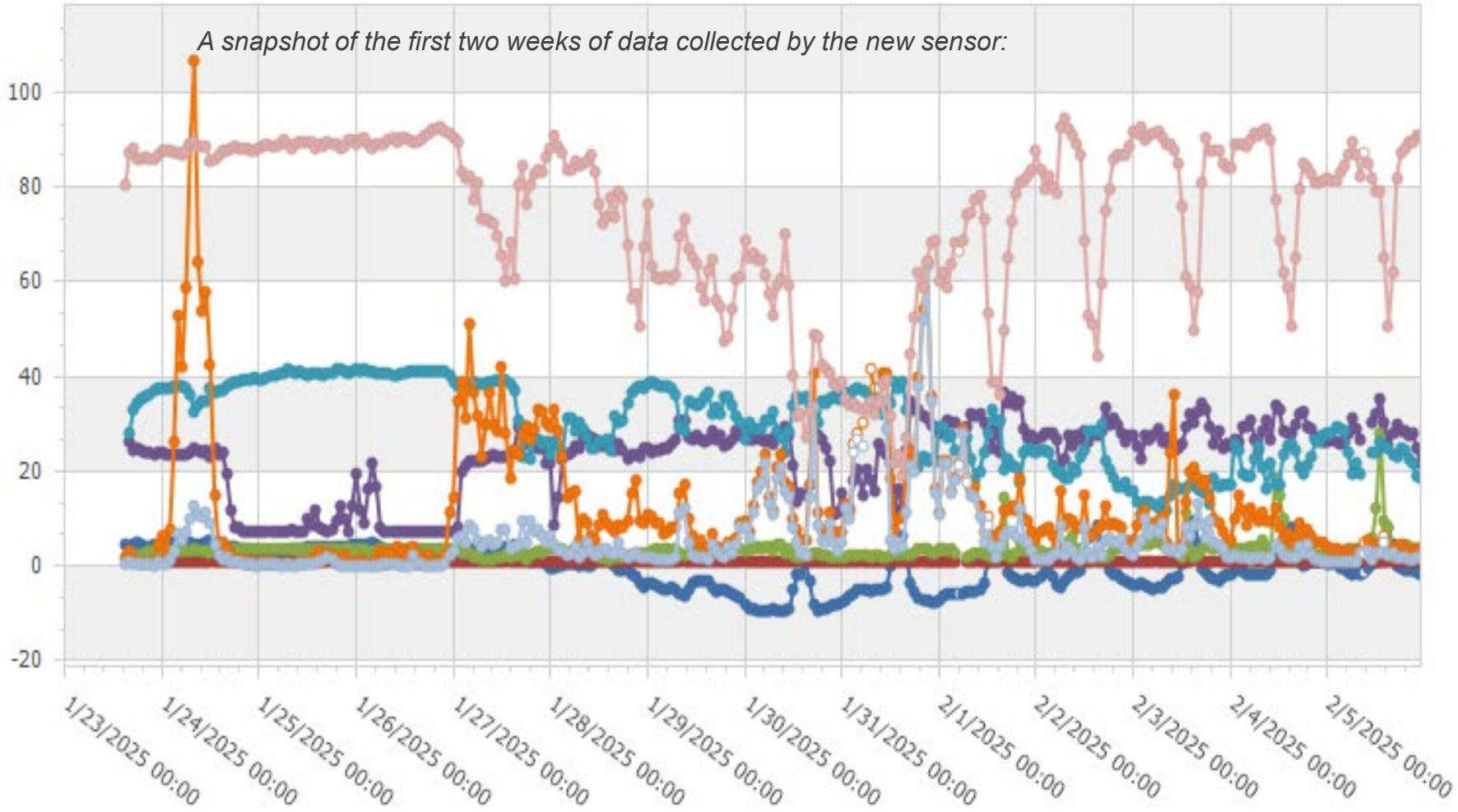


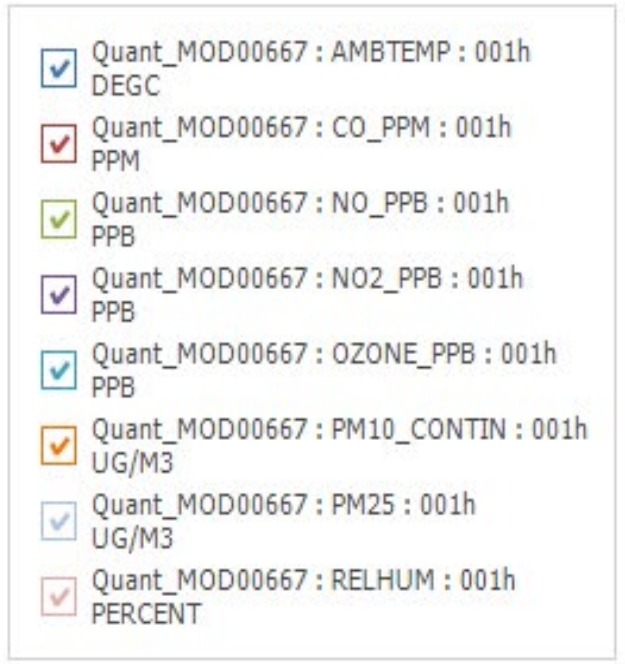
Cordova Sensor Swap

- HUGE shoutout to our community contacts in Cordova, Erik and Jimmy, for their impressive support and success in installing a replacement sensor- the new sensor has been running smoothly since its installation on January 23rd!



A snapshot of the first two weeks of data collected by the new sensor:

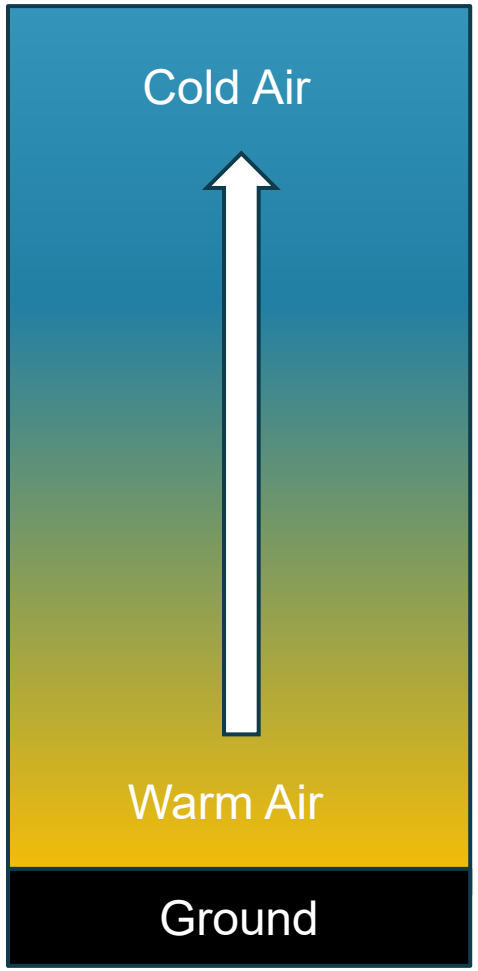


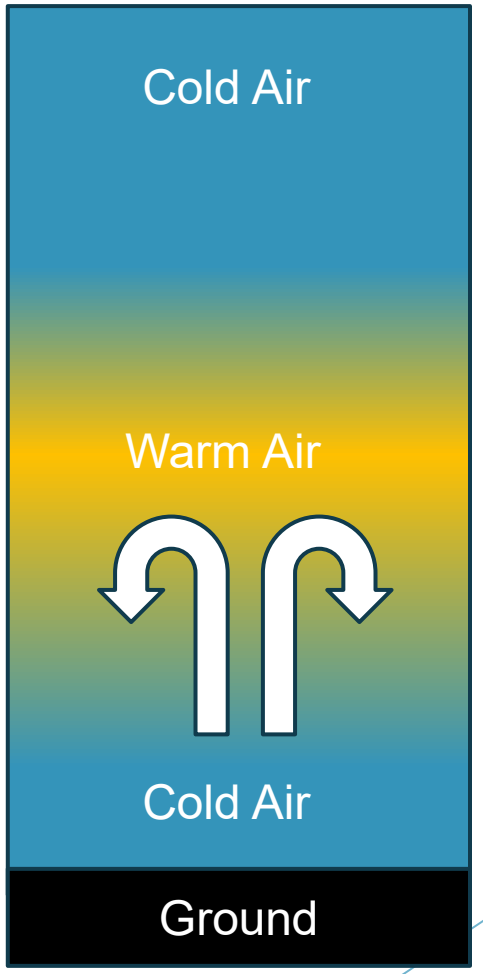


What is an Inversion?

Normal Temperature Gradient

- Surface level air is warm
- Air temperature cools at higher altitudes
- Direct, simple gradient
- Good mixing of air

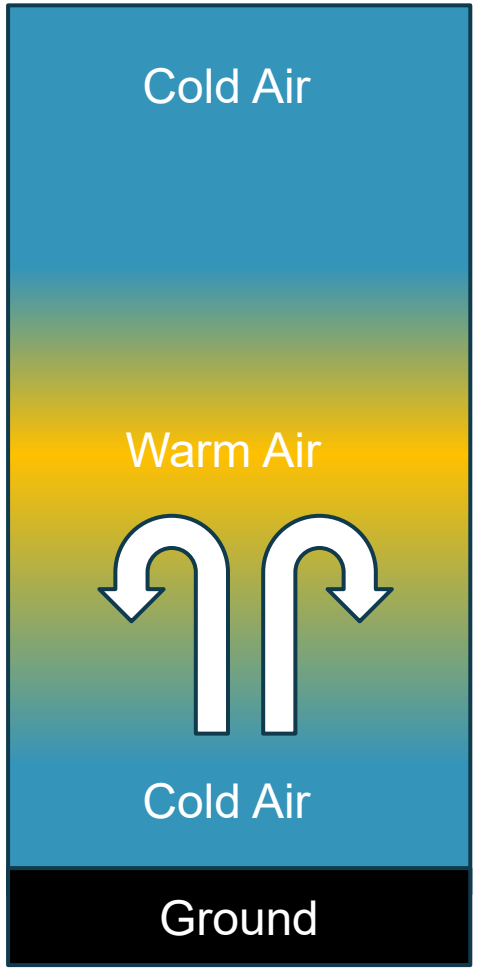




Inversion Temperature Gradient

- Surface level air is cold
- High altitude air is cold
- Separated by a layer of warm air
- Complex gradient
- Poor mixing of air

What creates an Inversion?



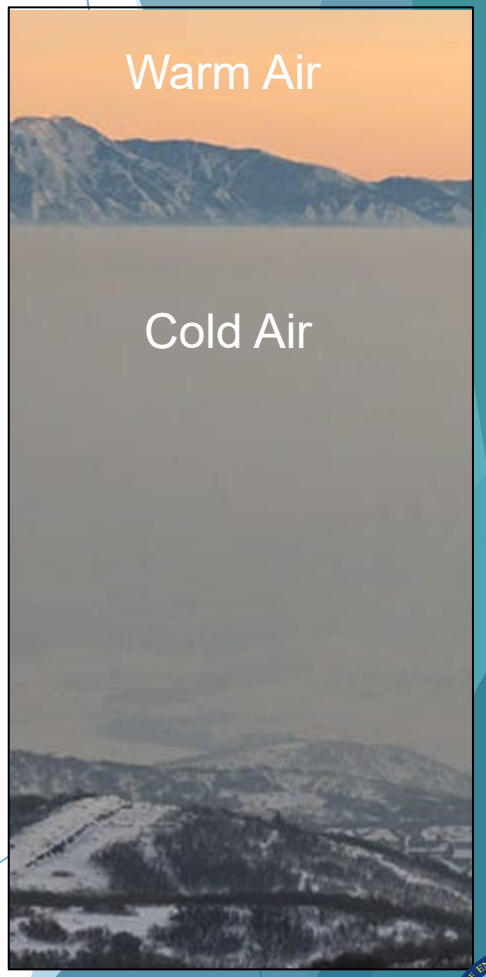
- The surface rapidly cools, releasing heat
- Warm air layer is trapped between cold surface air and colder high-altitude air

Contributing factors

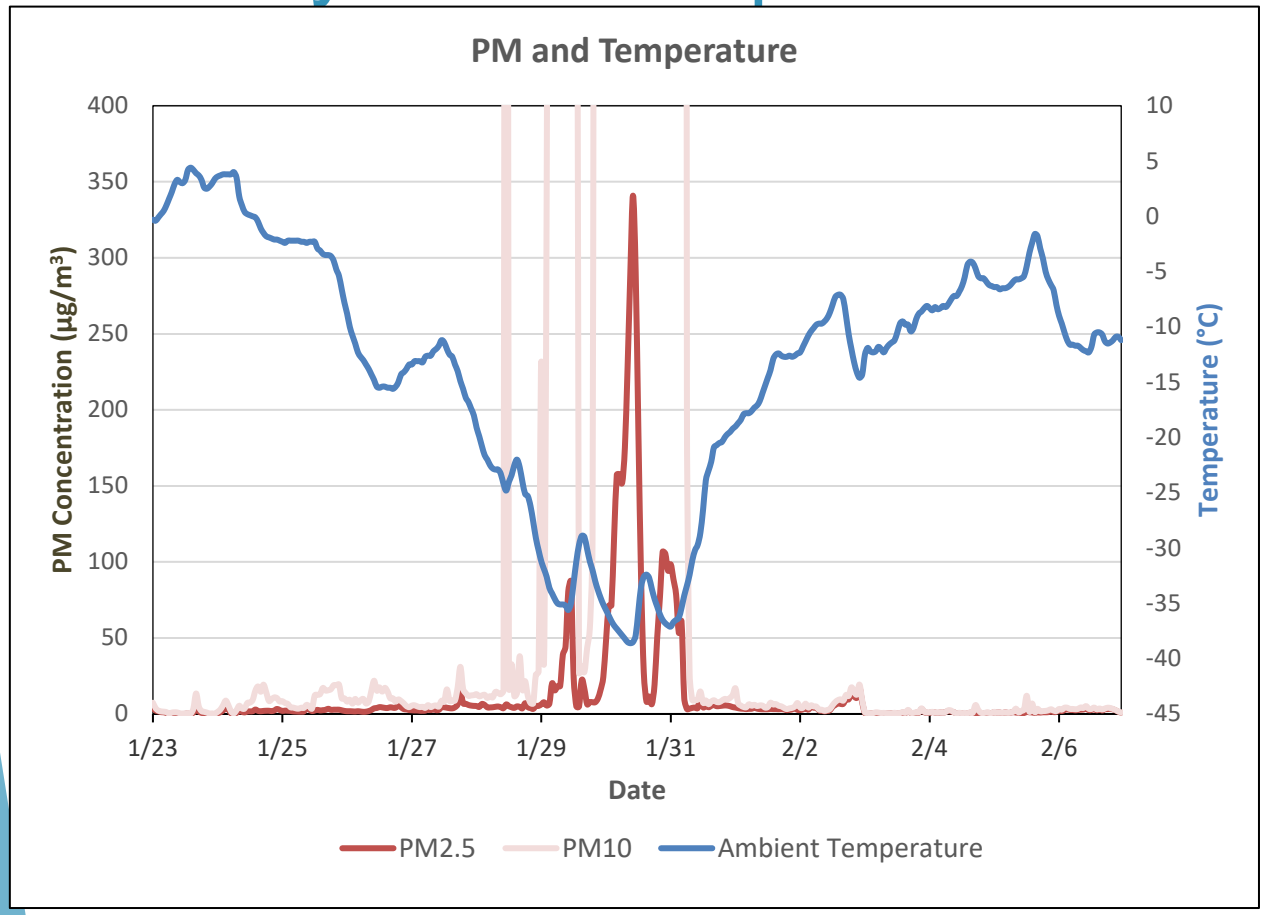
- Long winter nights
- No cloud cover
- Dry air near ground
- Low wind speed
- Snow cover

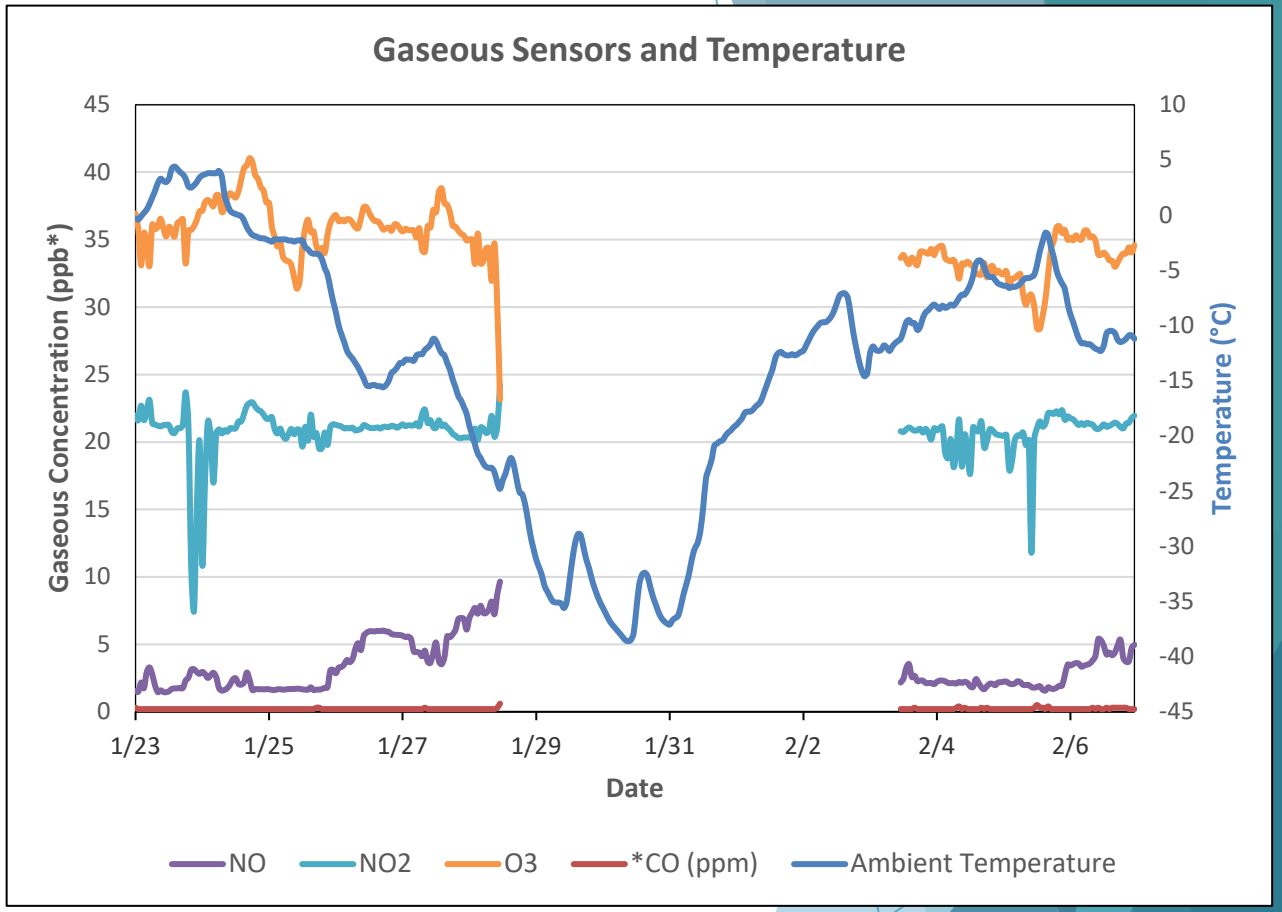
What's the problem with an Inversion?

- Warm air layer acts like a blanket
  - Pollutants are trapped, concentrated
  - Reduced visibility
- Reduced movement of air
  - Less mixing, less dispersal
- Alters weather conditions at the surface
  - Reduced likelihood of rain
  - Increased likelihood of storms and tornadoes



January 30th PM Spike in Galena





- Short-term, singular occurrence that does not repeat
- PM10 sensor is an evolving technology often hindered by environmental factors- moisture in air (ice fog, haze, etc.) can create false high readings.
- Important to assess local weather conditions for full story

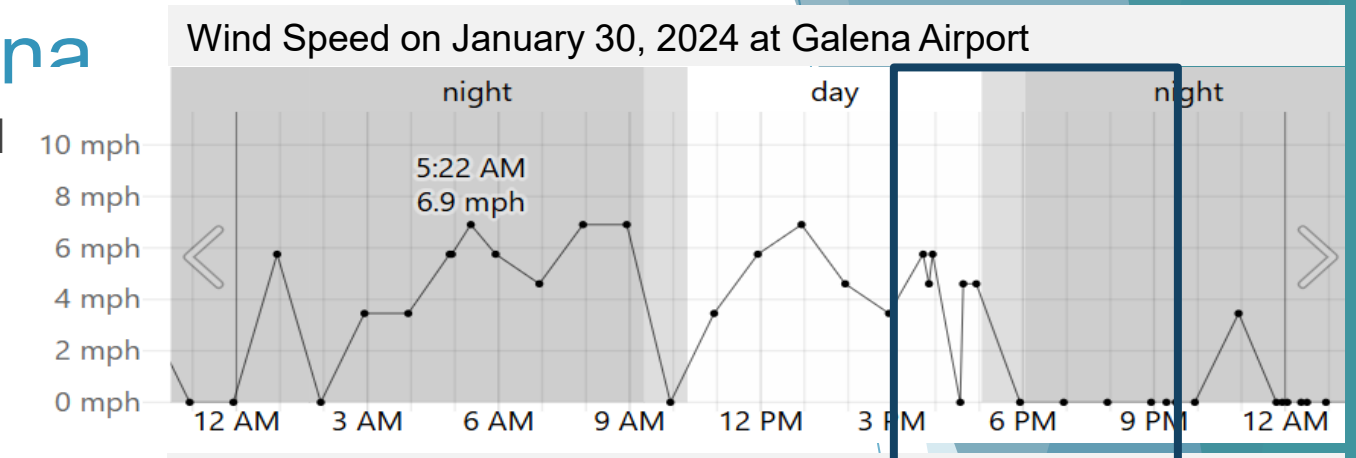
- Gaseous sensors briefly cut out at lowest part of the cold snap. Sensors resumed normal function as temperatures climbed back up

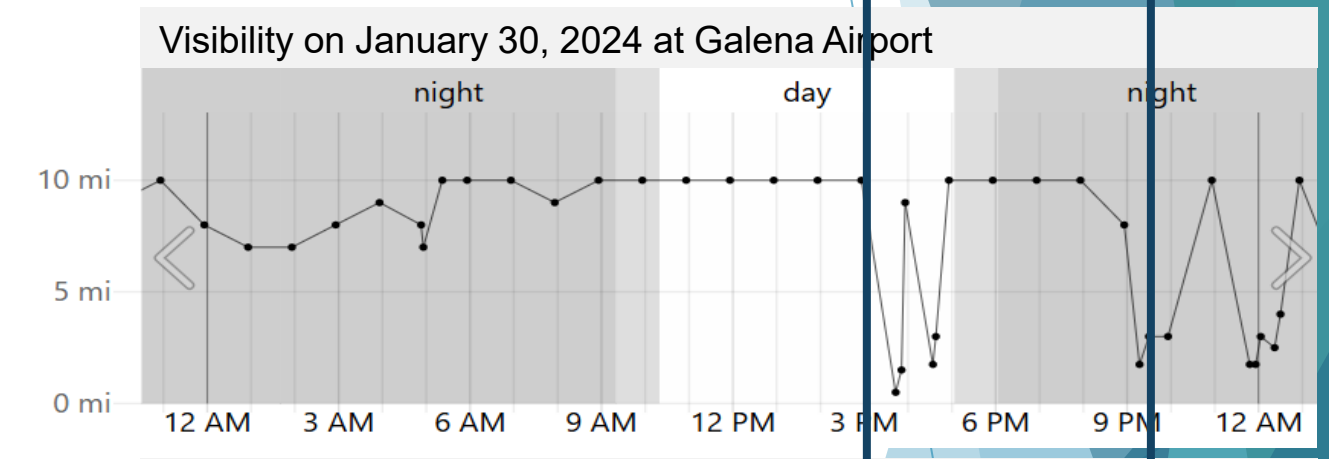
January 30th PM Spike in Galena

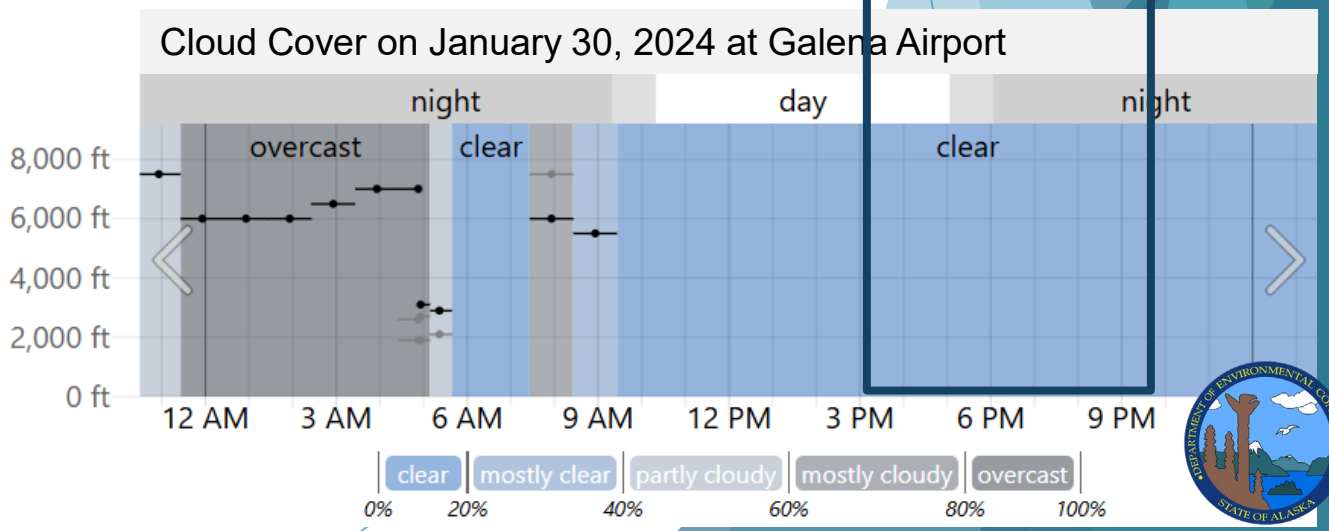
- Extreme, short-term cold temperatures combined with clear skis and calm winds created a significant temperature inversion that trapped pollutants at ground level
  - Ice fog interferes with PM10 sensor, creating very high values that do not pose health risks
  - Importance of contextualizing data with local weather trends

Time	Observations	Precipitation	Codes
12:56 AM	Light Snow	0.00 in	-SN
1:56 AM	Light Snow	0.00 in	-SN
2:56 AM	Light Snow	0.00 in	-SN
3:56 AM	Light Snow	0.00 in	-SN
4:56 AM	Light Snow	0.00 in	-SN
7:56 AM	Light Snow	0.00 in	-SN
3:43 PM	Haze		HZ
3:51 PM	Haze		HZ
4:34 PM	Haze		HZ
4:38 PM	Haze		HZ
9:17 PM	Mist		BR
9:30 PM	Mist		BR
9:56 PM	Mist		BR
11:48 PM	Mist		BR
11:56 PM	Mist		BR

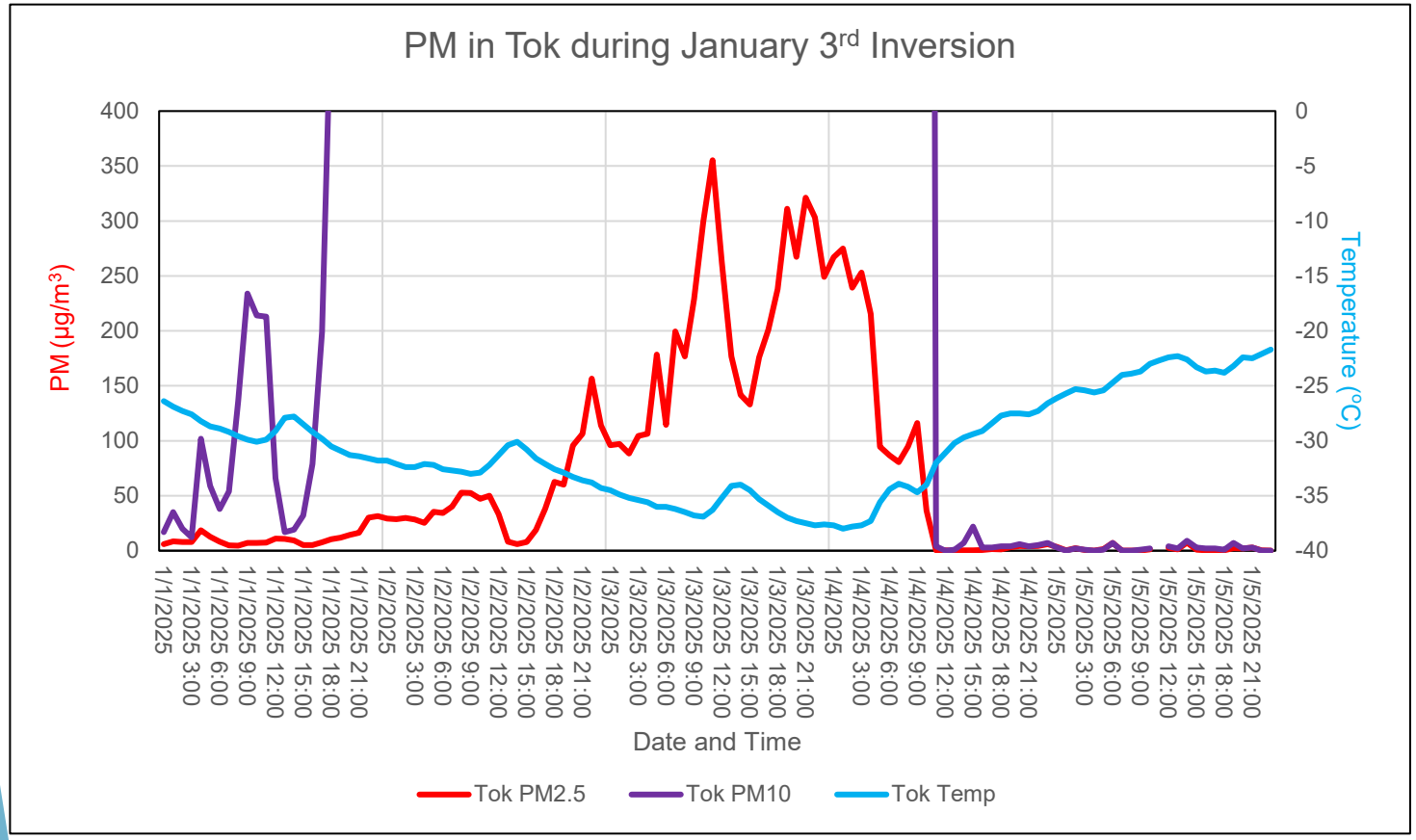
Historical data from [Weather Spark Weather History at Galena Airport]







January 3rd PM Spike in Tok

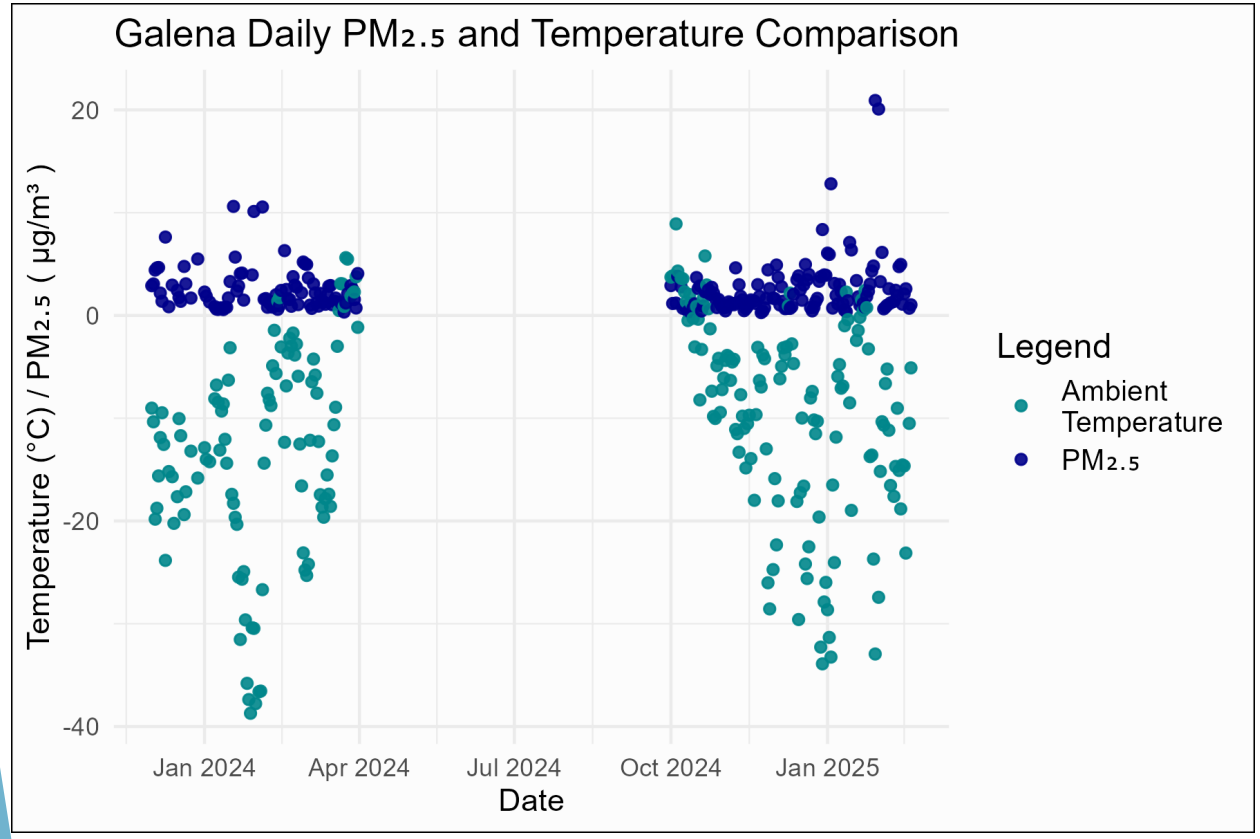


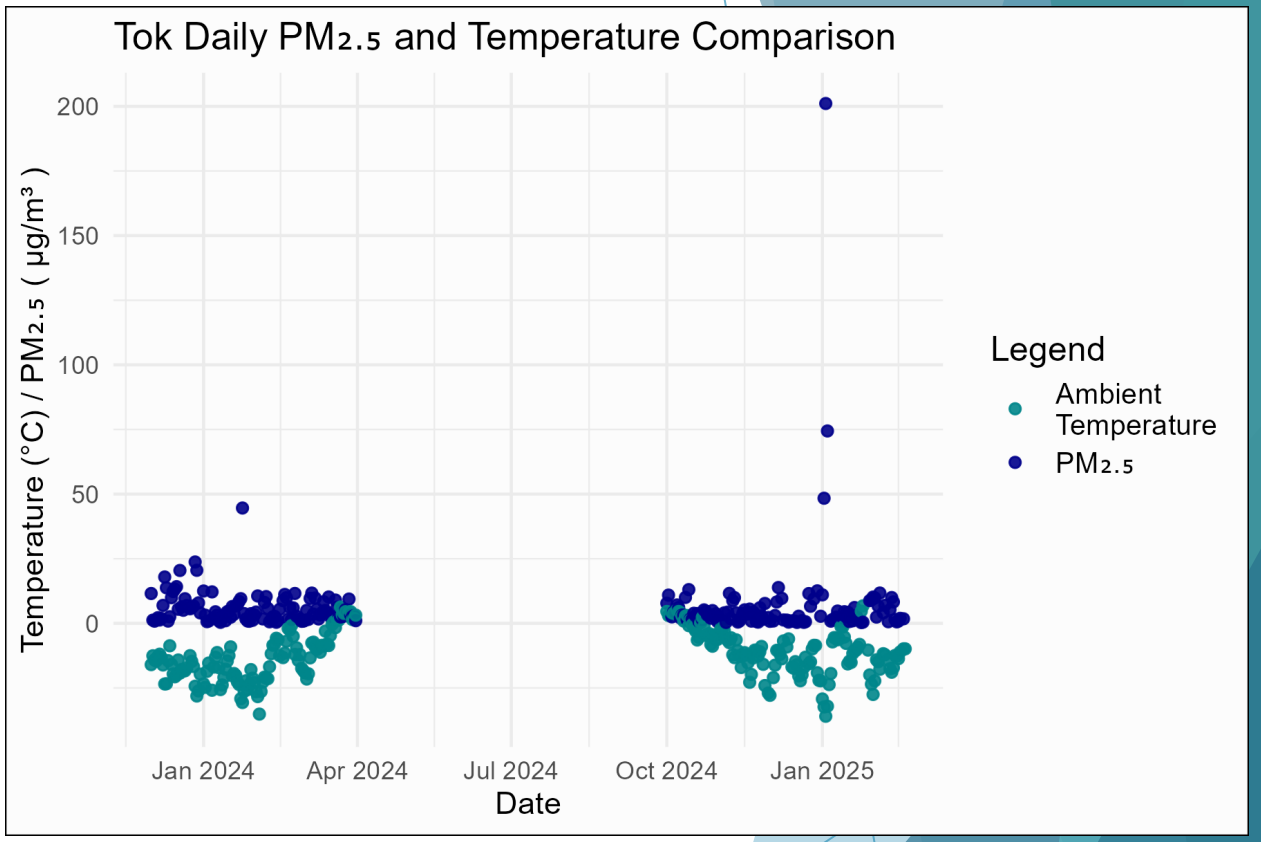
Thick ice fog, low visibility, and pollutants trapped by an inversion during an extreme cold spell in Tok, Alaska (1/3/2025).
Photo Credit: Dodi Wontorski, Tok resident

- Similar inversion pattern observed in Tok in early January
  - Temperatures around -30°C
  - Anomalously high PM_{10} readings

"The temperature ranged from -40F to -60F, with no trace of a breeze. There was a very thick smog with poor visibility due to heavy use of all kinds of heating appliances, wood, oil, and possibly one coal heater across the street from us, and from vehicle emissions. … Smoke from chimneys just fell down to the ground and hung about,"

Warmer Winters Impact on $PM_{2.5}$



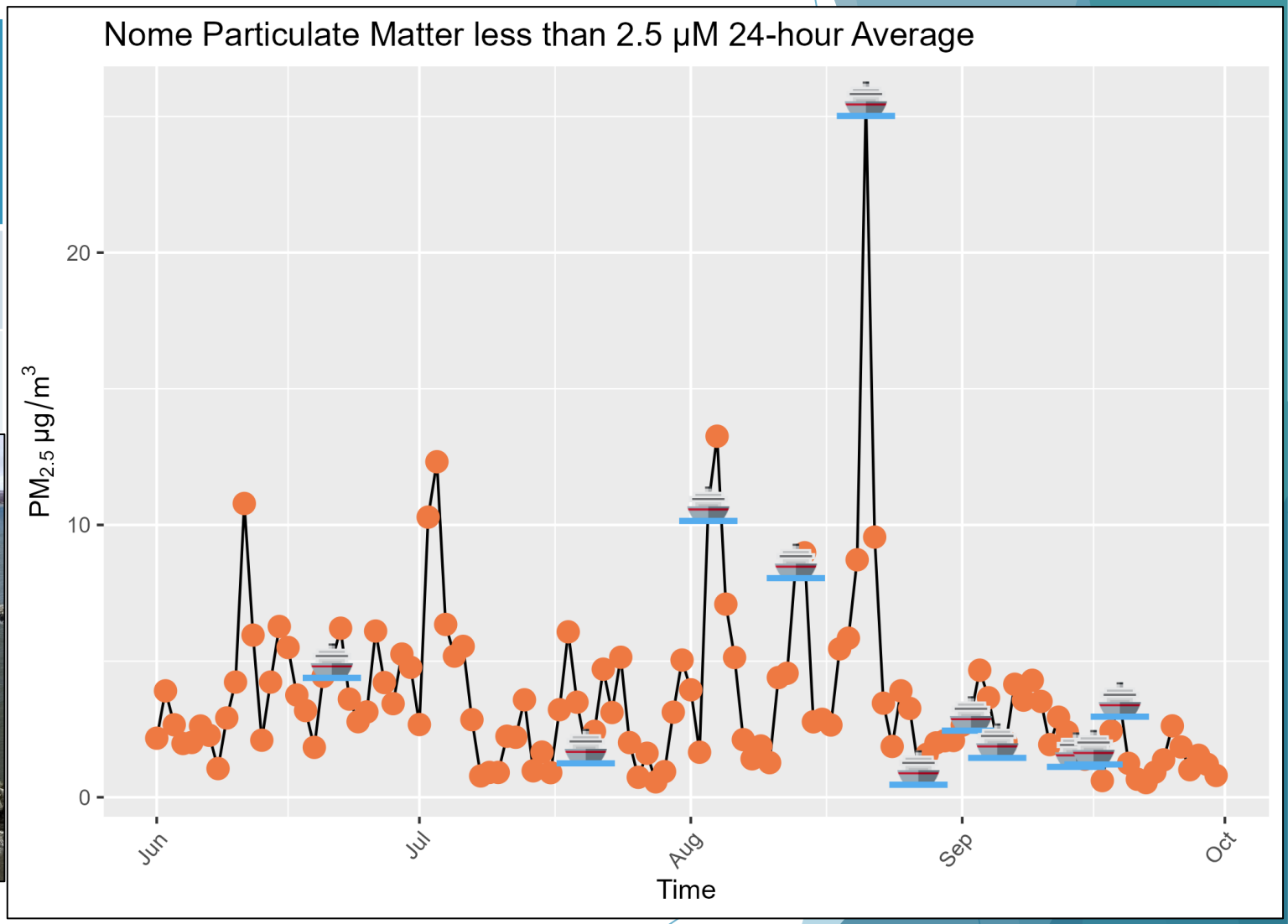


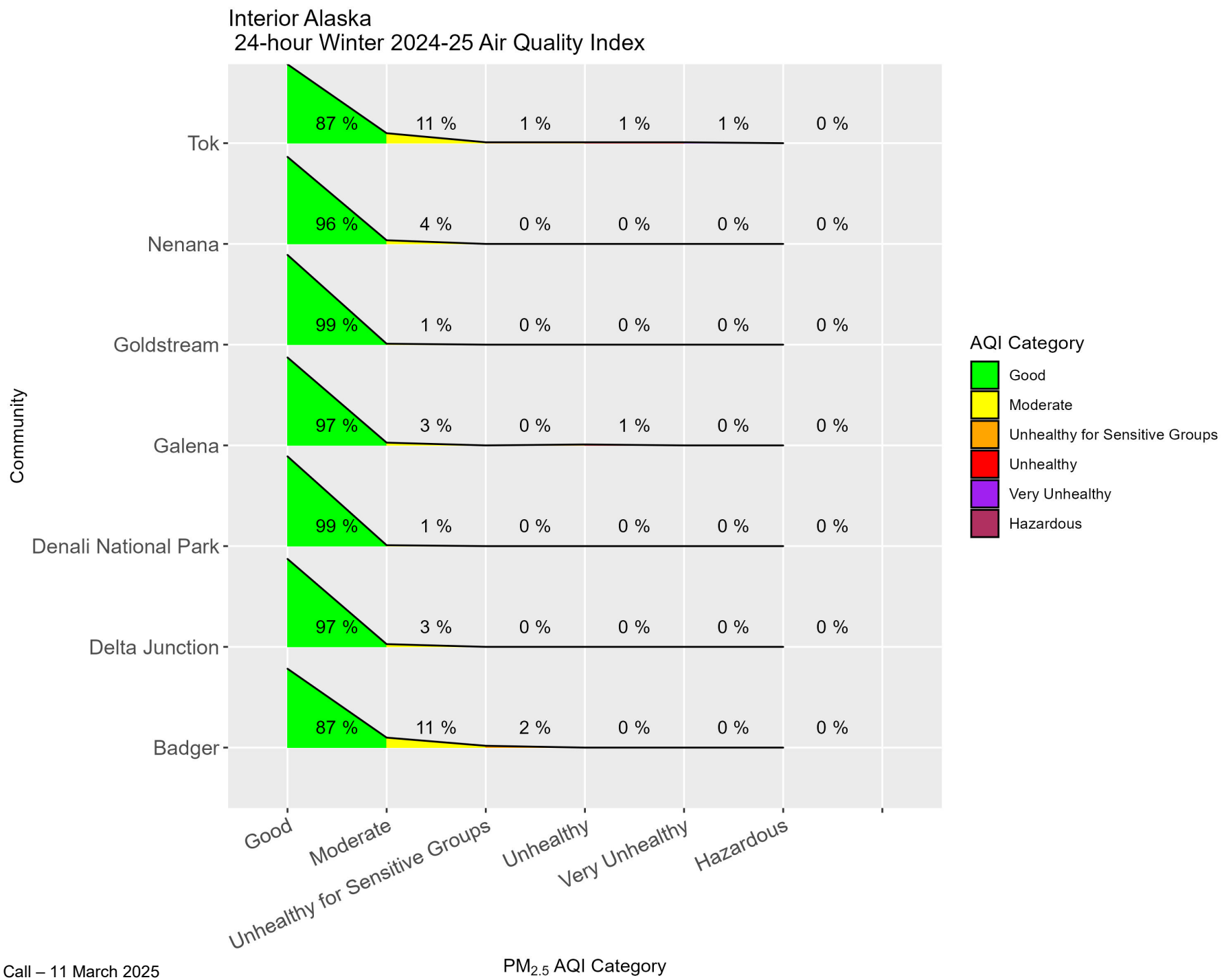
Seasonal Average	Ambient Temperature	$PM_{2.5}$
Winter 23-24’	-13°C	2.5(µg/m^3)
Winter 24-25’	-9.5°C	2.4 (µg/m^3)

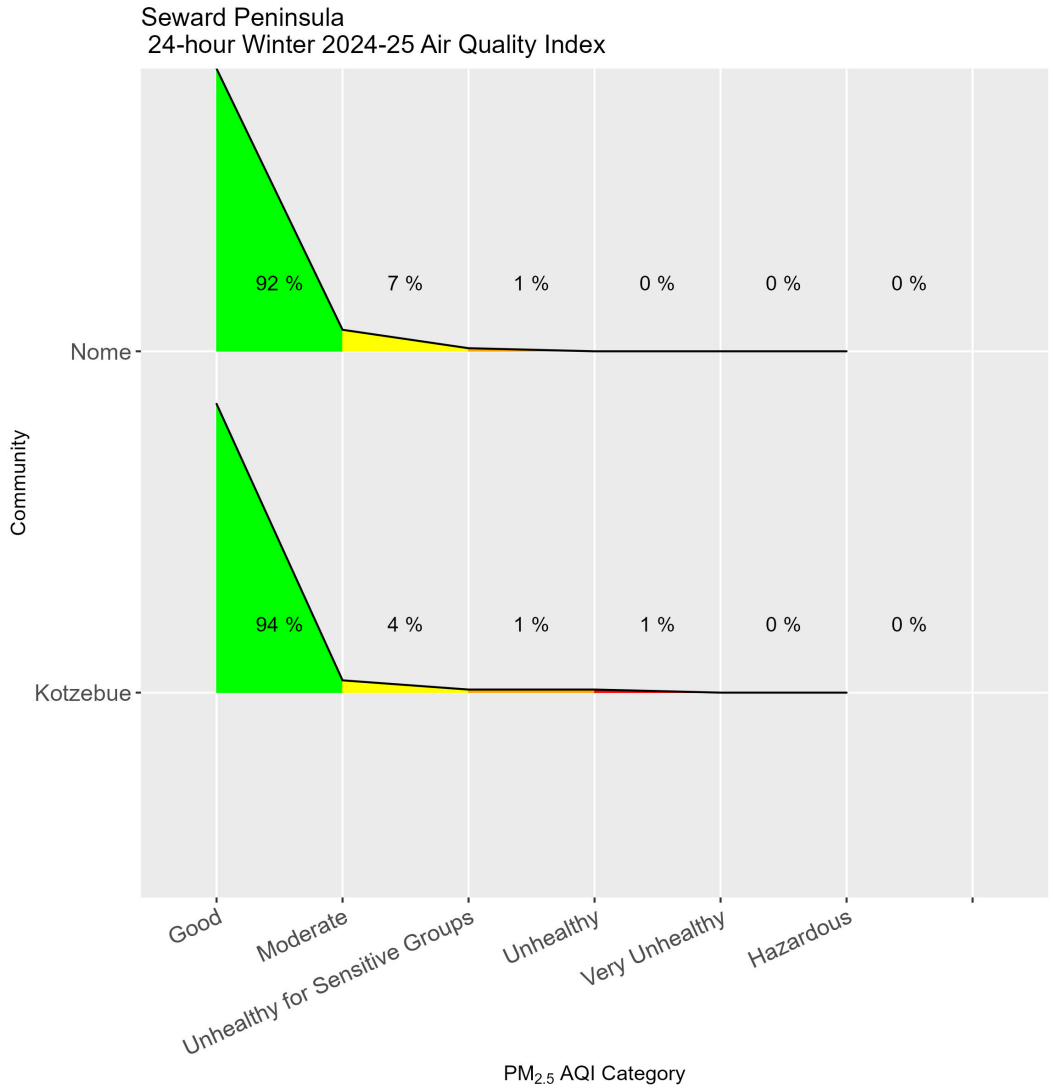
Seasonal Average	Ambient Temperature	$PM_{2.5}$
Winter 23-24’	-14°C	5.8(µg/m^3)
Winter 24-25’	-10°C	6.6(µg/m^3)

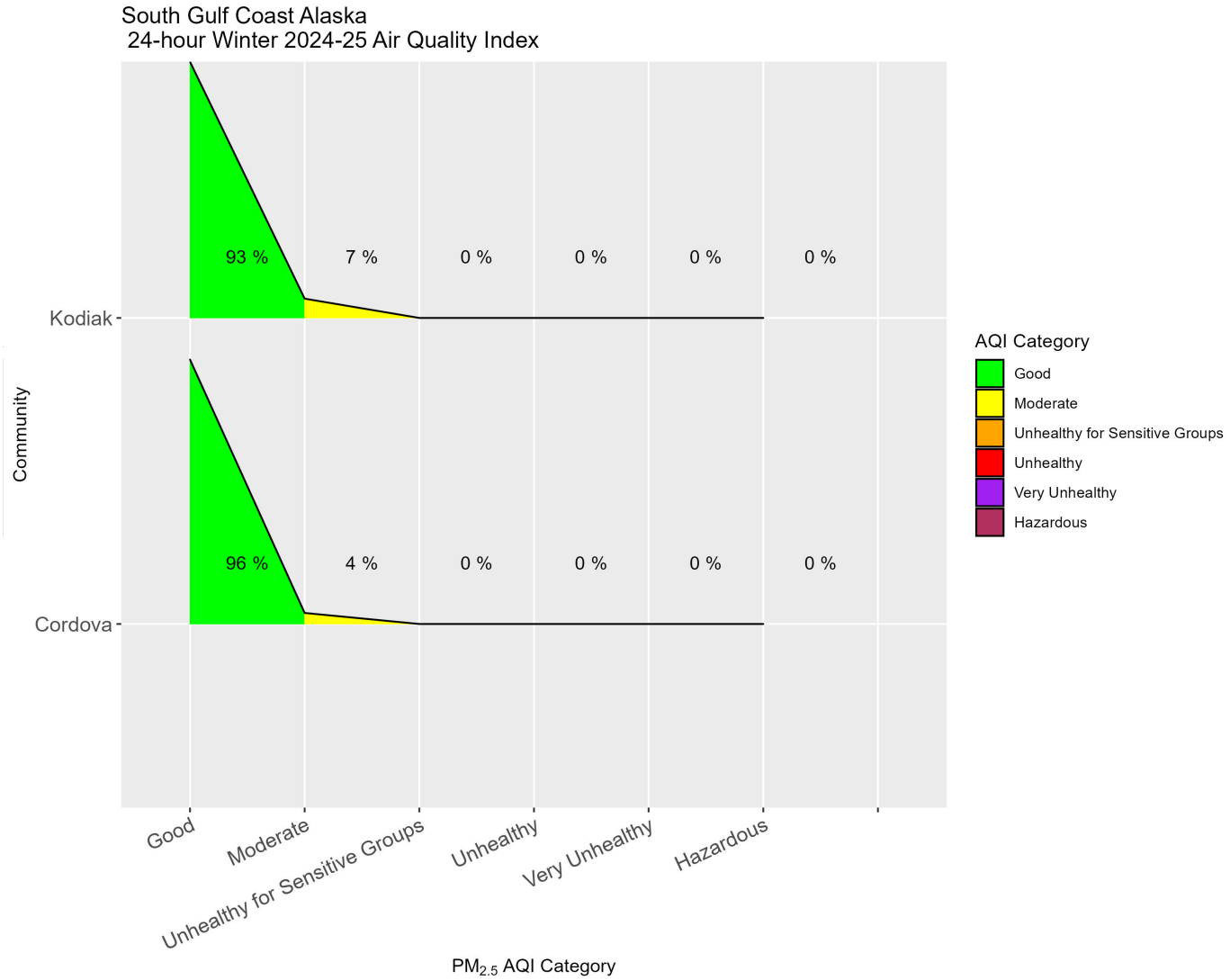
Cruise Ship Effects in Nome

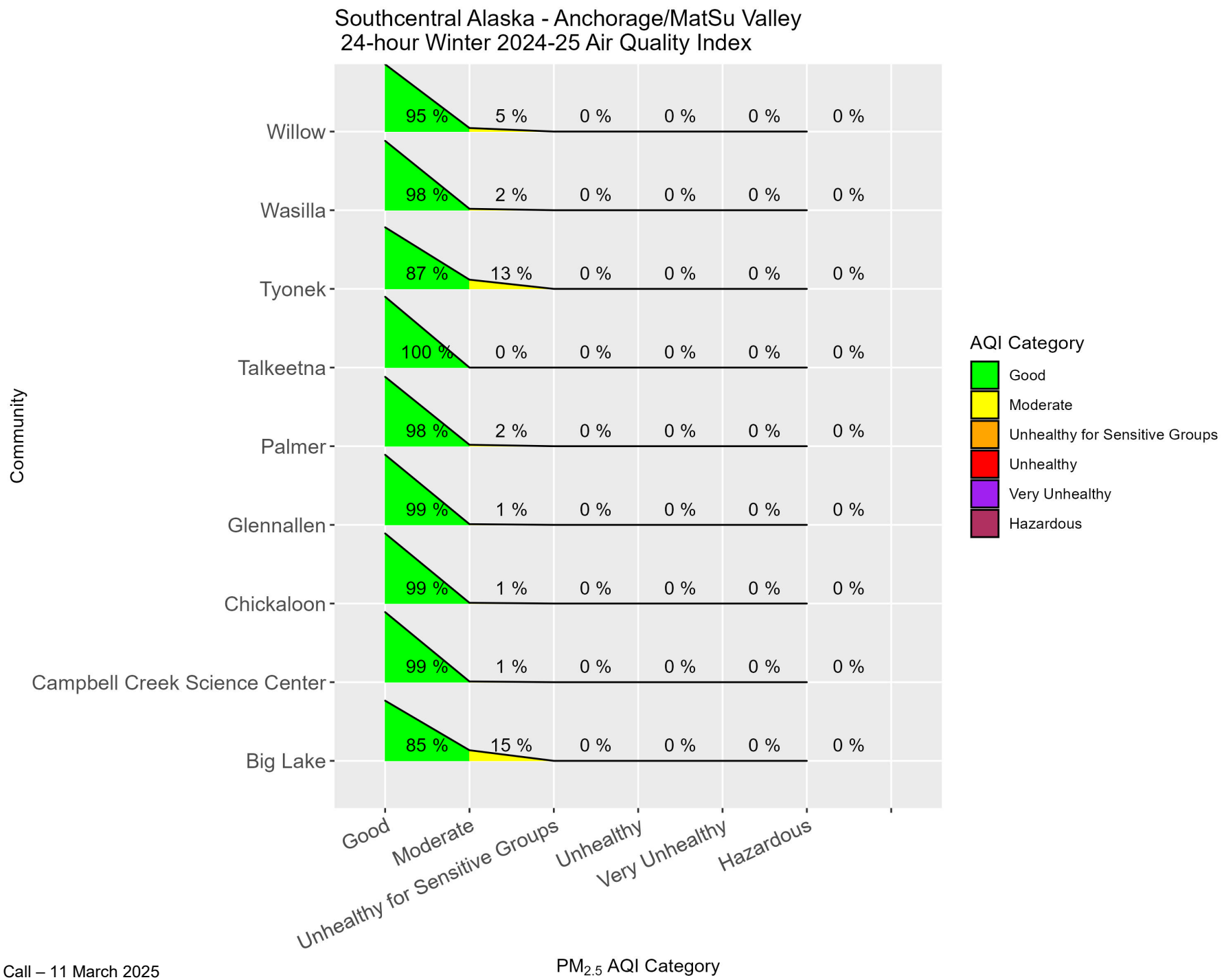
Cruise in port or at anchor?	Average hourly $PM_{2.5}$ ($\mu g/m^3$)	AQI category for average hourly $PM_{2.5}$
No cruise	3.45	Good
Cruise	5.62	Good

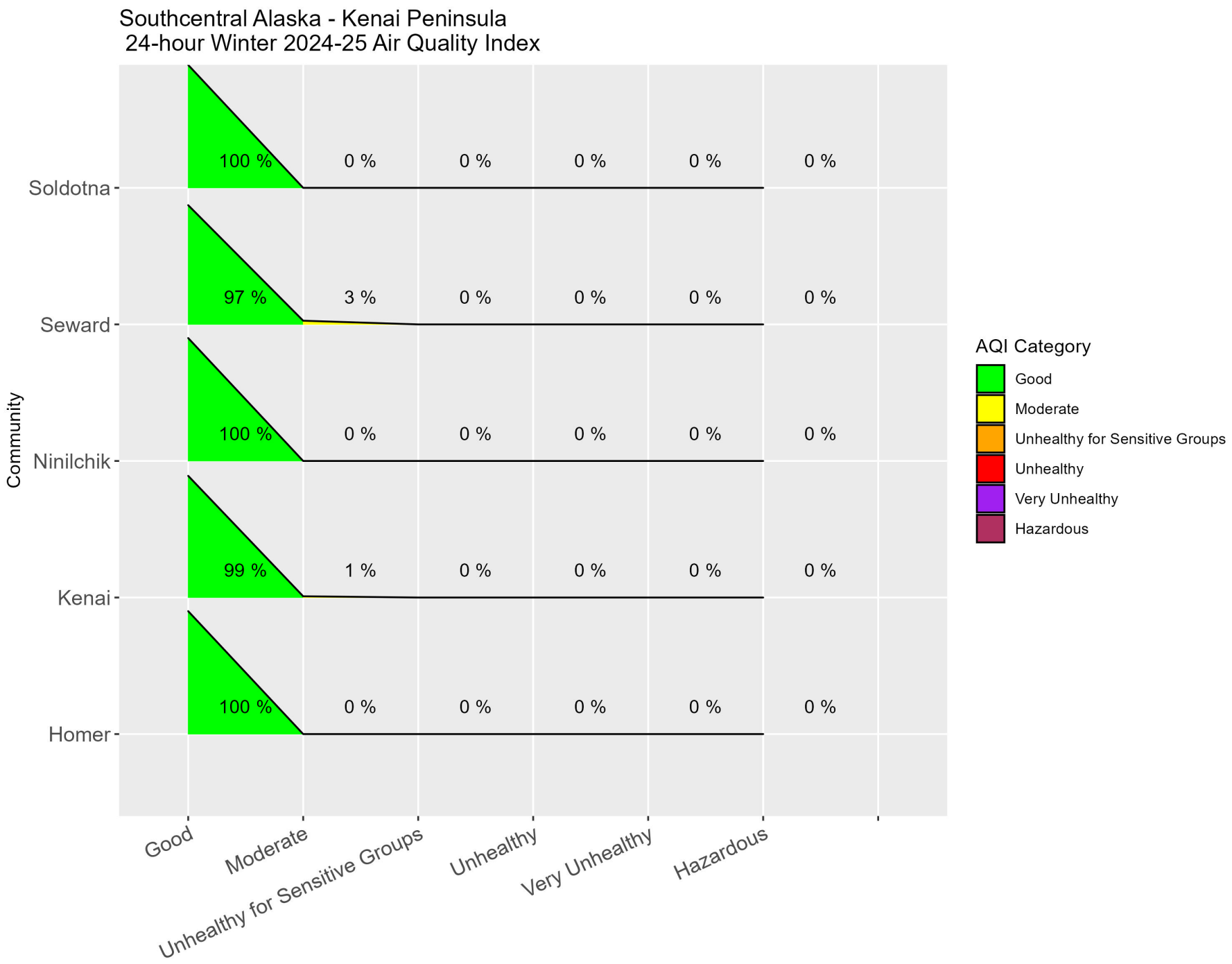



Interior Alaska
24-hour Winter 2024-25 Air Quality Index
Community
Tok
Nenana
Goldstream
Galena
Denali National Park
Delta Junction
Badger
87 %
11 %
1 %
1 %
1 %
0 %
96 %
4 %
0 %
0 %
0 %
0 %
99 %
1 %
0 %
0 %
0 %
0 %
97 %
3 %
0 %
1 %
0 %
0 %
99 %
1 %
0 %
0 %
0 %
0 %
97 %
3 %
0 %
0 %
0 %
0 %
87 %
11 %
2 %
0 %
0 %
0 %
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
PM2.5 AQI Category
AQI Category
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous


Seward Peninsula
24-hour Winter 2024-25 Air Quality Index
92 %
7 %
1 %
0 %
0 %
0 %
Nome
94 %
4 %
1 %
1 %
0 %
0 %
Kotzebue
Community
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
PM2.5 AQI Category


South Gulf Coast Alaska
24-hour Winter 2024-25 Air Quality Index
93 %
7 %
0 %
0 %
0 %
0 %
Kodiak
96 %
4 %
0 %
0 %
0 %
0 %
Cordova
Community
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
PM2.5 AQI Category
AQI Category
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous


Southcentral Alaska - Anchorage/MatSu Valley
24-hour Winter 2024-25 Air Quality Index
Community
Willow
Wasilla
Tyonek
Talkeetna
Palmer
Glennallen
Chickaloon
Campbell Creek Science Center
Big Lake
95 %
5 %
98 %
2 %
87 %
13 %
100 %
0 %
98 %
2 %
99 %
1 %
99 %
1 %
99 %
1 %
85 %
15 %
0 %
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
PM2.5 AQI Category
AQI Category
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous


Southcentral Alaska - Kenai Peninsula
24-hour Winter 2024-25 Air Quality Index
Community
Soldotna
Seward
Ninilchik
Kenai
Homer
100 %
0 %
0 %
0 %
0 %
97 %
3 %
0 %
0 %
0 %
100 %
0 %
0 %
0 %
0 %
99 %
1 %
0 %
0 %
0 %
100 %
0 %
0 %
0 %
0 %
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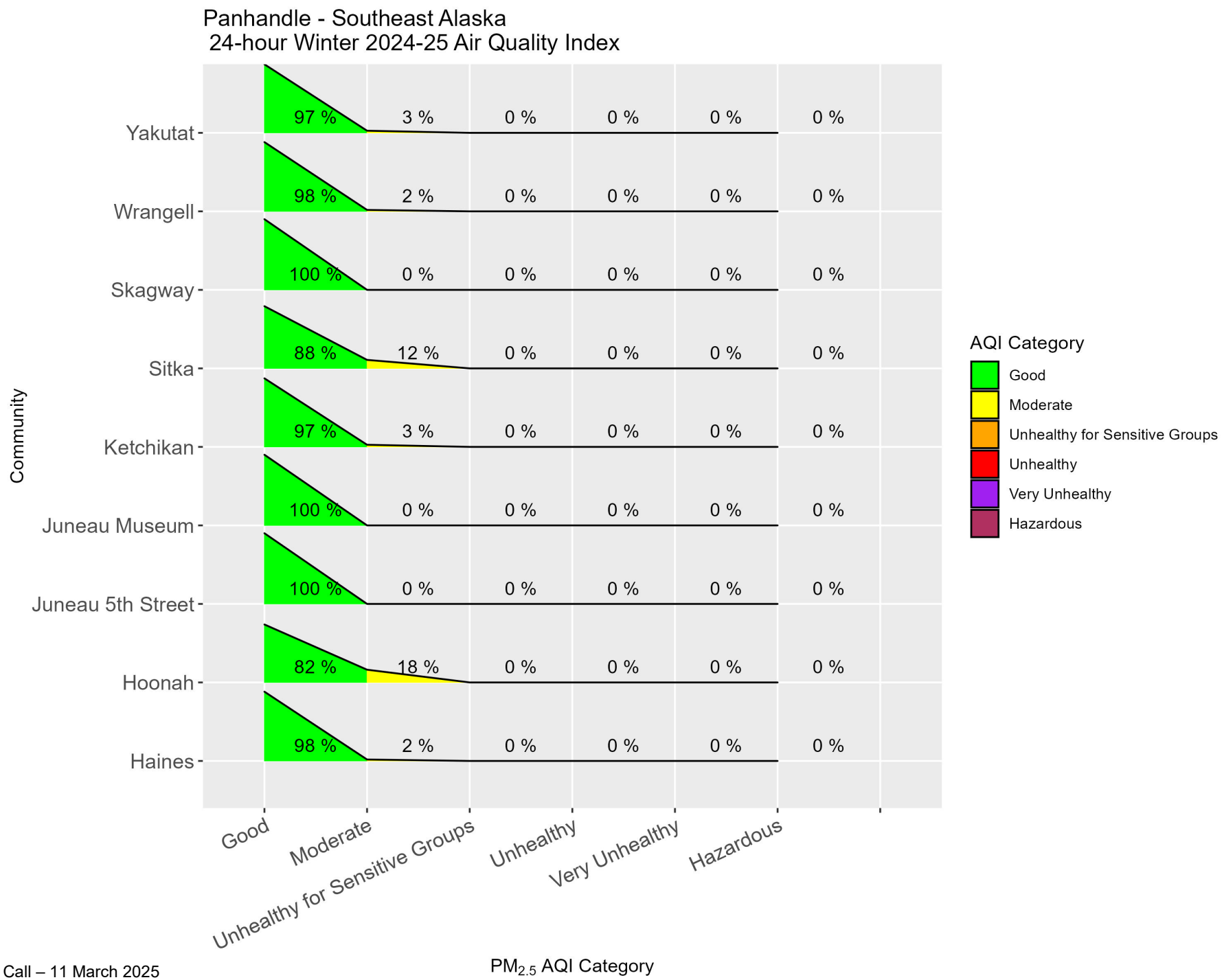
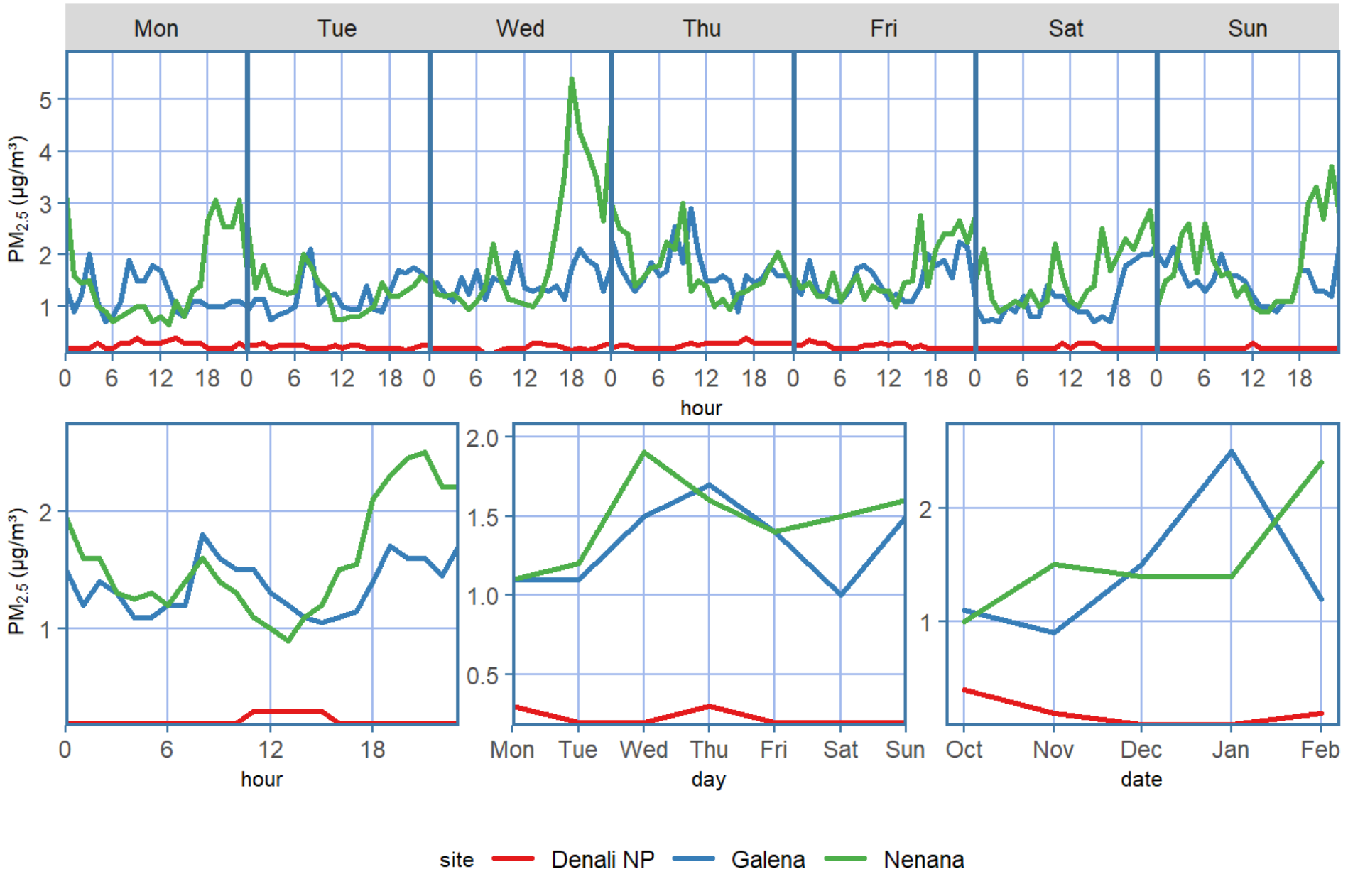
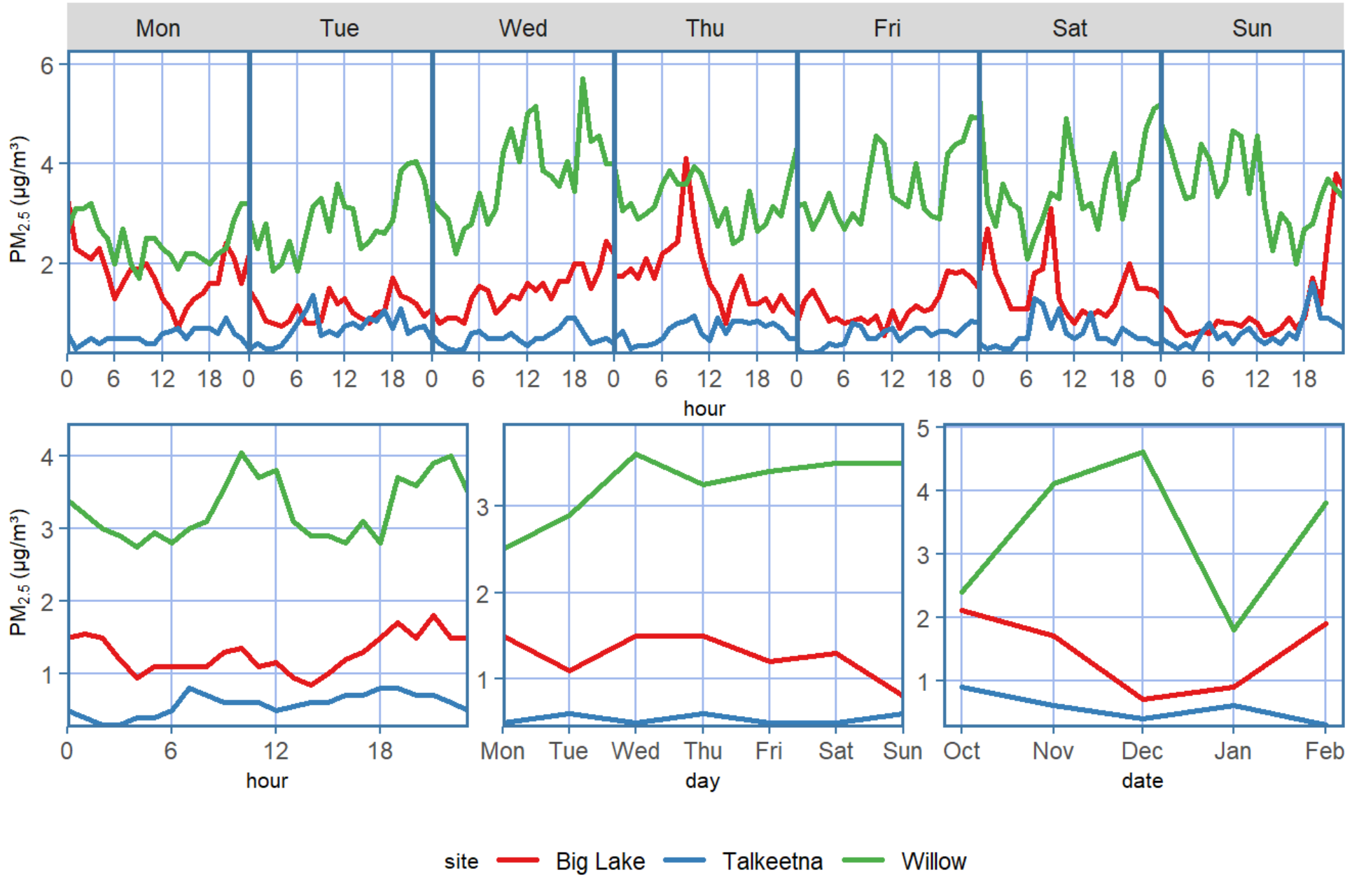

Panhandle - Southeast Alaska
24-hour Winter 2024-25 Air Quality Index
Community
Yakutat
Wrangell
Skagway
Sitka
Ketchikan
Juneau Museum
Juneau 5th Street
Hoonah
Haines
97 %
3 %
98 %
2 %
100 %
0 %
88 %
12 %
97 %
3 %
100 %
0 %
100 %
0 %
82 %
18 %
98 %
2 %
0 %
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
AQI Category
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous
PM2.5 AQI Category

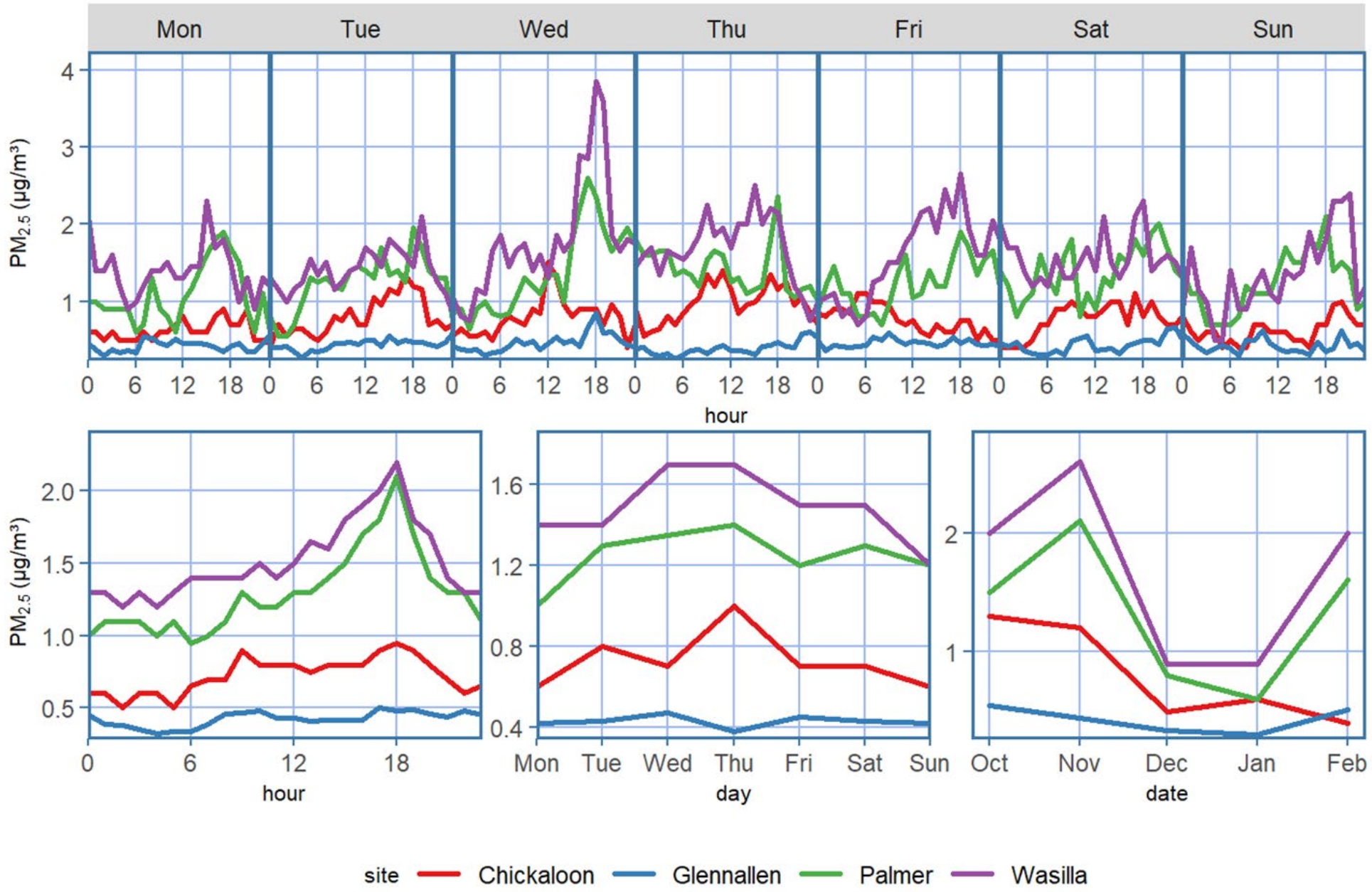
Western & Southern Interior Quants: Median $PM_{2.5}$ Concentrations Oct 2024 - Feb 2025



West Mat-Su Valley Quants: Median $PM_{2.5}$ Concentrations Oct 2024 - Feb 2024



East Mat-Su Valley Quants: Median $PM_{2.5}$ Concentrations Oct 2024 - Feb 2025

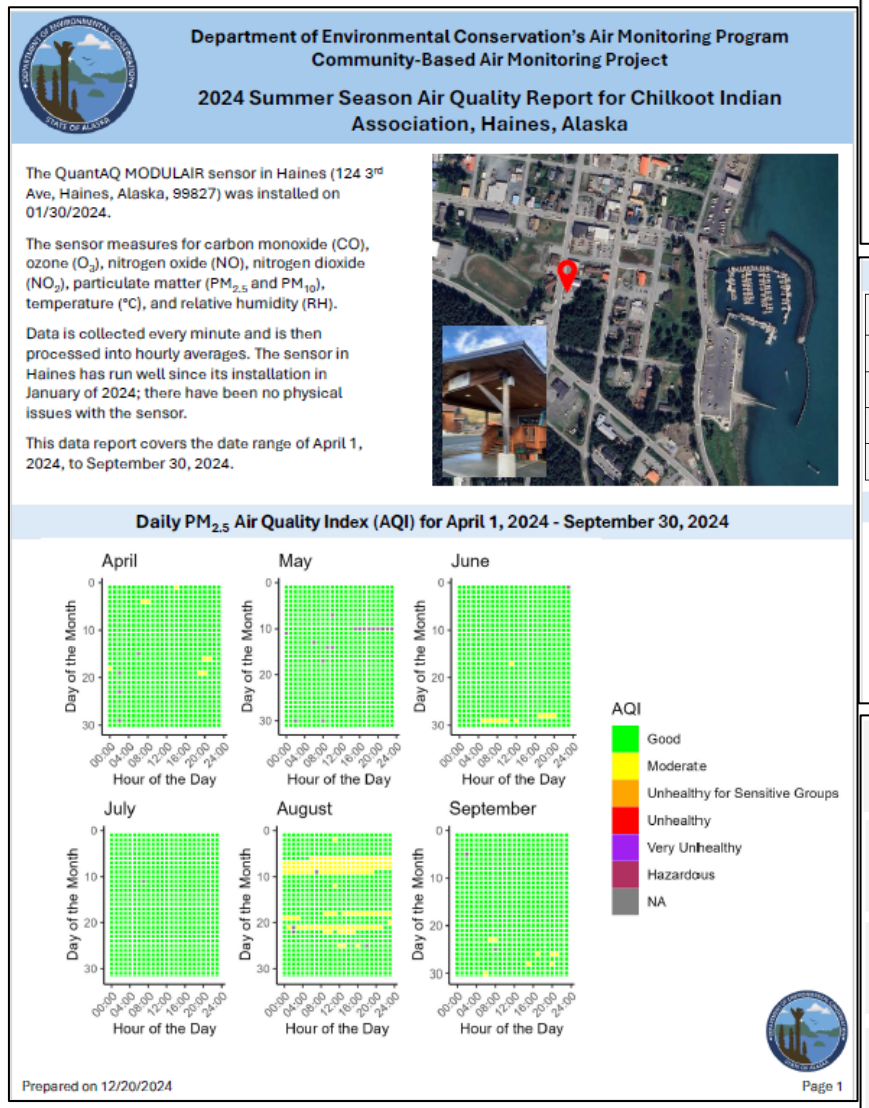


Interested about a specific sensor within a range of dates?

- Community Sensor Network Diurnal Comparisons

Community Data Reports

- Semi-annual reports giving overview of sensor performance, data preview, and air quality education resources
- Summer Season covers April 1-September 30
- Winter Season covers October 1-March 31
  - Next reports available April 2025
  - View all reports here:



Department of Environmental Conservation's Air Monitoring Program
Community-Based Air Monitoring Project

2024 Summer Season Air Quality Report for Chilkoot Indian Association, Haines, Alaska

The QuantAQ MODULAIR sensor in Haines (124 3rd Ave, Haines, Alaska, 99827) was installed on 01/30/2024.

The sensor measures for carbon monoxide (CO), ozone (O_3), nitrogen oxide (NO), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), temperature (°C), and relative humidity (RH).

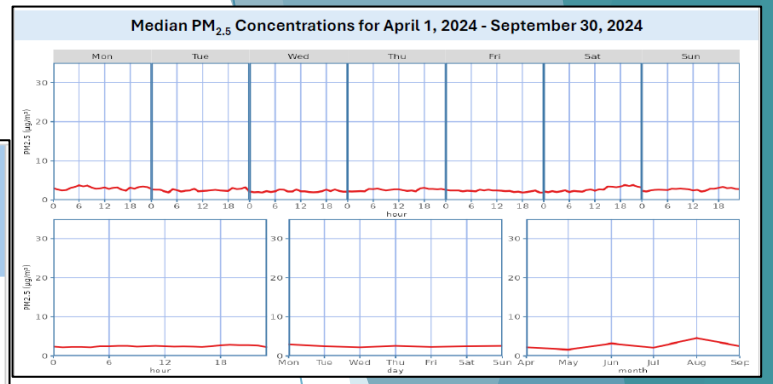
Data is collected every minute and is then processed into hourly averages. The sensor in Haines has run well since its installation in January of 2024; there have been no physical issues with the sensor.

This data report covers the date range of April 1, 2024, to September 30, 2024.

Daily $PM_{2.5}$ Air Quality Index (AQI) for April 1, 2024 - September 30, 2024

Prepared on 12/20/2024

Page 1



Median $PM_{2.5}$ Concentrations for April 1, 2024 - September 30, 2024

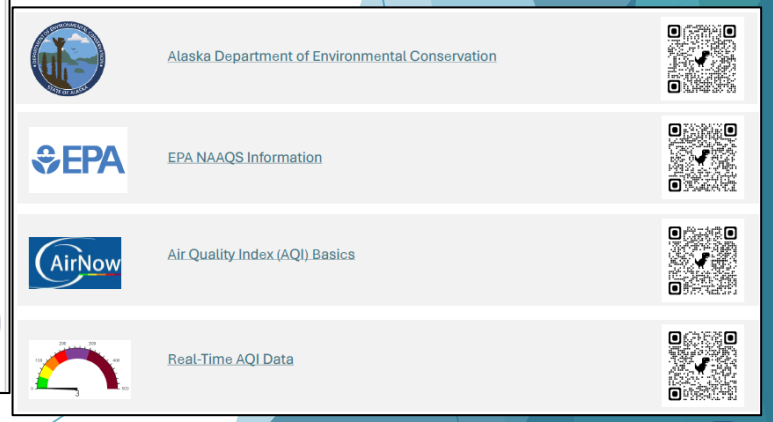
Descriptive Statistics of Air Pollutants*

Parameter	1-hr $PM_{2.5}$ ($\mu g/m^3$)	24-hr $PM_{2.5}$ ($\mu g/m^3$)	1-hr PM_{10} ($\mu g/m^3$)	24-hr PM_{10} ($\mu g/m^3$)	1-hr O_3 (ppb)	1-hr NO_2 (ppb)	1-hr NO (ppb)	1-hr CO (ppb)
Min	0.10	0.80	1.00	0.80	8.49	2.62	1.39	212.63
Mean	3.31	3.30	13.45 **	13.05 **	31.03	15.75	2.21	303.64
1st Max	29.20	17.10	637 **	45 **	55.32	35.26	6.81	1179.45
2nd Max	28.10	17.00	285 **	32 **	54.89	33.74	6.52	816.13

Data Discussion

$PM_{2.5}$ ambient air quality in Haines for the summer 2024 season fell mostly in the "good" range of the Air Quality Index (AQI; more information about AQI is provided on page 3), with several days in April, June, August, and September reporting brief periods of "moderate" air quality. Diurnal patterns show little variability of $PM_{2.5}$ concentrations across different time of day or days of the week. From April to September, June and August showed the biggest increases of $PM_{2.5}$, potentially due to smoke transported from wildfires in Canada.

* These statistics are based on preliminary data readings and are intended to provide a brief overview of sensor activity. Finalized data may be obtained upon request and through our annual statistical reports. Data from the community sensor network is non-regulatory and not comparable to the EPA's National Ambient Air Quality Standards (NAAQS; more information about the EPA NAAQS is provided on page 3).



Alaska Department of Environmental Conservation

EPA NAAQS Information

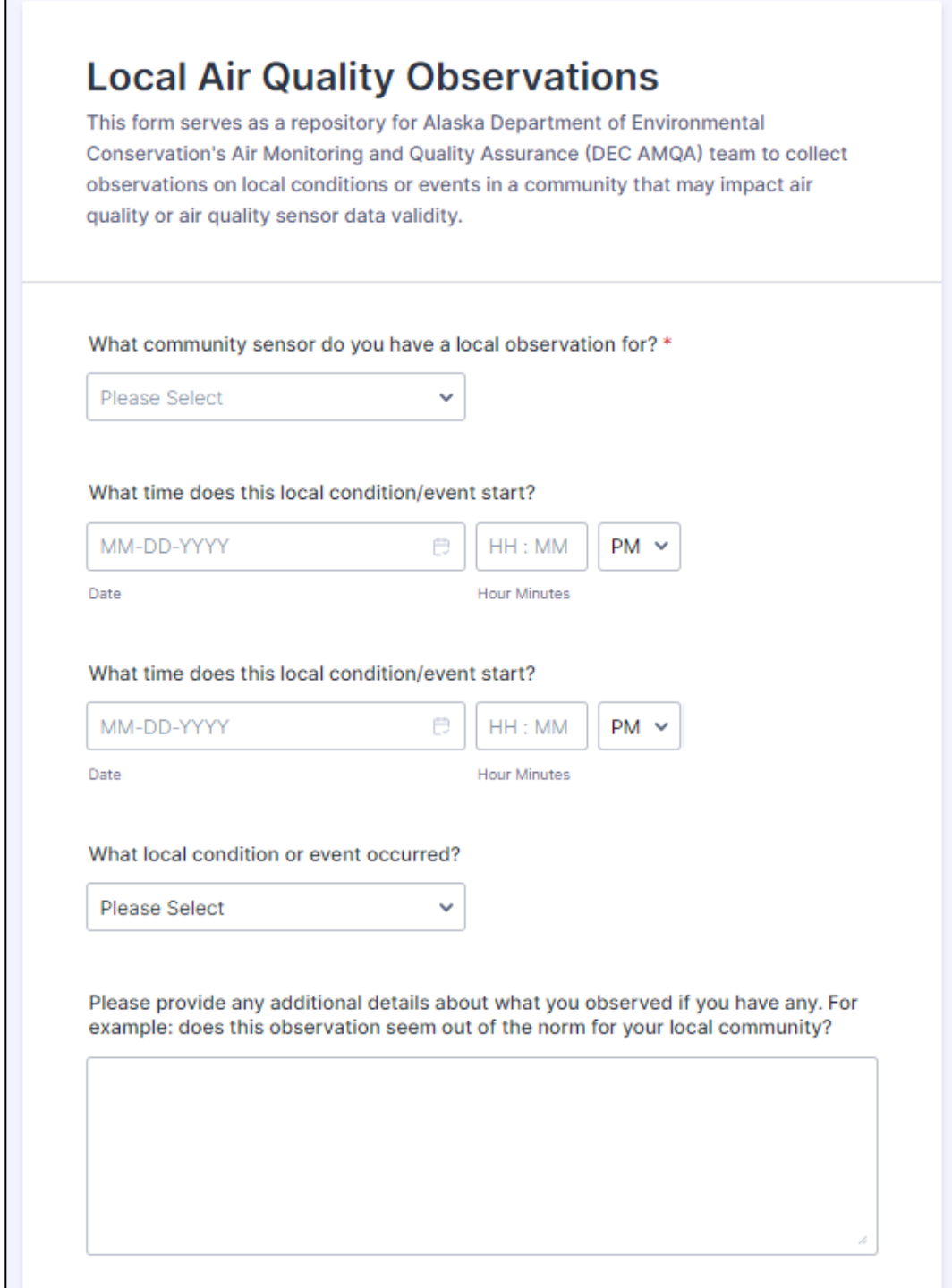
Air Quality Index (AQI) Basics

Real-Time AQI Data

https://dec.alaska.gov/air/air-monitoring/instruments-sites/community-based-monitoring/

Local Air Quality Observations

Link for: Local Air Quality Observations jot form



Local Air Quality Observations

This form serves as a repository for Alaska Department of Environmental Conservation's Air Monitoring and Quality Assurance (DEC AMQA) team to collect observations on local conditions or events in a community that may impact air quality or air quality sensor data validity.

What community sensor do you have a local observation for? *

Please Select

What time does this local condition/event start?

MM-DD-YYYY | HH : MM | PM

Date | Hour Minutes

What time does this local condition/event start?

MM-DD-YYYY | HH : MM | PM

Date | Hour Minutes

What local condition or event occurred?

Please Select

Please provide any additional details about what you observed if you have any. For example: does this observation seem out of the norm for your local community?

Rowing in the same direction

- **Sensor Network Expansion**
  - Wi-Fi sensors
  - Interior wildfire network
  - Municipality of Anchorage network
- **We want to host your air quality data on our website!**
- **DEC sensor network collaboration**
  - Contact us for direct collaboration
  - Future calls and knowledge share
  - Data available at request
  - *What data do you want to see?*

Thank you to all our community partners!

- Ninilchik Library
- Big Lake Public Library
- Cathedral of the Nativity of the Blessed Virgin Mary
- Tok Community Library
- Palmer Public Library

Contact us

Questions

- Next quarterly call date: June 10th @ 10-11am. Link in chat will take you to registration and will be emailed to our contact list.
- Visit our Air Quality Index Map (or Google 'Alaska air quality' and look for DEC AQI link)
- Contact info is in chat and in QR code

Resources

- Not sure what sensor to buy?
  - EPA Air Sensor Toolbox: epa.gov/air-sensor-toolbox
  - South Coast AQMD's AQ-SPEC program and evaluations: aqmd.gov/aq-spec
  - Contact us!
- ANTHC's PurpleAir program – contact ANTHC