OAAR
Observation Array, Alaska Region Newsletter

Issue: 5, February 2022

Observation = Climate Data

When an observation is taken, in that moment a snippet of information is captured. On its own, it may seem insignificant but that couldn't be further from the truth.

Data collected from hundreds of sites around Alaska make up the data that allows for NOAA's National Centers for Environmental Data and other partners to compute data, trends and averages for our State.

Observations are used in a plethora of ways, varying from the current forecast to climate research.

Here is the latest State Climate Summaries: ALASKA SUMMARY

Enjoy!

Inside this issue:

Southcentral

Introduction by: Kaitlyn O'Brien
Event Analysis by: Shaun Baines, Aviva Braun, and Brian Brettschneider

Those who live in the Matanuska Valley noticed that 2022 came in roaring. Quite literally, in fact, as the area experienced roaring winds associated with a significant Bora Wind Event. It was as if the flip of a calendar page coincided with an extreme flip in the weather, to include gusty winds and bitterly cold temperatures. And it wasn't just for one day, either. This particular event lasted for over 2 days! Winds in excess of 50 mph howled across the Matanuska Valley for 51 hours, to be exact.

But *why* did this happen?

And *what* caused the wind to persist for so long?

Several meteorologists at the Weather Forecast Office in Anchorage went to work immediately after this event to collect data, download observations, and write an event analysis. An excerpt from their report follows on the next few pages, and will provide some insight into the questions listed above.

Matanuska Glacier, photo captured by NWS Anchorage staff

What is a Bora Wind?

?

A regional downslope wind whose source is so cold that it is experienced as a cold wind, despite compressional warming as it descends the lee slope of a mountain range.

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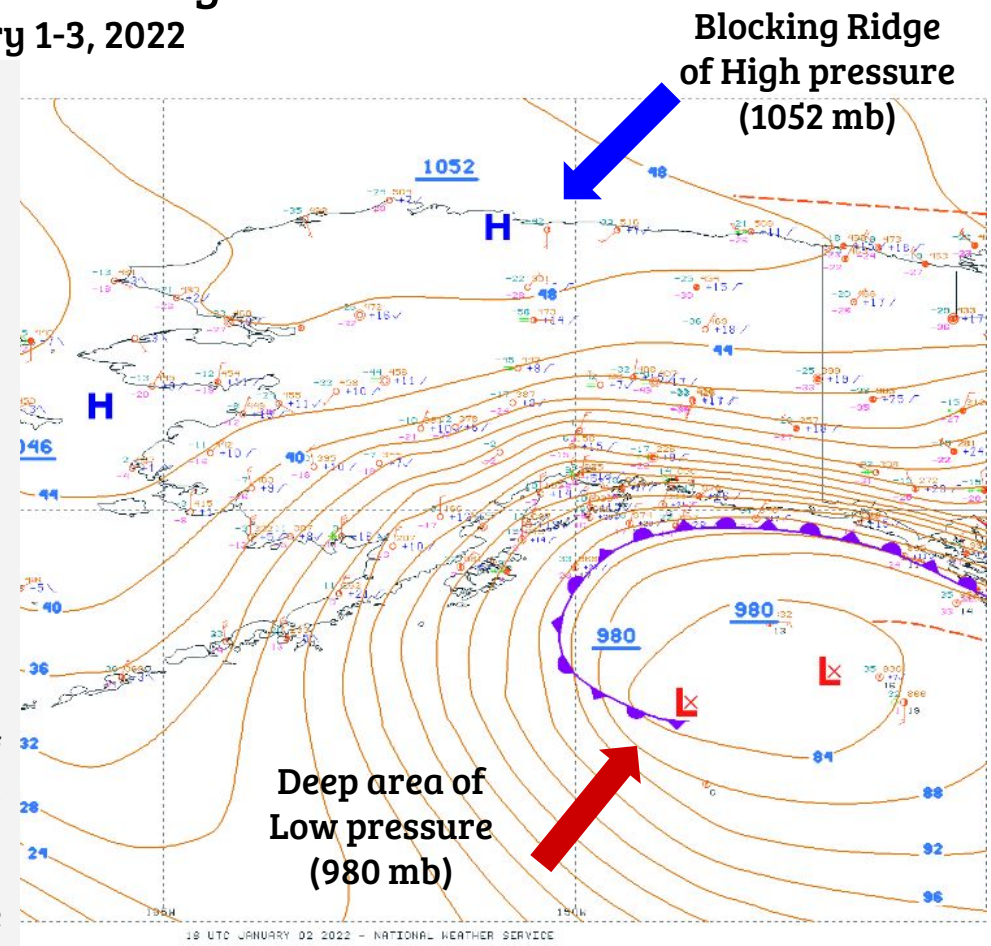
A Review of the Matanuska Valley Bora Wind Event

January 1-3, 2022

A significant wind event took shape over the first few days of the new year in what is called a **bora wind event**. Bora winds are driven by significant differences in temperature and pressure over a short distance causing strong winds to develop.

A near-stationary atmospheric setup aloft over a prolonged period of time led to about 40 hours of hurricane-force winds that accelerated southwestward along the surface of the Matanuska Valley. Two vastly different systems were located on either side of the Matanuska Valley. To the north, a deep, cold air mass sat stagnant over the Alaska interior, held in place by a strong high pressure system, known as a blocking high. To the south, a deep warm air mass sat over the Gulf of Alaska associated with a deep low pressure system, unable to move due to the blocking high. While many of the Valley's impacts were due to strong winds and wind gusts, the extreme cold temperatures, acting in combination with wind-driven power outages across the valley, led to further impacts in these extreme conditions.



Southcentral

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Date and Time	Wind Gust
Dec 23, 1996 at 9:55 AM	112 mph
Dec 23, 1996 at 10:58 AM	112 mph
Dec 23, 1996 at 8:59 AM	100 mph
Jan 17, 2005 at 3:53 PM	92 mph
Dec 23, 1996 at 7:56 AM	90 mph
Jan 2, 2022 at 5:36 PM	88 mph

***Table 1**: Strongest Wind Gusts Recorded at the Palmer Airport*

Hours	Description
59	March 2-6, 1989. Palmer gusted to 63 mph.
52	February 18-20, 1956. Colder than the 2022 event.
51	February 6-8, 1979. Palmer gusted to 79 mph.
46	Late February 1994. Palmer gusted to 54 mph.
44	January 1-3, 2022. Cold. Palmer gusted to 88 mph.

***Table 2**: Historical Bora Wind Event Comparison*

The duration and extremes documented during the event were significant. The strongest winds recorded were at the Palmer Airport with a peak wind gust of 88 mph at 5:36 PM January 2nd, and a gust to 91 mph at the Glenn-Parks Highway Interchange at about the same time. This rivals the strongest gusts reached at the Palmer Airport since recording began in 1972, becoming the 5th strongest wind gust recorded at the Palmer Airport, though the four strongest gusts only occurred over two separate days, December 23, 1996 and January 17, 2005, ranging between 90 and 112 mph (see Table 1). The Wasilla Airport peaked at 74 mph on January 2nd at 10:16 PM.

The duration of the event was pronounced. Not only were there about 40 hours of hurricane force winds (74 mph or greater) noted at the Palmer Airport, but there were about 51 hours of wind gusts 50 mph or greater between January 1st and 3rd. Taking a regional perspective and including Anchorage in the picture, this Bora Wind event ranks 5th for longevity since records began, though is likely the strongest wind event associated with a Bora Windstorm for Palmer on record (see Table 2).

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The final aspect of note was the extreme cold associated with the event and duration to which the cold lingered. While temperatures dropped into the single digits by January 2nd, temperatures dropped below zero January 4th and remained frigid through January 7th, before increasing back into the teens.

While the initial period of cold air advection (bora) likely led to development of strong winds in the Matanuska Valley on January 1st, gap winds, driven by both pressure and thermal gradients, are what sustained the winds for multiple days in what turned out to be an impressively long duration windstorm.

3 key details contributed to the duration and severity of this event:

1 Very cold air, bottoming out at about -31F to -40F, moved over the Alaska Range and into the Copper River Basin at about 3,000 feet above ground, on January 2nd. Surface temperatures dropped to single digits on the 2nd, and below zero on January 4th.

2 Amplified pressure differentiations developed between the northeast Gulf and northern Alaska. The strengthening surface low over the Gulf dropped to about 972 mb, while an extremely strong surface high topped out around 1052 mb on January 2nd. This created extremely tight pressure gradients between the northern Alaska high and the Gulf low, especially over Southcentral Alaska. This led to the development of strong winds from the northeast over the period, accelerating through the Matanuska Valley.

3 The presence of both thermal and pressure gradients combined to create much stronger winds than would otherwise be observed if standing alone.

Southcentral

Eric Drewitz

Wind Rose Climatology

Have ever heard of a wind rose?

A wind rose is a graph that visualizes wind speed and direction. It is a great way to look at the behavior of winds for a specific place over a given period of time.

Wind roses can tell you two things:

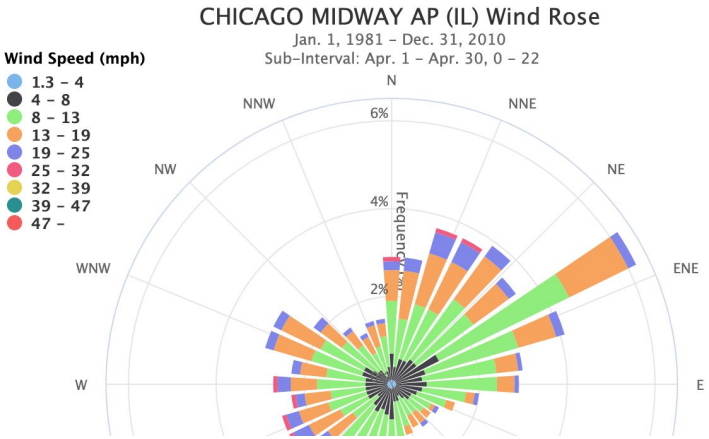
1) Predominant wind direction for a specific location over a given period of time

2) Frequency of high & calm winds (and everything in between) for each given wind direction for a specific place over a given period of time.

Over the next couple of pages, we'll take a look at Palmer Wind Climatology* by looking at seasonal wind roses. Each wind rose is comprised of hourly observations^ from the Palmer Airport over a 31 year period, and is divided by meteorological season.

It's important to note these observations span from January 1, 1991 through December 31, 2021 and **do not take into account the recent Bora Wind Event in early 2022.*

^Several hourly observations were missing over this 31 year period: 15,507 in spring, 14,524 in summer, 13,300 in fall, and 14,861 in winter

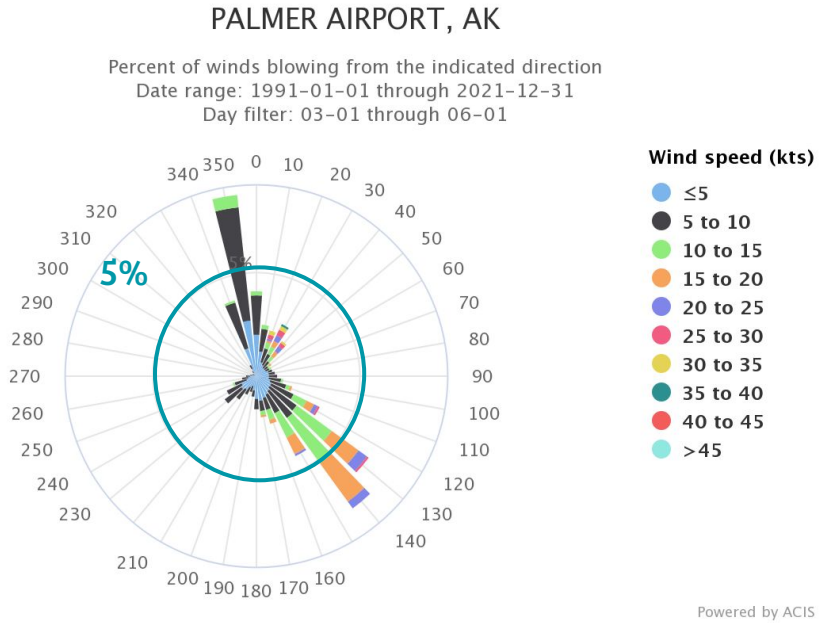


Example of a wind rose for Chicago Midway Airport.
Source: climate.gov

Directions are indicated around the outer edge of the circle. Each color represents a different range of wind speeds. From the center of the circle outward, percentages indicate the frequency of the wind occurring from each direction.

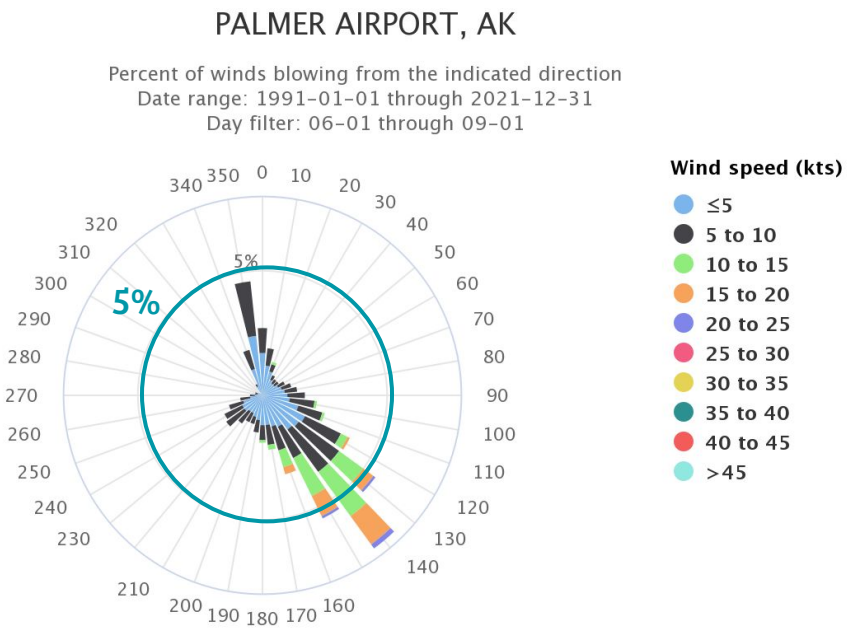
Southcentral

Eric Drewitz



Spring (Mar/Apr/May)

During the meteorological spring, the strongest winds observed at the Palmer airport station are out of the northeast (Matanuska Valley Winds), while the second strongest occur out of the southeast (Knik Arm Wind). The most frequent wind direction is out of the northwest. There is also a higher frequency of southeast winds compared to fall and winter, but not as frequent as in summer.



Summer (Jun/Jul/Aug)

During meteorological summer, the winds are the lightest out of any season and also have the most variation in direction. Southeast is the most frequent wind direction observed during the meteorological summer while northwest is the second most frequent. The strongest winds occurred out of the southeast direction.

Southcentral

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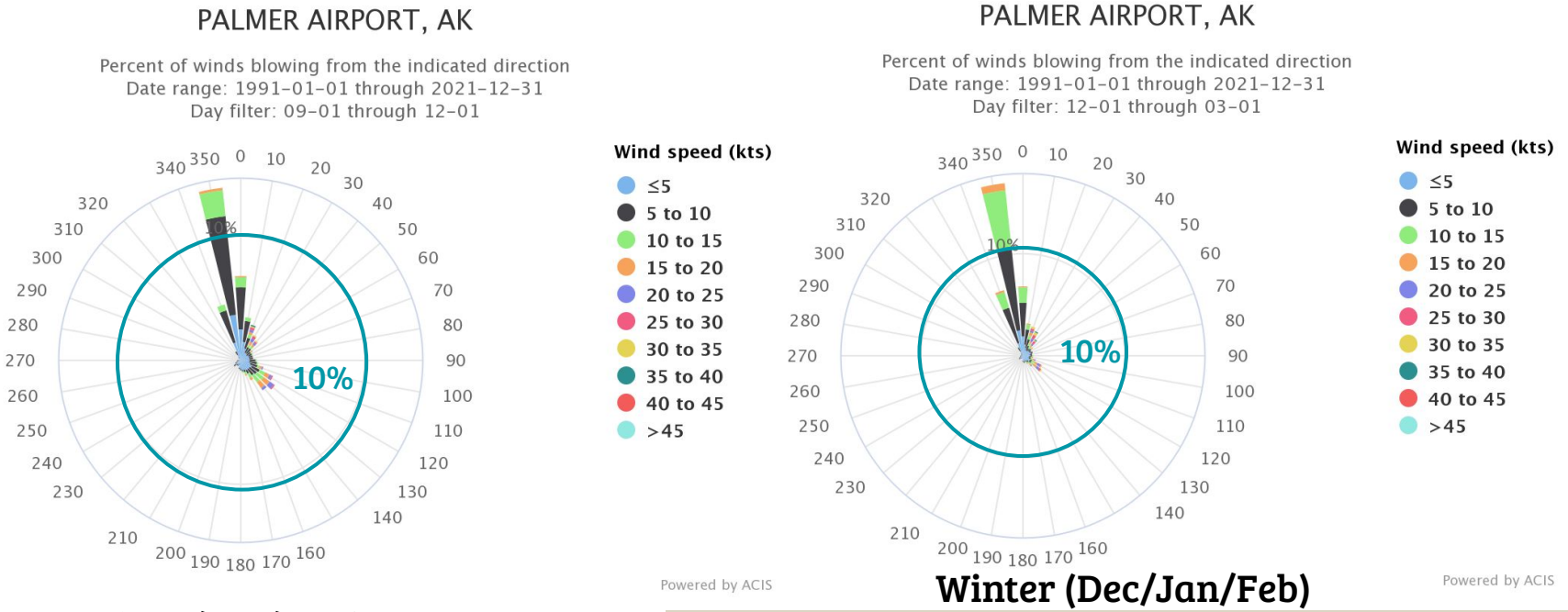

Fall (Sep/Oct/Nov)

Fall produces the strongest winds out of the northeast, while the second strongest winds occur out of the southeast. The weakest winds are from the west and southwest. However, northwest is the most frequent wind direction during this 31-year period.

Winter (Dec/Jan/Feb)

Winter sees the strongest winds out of the northeast, and second strongest out of the southeast. The most frequent wind direction is out of the northwest during this 31-year period. The wind pattern for meteorological winter closely mimics that of meteorological fall in that the strongest winds occur when the wind direction is between 20 and 40 degrees (northeasterly).

Regional Office - Upper Air Division

Kimberly Vaughan, Data: Larry Hubble

Alaska Region has 13 Upper Air stations, reaching to the far north in Utqiaġvik, St. Paul Island to the west and Annette Island for the farthest east and southern site.

The Alaska stats are collected and a friendly competition for office bragging rights. Many factors go into a successful flight, most issues are beyond human control these days with the invention of an auto launch system for the Upper Air balloon and sonde.

2021 Alaska Upper Air Report

Anchorage Wins the 2021 Alaska Upper Air Championship! 2nd in the NWS for 2021!
Anchorage Has Won 7 Alaska Upper Air Championships Since 2011!
Cold Bay Wins the Alaska U/A 2nd Place Award for 2021! 5th in the NWS for 2021!
King Salmon Wins the Alaska U/A 3rd Place Award for 2021!
Kotzebue Wins the Alaska U/A Most Improved Award for 2021!
Kodiak Wins the Alaska U/A 4th Place Award for 2021! 12th in the NWS for 2021!
Kodiak Wins the 2021 Alaska Burst Height Championship with 34,401 Meters!
Kodiak Wins Alaska U/A Station of the Month for December 2021!
Alaska U/A network Missed 98 Observations for December! Equipment Problems!
Alaska U/A network Only Had 92.4% Data On Time For December
St Paul U/A COMMS Line Down Over 7 Weeks (All of December)!

Regional Office - Upper Air Division

Kimberly Vaughan, Data: Larry Hubble

Every day around the world thousands of balloons are sent up into the atmosphere collecting data that is used by forecasters and to produce forecast models. In Alaska these launches are planned for just after 2 am and 2 pm AKST or 3 am and 3 pm AKDT (11z and 23z). These are globally agreed upon times so that modeling centers around the world can use the data. Extra launches can happen, as additional data may be requested.

Many balloons are still launch manually, but there has been a move to Automated Radiosonde Observing Systems like the one shown here.

All 13 upper air sites in Alaska have AROS installed and they are fully functional. They only need a human to restock the balloon every 12 days and perform preventative Maintenance.

Vaisala AROS at King Salmon, Alaska

...BONUS INFO...

You can read more about the AROS and how it came to Alaska: AROS

Want to see a launch looks like? Check out this You Tube video from our NWS cousins in Texas.

Regional Office - Upper Air Division

Kimberly Vaughan, Data: Larry Hubble

Alaska Upper Air Leading Stations 1995 – 2021

Year	1st Place	2nd Place	3rd Place	Most Improved	Alaska Cline Award
1995	Bethel	St. Paul	Yakutat-King Salmon	Kotzebue	no award
1996	Yakutat	St. Paul-Cold Bay		Kodiak	no award
1997	Bethel	Yakutat	Cold Bay	Fairbanks	no award
1998	King Salmon	Bethel	Yakutat	Annette	no award
1999	Cold Bay	Barrow	King Salmon	St. Paul	Cold Bay
2000	Kotzebue	Barrow	King Salmon	Kotzebue	Barrow - 2nd Nationally
2001	Fairbanks	Anchorage	McGrath	Fairbanks	St. Paul – 2nd Nationally
2002	Fairbanks	McGrath	Barrow	Fairbanks	Fairbanks - 2nd Nationally
2003	Fairbanks	MOBEU	Bethel	Cold Bay	Fairbanks - National Winner
2004	Fairbanks	St. Paul	MOBEU	Annette	Fairbanks - 2nd Nationally
2005	King Salmon	Bethel	Barrow	Kotzebue	Yakutat
2006	Kodiak	Bethel	Barrow	Kodiak	Barrow - National Winner
2007	Kodiak	St. Paul	Cold Bay	Yakutat	Kodiak - National Winner
2008	Kodiak	Fairbanks	McGrath	Fairbanks	Kodiak - 2nd Nationally
2009	St. Paul	Barrow	MOBEU	Annette	McGrath - 2nd Nationally
2010	Fairbanks	Kodiak	MOBEU	Yakutat	St. Paul - 2nd Nationally
2011	Anchorage	Kodiak	MOBEU	Bethel	Anchorage – 3rd Nationally
2012	Anchorage	Bethel	King Salmon	Bethel	Anchorage – 3rd Nationally
2013	Anchorage	St. Paul	King Salmon	Kotzebue	Anchorage – No National Award
2014	Anchorage	Barrow	McGrath	Cold Bay	Anchorage– No National Award
2015	Fairbanks	McGrath	King Salmon	Kodiak	McGrath-No National Award
2016	Anchorage	St. Paul	Cold Bay	Cold Bay	no award
2017	St. Paul	King Salmon	Cold Bay	Annette	no award
2018	St. Paul	Anchorage	King Salmon	Anchorage	no award
2019	Kodiak	Bethel	McGrath	Bethel	no award
2020	Anchorage	Kodiak	King Salmon	Cold Bay	no award
2021	Anchorage	Cold Bay	King Salmon	Kotzebue	no award

Bragging rights…
I was stationed in Cold Bay in 1999.
-Kimberly

The Isaac M. Cline Award recognizes operational excellence of line and program staff employees in the delivery of products and services supporting and enhancing the achievement of NWS strategic and operating plans. The awards are named in honor of Isaac M. Cline, one of the most recognized employees in weather service history. Mr. Cline made numerous contributions to the mission of the Weather Bureau. Most noteworthy of his accomplishments were the actions Isaac Cline took during the Galveston hurricane of 1900, the deadliest weather event in U.S. history. Isaac Cline's acute understanding of weather conditions, and his heroic forecasts and hurricane warnings saved several thousands of lives.

(Source: DOC-NOAA-NWS: NWSM 1-401)

Southeast

Kimberly Vaughan

The first half of the Winter in SE has been anything but boring and the new year's weather didn't slack off.

In the summer dedicated Cooperative Observers sweltered in 80-90 degree days.

While in the winter Cooperative Observers braved heavy and deep snow, torrential rains and bone chilling temperatures to collect the daily data.

DAILY TOP 3 TEMPERATURES

2021 - COOP

Daily High Temperatures	2021	Day of Occurrence	Record	Date of Record
Hyder	91°	June 29	94°	Jun 20, 2018+
Thorne Bay	89°	June 29	90°	Aug 1, 2020
Ketchikan 13N NEW	*87°*	*June 29*	86°	Jun 19, 2018

Daily Low Temperatures	2021	Date of Occurrence	Record	Date of Record
Juneau Forecast Office	-14°	February 10	-18°	Jan 7, 2009
Haines #2	-7°	February 10	-12°	Jan 28, 2008
Eaglecrest Base	-7°	February 9	-13°	Feb 9, 2008

Southeast

Kimberly Vaughan

COOP station rankings for 2021:

TOP 3 PRECIPITATION

Daily Precipitation	2021	Date of Occurrence	Record	Date of Record
Pelican	6.76"	August 13	9.75"	Dec 2, 2020
Klawock Water Plant NEW	*6.50"*	*December 11*	4.08"	Nov 29, 2020
Little Port Walter	4.98"	October 2	14.84"	Dec 6, 1964

Monthly Precipitation	2021	Month of Occurrence	Record	Date of Record
Snettisham Power Plant	30.63"	October	43.60"	October 2008
Little Port Walter	29.76"	September	69.35"	October 1974
Pelican	28.92"	October	58.30"	October 1978

Yearly Precipitation	2021	Record	Date of Record
Snettisham Power Plant	218.08"	227.91"	2015
Little Port Walter	214.52"	292.24"	1987
Pelican	155.86"	205.43"	2015

Southeast

Kimberly Vaughan

COOP station rankings for 2021:

TOP 3 SNOWFALL

Daily Snowfall	2021	Date of Occurrence	Record	Date of Record
Annex Creek	22.5"	November 28	29.3"	Jan 15, 1980
Ketchikan 13N	20.8"	March 13	30.0"	Mar 26, 2008
Snettisham Power Plant	18.58"	December 3	25.0"	Feb 9, 2009

Monthly Snowfall	2021	Month of Occurrence	Record	Date of Record
Eaglecrest Base	91.6"	March	112.4"	March 2007
Snettisham Power Plant	81.5"	December	152.0"	March 2007
Petersburg	68.1"	December	94.0"	December 1946

Yearly Snowfall	2021	Record	Date of Record
Eaglecrest Base	NEW *344.2"*	313.0"	2009
Snettisham Power Plant	308.9"	360.2"	2007
Annex Creek	273.0"	410.4"	1918

Northern and Interior Alaska

Dakari Anderson

PAMELA GREEN: INSIGHT INTO AN OBSERVER'S LIFE

One of the backbones of our operations is observations. Luckily, we have some of the best observers across the country, and some have the added responsibility of working directly with us to provide daily climate observations. We recorded and maintained these records as added observations for our short-term weather analysis, and it established a climate record for Lake Minchumina that is invaluable data that we would not have otherwise. One of these valued members is Pamela Green from Lake Minchumina.

Green and her family have been working with us for over 25 years and have resided in Alaska for five generations. Weather observations have been an active part of her life; her father, husband, and son all become pilots, an occupation that can be intensely dependent on weather conditions. Her father was a trained forecaster and worked for the Alaska Bureau of Land Management as a fire control officer. Fires can induce their weather conditions, so understanding the relationship between the two is a life-saving endeavor. This interest in weather followed Green with her interest in gardening and mycology, another weather-dependent activity, especially in Alaska where temperatures can be deadly to plants.

Huslia

Population: 633
Native Name: Ts'aateyhdenaadekk'onh Denh
Language: Denaakk'e (Koyukon)

Huslia is an Athabascan village and is located on the north bank of the Koyukuk River, about 70 air miles northeast of Galena. It lies within the Koyukuk National Wildlife Refuge. The continental climate zone encompasses most of the central part of the state and experiences extremely cold winters and warm summers.

Northern and Interior Alaska

Dakari Anderson

Green's most memorable weather event was a windstorm in the early '70s. She recalled being pelted with small debris while attempting to put away small farm animals. After the winds subsided, she remembers looking back along the trail she took to her house and seeing it laid over with birch trees. Windstorms aren't the only extreme weather Green has seen as she has been impacted by major forest fires and blizzards. She recalls a large forest fire threatening their home, "To have a huge fire bearing down on you is something you never forget." She describes the fire having its own winds and a deafening roar. Burnt spruce needles rained from the sky as Black Spruce trees got caught in the burn area and updraft of the fire. She drove on a road parallel to the fire where the heat off the ground could burn your arm 12-20 feet away with the windows down.

Luckily, Alaskan living is not all negative. From the large fire, great moose browse and blueberries grew in the burned area. Green feels privileged to live in Alaska and has 5 generations of family that has resided in Lake Minchumina. Her favorite season in Alaska is Fall, loving the berries, colors, hunting, and harvesting gardens that come with the season. NWS Fairbanks will be forever grateful for her and her family's contribution to the Weather Service and for helping us achieve our mission of protecting life and property!

Photos of ice formations by: Pamela Green

Resources

Cooperative Observer Program: https://www.weather.gov/coop/

CoCoRaHS: https://www.cocorahs.org/state.aspx?state=ak

Voluntary Observing Ship Program: https://www.vos.noaa.gov/

Alaska Region: https://www.weather.gov/alaska/

Sea Ice Program: https://www.weather.gov/afc/ice

Alaska-Pacific RFC: https://www.weather.gov/aprfc/

Climate Prediction Center: https://ww.cpc.ncep.noaa.gov/

National Centers for Environmental Information: https://www.ncei.noaa.gov/

Weather Forecast Offices

WFO Anchorage: https://www.weather.gov/anchorage/

WFO Fairbanks: https://www.weather.gov/fairbanks/

WFO Juneau: https://www.weather.gov/juneau/