



SNOW

National Snow Analysis Overview

National Water Center

February 26, 2025

Carrie Olheiser RTI

NWS / OWP

nwc.wpod.winterhydro@noaa.gov

www.nohrsc.noaa.gov



NOAA Eastern Region Climate Services Webinar



NWC

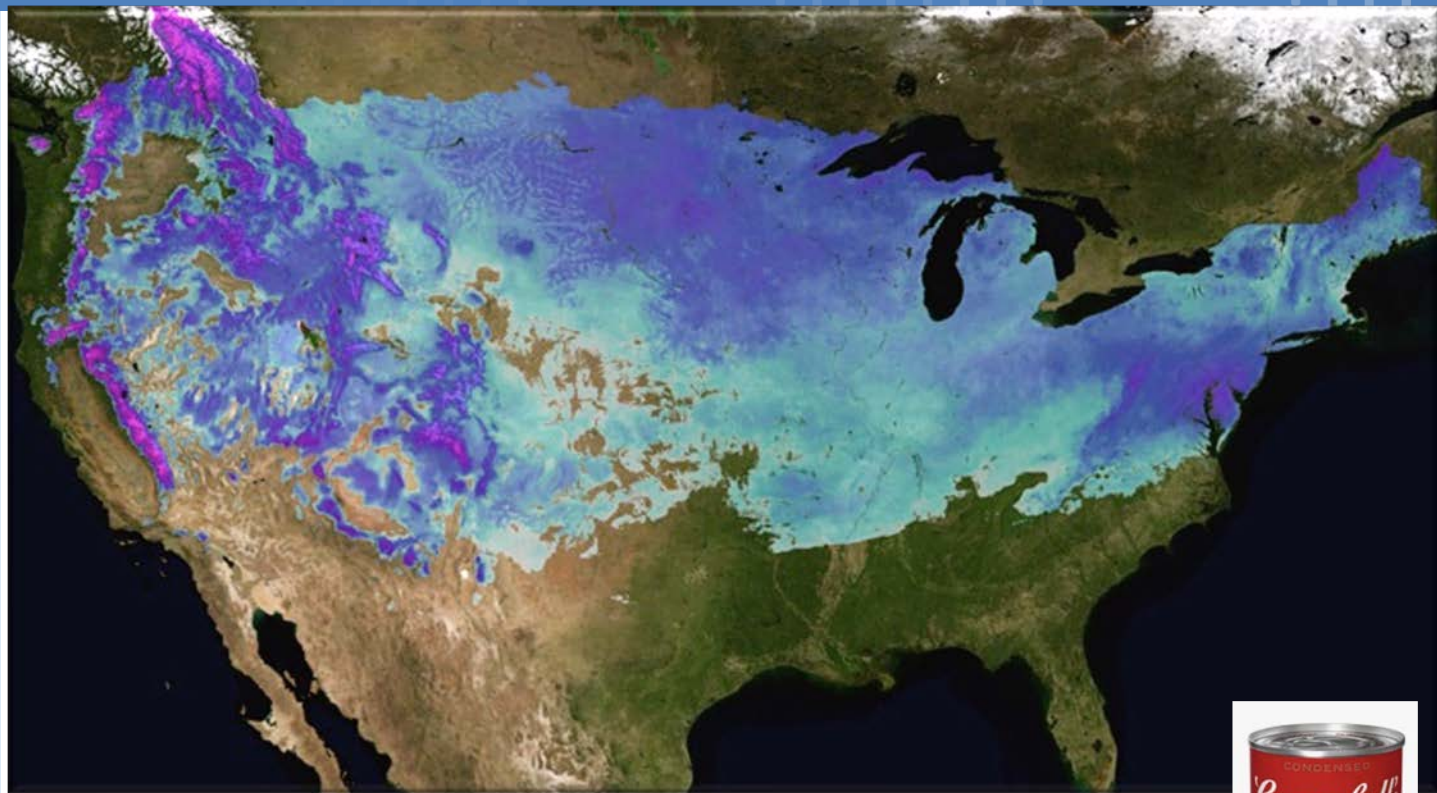
National
Water
Center

Department of Commerce // National Oceanic and Atmospheric Administration // National Water Center 1

Importance of Snow

Why is this work important?

- Water Supply
- In excess of 70% of Western States runoff originates in the snowpack
- Spring Snowmelt Flooding
- The economic value of snowmelt is estimated at \$350B/Yr
- Winter Tourism is \$8 Billion / Yr industry
- "The Value of Snow and Snow Information Services" (2004)



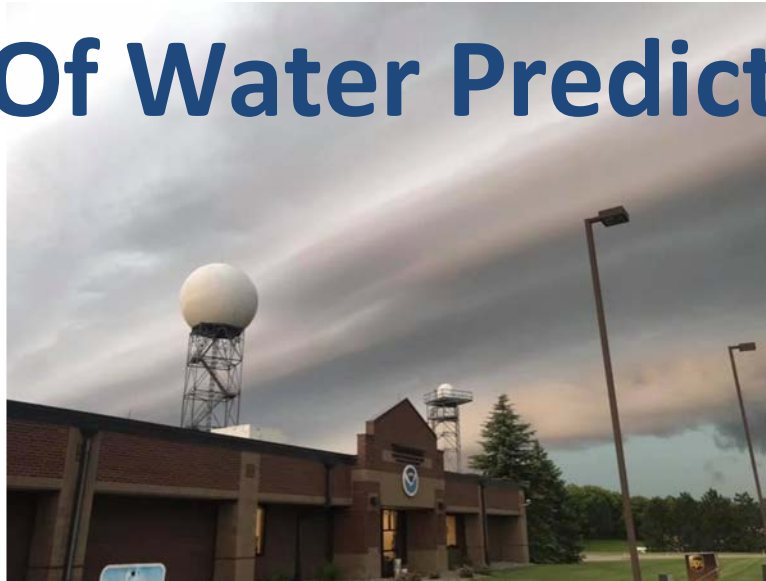
"In Wisconsin, our snowy winters are not just another season, but also a huge economic driver, particularly in the Northern part of the state. This year's low snowfall has hit many Wisconsin businesses hard and we need to do more to ensure they get some relief," said **Senator Baldwin**. "I was happy to partner with Governor Evers to successfully push the Biden administration to ensure Northern Wisconsin businesses impacted by this year's low snowfall can get the support and help they need."



ceanic and Atmospheric Administ



Office Of Water Prediction

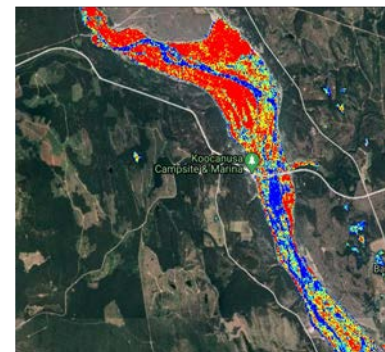
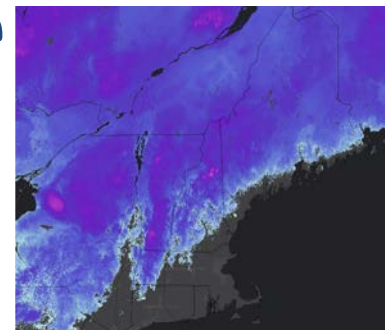


National Water Center

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Winter Hydrology and Remote Sensing Desk Operations

- National Snow Analysis
 - SNODAS Operations and Assimilation
 - National Snowfall Analysis
 - Regional Snow Coordination Meetings
 - NWS, USACE, state and local partners
- Airborne Snow Survey Operations
 - Snow water equivalent derived from terrestrial gamma radiation
 - Operational testing of new King Air (N67RF) airframe in support of gamma operations.
- Remote Sensing
 - Synthetic Aperture Radar River Ice Surveillance (SARRIS)
 - The only continental scale SAR derived river ice surveillance
 - Directly supporting APRFC, NWRFC, MBRFC, NCRFC, NERFC





Mission



To support the National Weather Service's mission by producing the best estimate of snow water equivalent, using all available data including satellite, airborne, and in-situ observations for the protection of life and property and enhancement of the national economy.



Operational mission collecting SWE and soil moisture measurements since 1980.



Behinds the Scenes



← → ↻ nohrsc.noaa.gov

National Weather Service
National Operational Hydrologic Remote Sensing Center

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City, ST Go

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NOAA's Source for Snow Information

The National Operational Hydrologic Remote Sensing Center provides comprehensive snow observations, analyses, data sets and map products for the Nation.

- National Snow Observation Database
- Airborne Snow Surveys
- Satellite Snow Cover Mapping
- Snow Modeling and Data Assimilation
- Analyses, Maps, and Interactive Visualization Tools
- Integrated Snow Datasets for Geospatial Applications
- Applied Snow Research

NOHRSC products and services support a wide variety of government and private-sector applications in water resource management, disaster emergency preparedness, weather and flood forecasting, agriculture, transportation and commerce.

SNOW = WATER = LIFE

Snow Analysis Highlights

Tuesday, July 18, 2023

Snow Model Status: The model analysis is out to Tuesday, 2023-07-18 0600 UTC. The daily model forecast is out to Friday, 2023-07-21 0600 UTC.

more ...

Website News

The National Snowfall Analysis, an observation-based, gridded estimate of recent snowfall, is now an operational product. Stand-alone imagery, seasonal totals, and data downloads in several formats are available in the National Snowfall Analysis section of the website. Products are also available in the the NOHRSC Interactive Snow Information section of the website. For more information, see the NWS Public Information Statement PWS22-05. For product questions, contact shawn.carter@noaa.gov. For technical questions, contact gregory.fall@noaa.gov.

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National Weather Service
National Operational Hydrologic Remote Sensing Center
Office of Water Prediction
1735 Lake Drive W
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National Snow Analysis



Multisensor Snow Observations

Ground

Airborne

Satellite

Snow Modeling and Data Assimilation (SNODAS)

Numerical Weather
Prediction Inputs
(Forcing Engine)

Mass/Energy Balance
Model + Snow
Assimilation

Gridded Snow Characteristics:
CONUS + S. Canada
1 km² Spatial Resolution
1 Hour Temporal Resolution

Snow Information (Products)

Downloadable Maps

Interactive Mapping

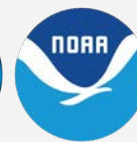
Text Products

Gridded Binary Files

Time Series Plots

Text Discussions

National Snow Analysis



Multisensor Snow Observations

Ground

Airborne

Satellite

- **National Weather Service**

First order stations
Cooperative observers

- **Federal and State Agencies**

NRCS SNOTEL and Snow Courses
USACE New England District Snow Surveys
Federal Aviation Administration
California Department of Water Resources

- **Regional Mesonets and Surveys**

State Mesonets
CoCoRaHS
MesoWest

- **International Agencies**

St. John River Basin
Environment Canada
BC Hydro

Ingest:

Data from IDS/DDPLUS (LDM);
HADS; MADIS; METAR



Processing:

SHEF/MADIS/METAR
decoders; SNODAS grid
sampling



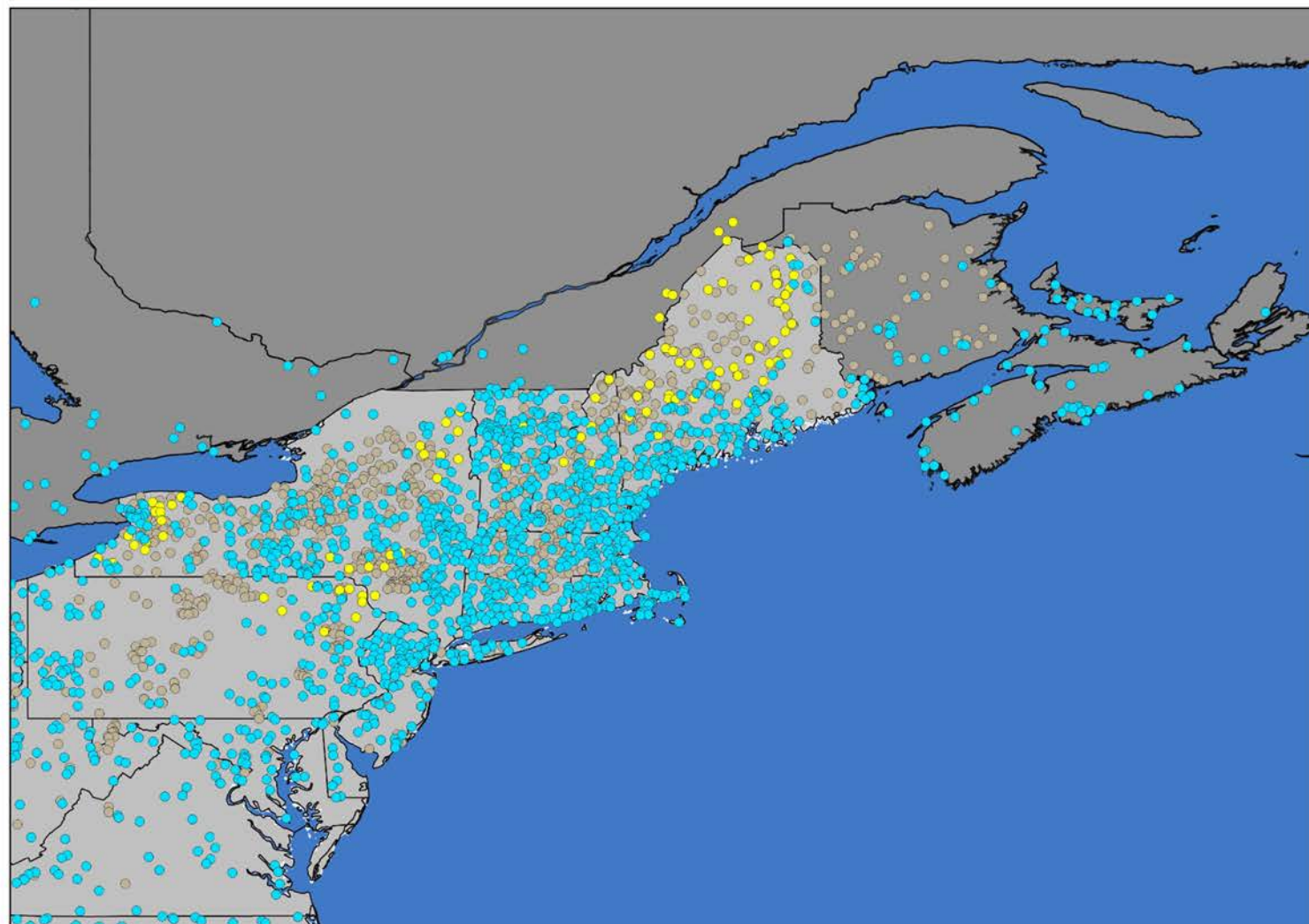
Storage:

PostgreSQL databases (data
from ~2002, >85209 reporting
stations) and Metadata for
264,213

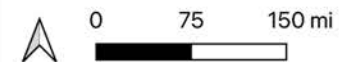


Snow Water Equivalent Observations

NWC | National Water Center



gamma
cocorahs

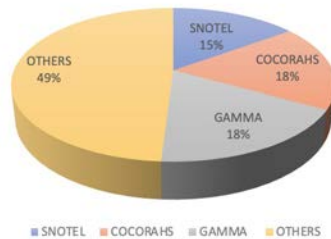




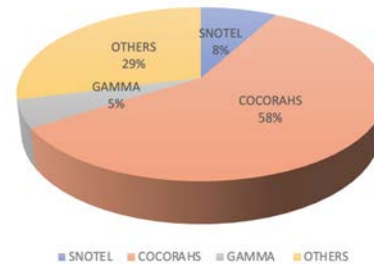
Unique SWE Observations



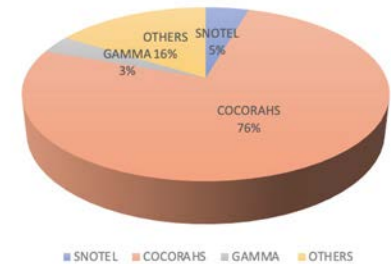
Unique SWE Stations 2006



Unique SWE Stations 2014



Unique SWE Stations 2021



- Since 2006 the number of SWE stations has increased from ~4000 to more than ~12500 stations.
- The total contribution of SWE reporting stations from CoCoRaHS has increased from 18% to 76% !

National Snow Analysis



Multisensor Snow Observations

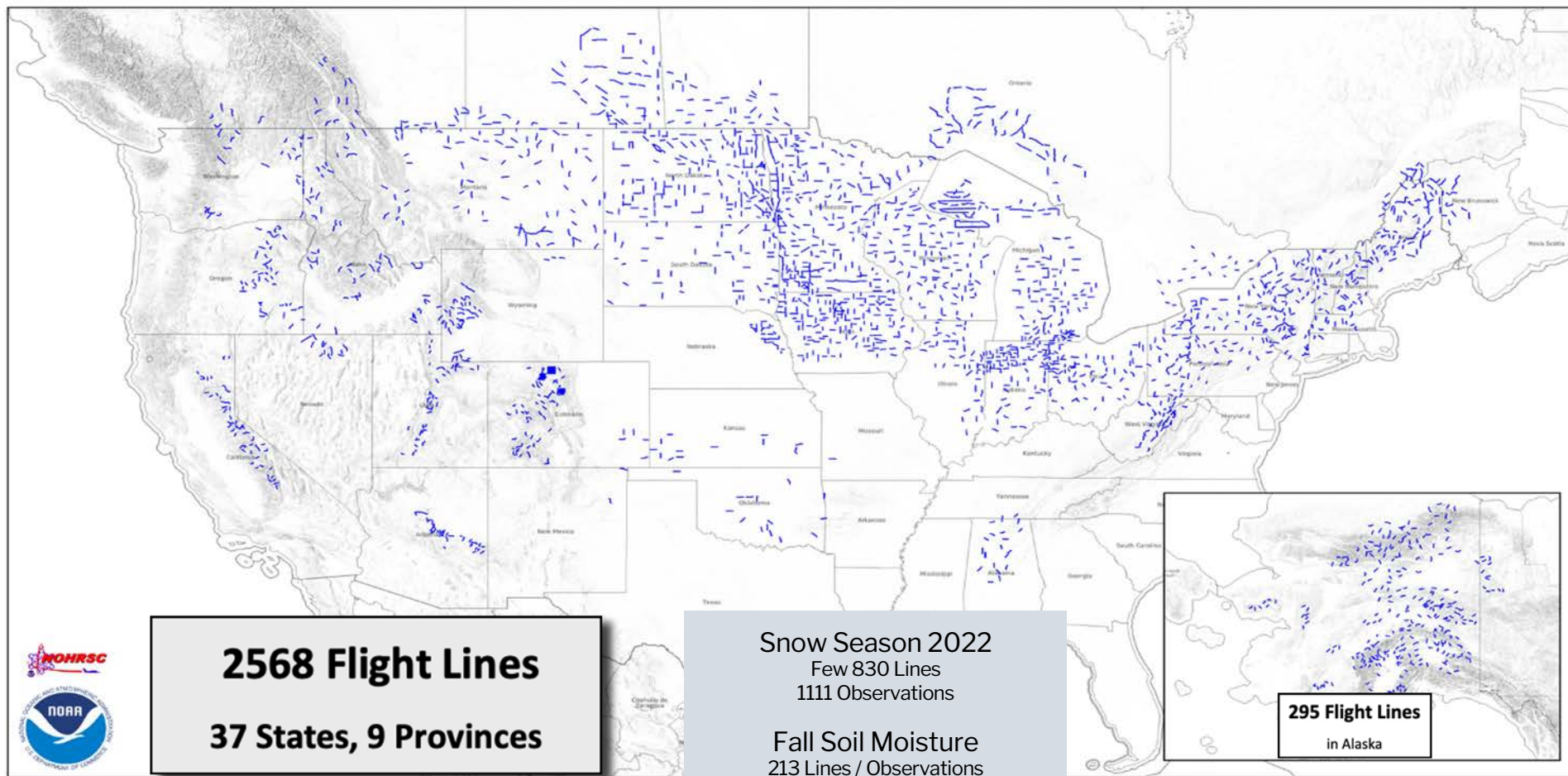
Ground

Airborne

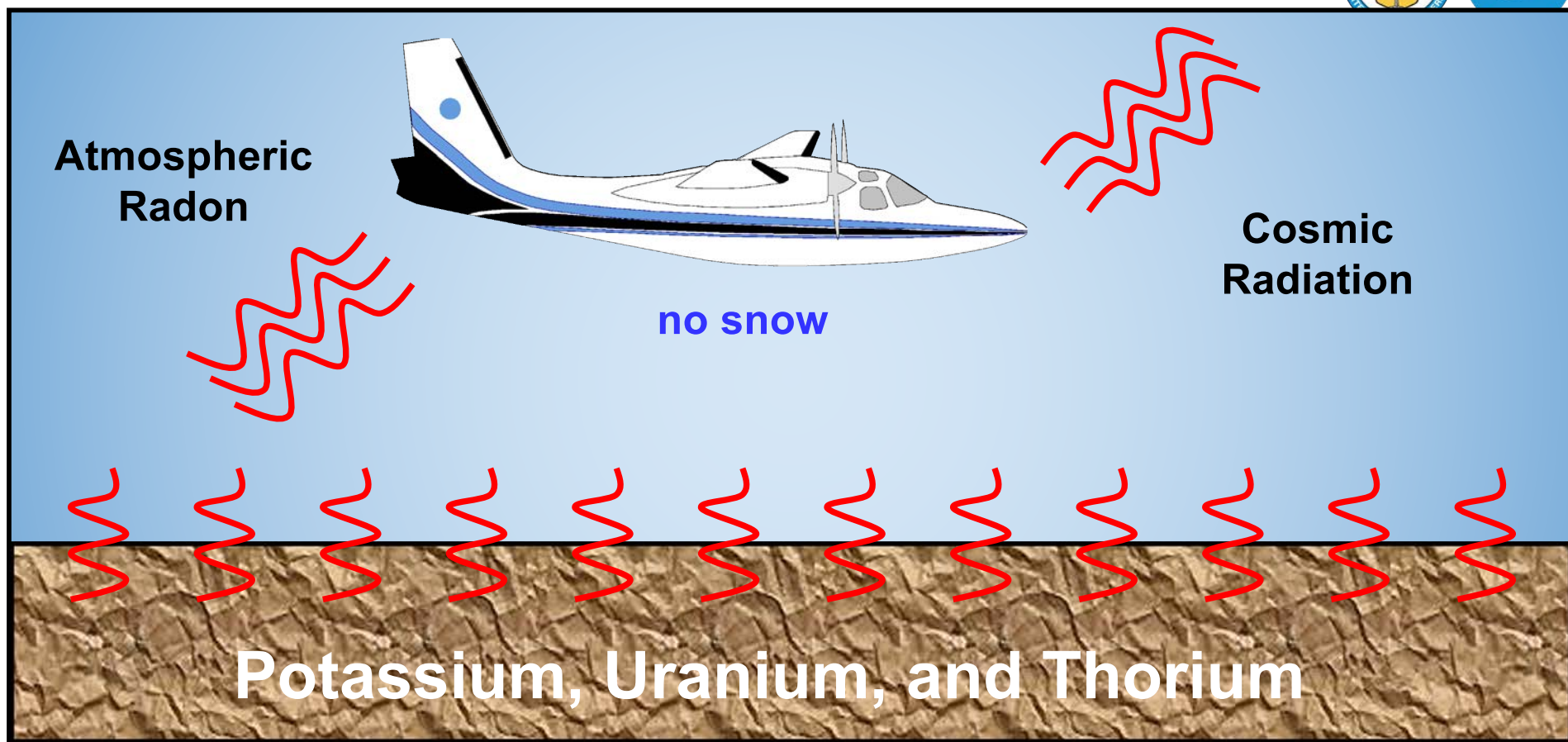
Satellite



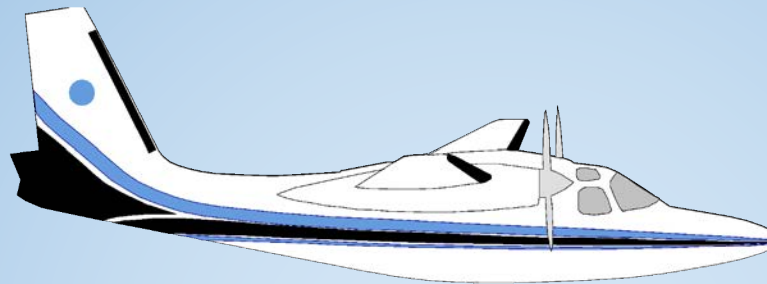
Airborne Snow Survey Flight Line Network



Natural Terrestrial Gamma Radiation



Natural Terrestrial Gamma Radiation

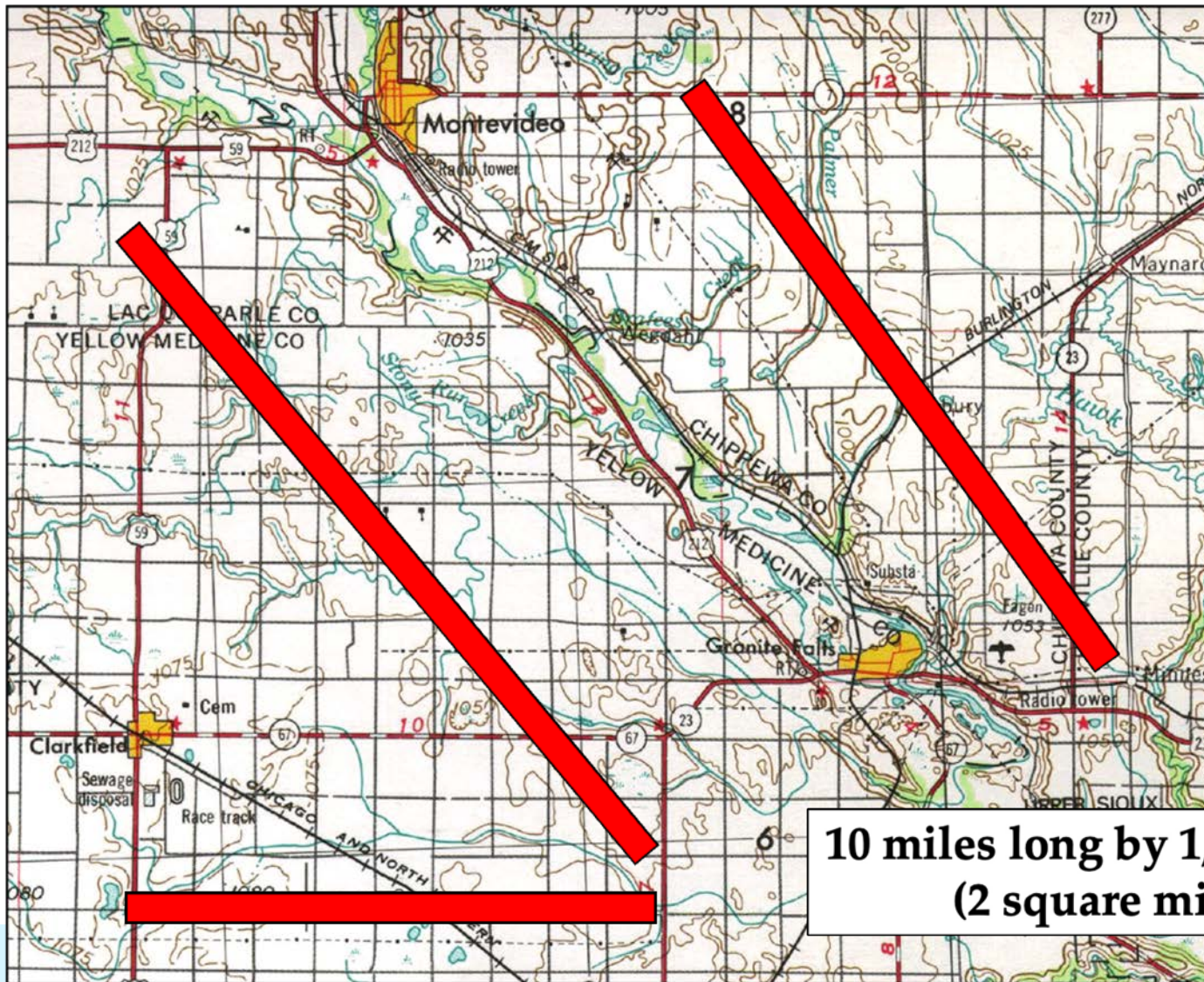


snow cover
conditions

Pure, uncollided gamma radiation

Radiation absorbed by water mass in snow pack

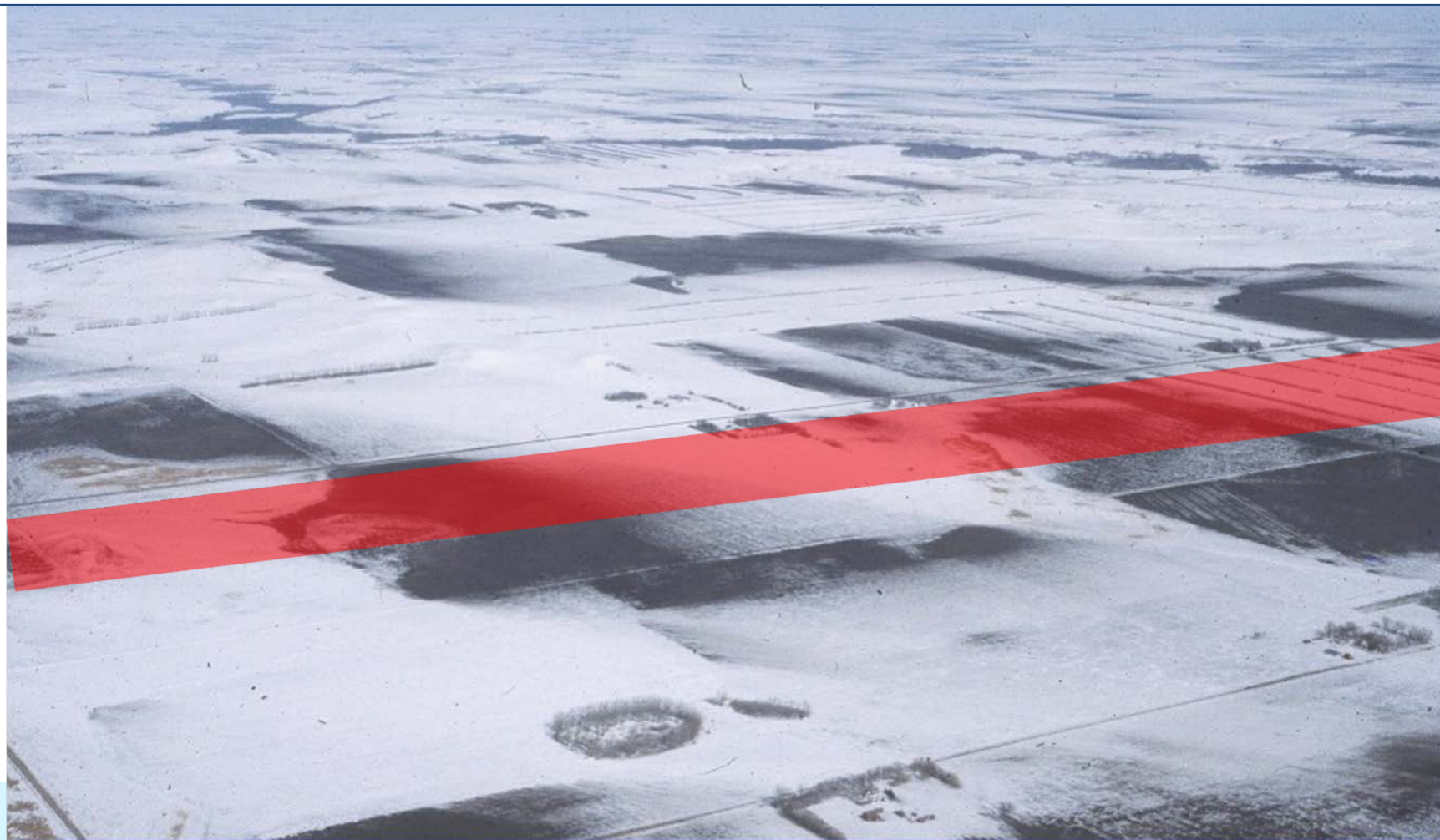
Potassium, Uranium, and Thorium



**10 miles long by 1,000 feet wide
(2 square mile area)**



Airborne measurements integrate shallow and deep snowpacks





Ground ice 2 to 4 inches thick also acts like snow water equivalent.





Airborne Snow Water Equivalent

Measurement Error (cm)



	Agriculture	Forest
Root Mean Square Error	0.81	2.31
Average Absolute Error	0.75	1.87
Average Bias	0.54	0.15
Percent Bias	12.10	1.28
N (Flight Lines)	23	70



Project Story

Airborne Snow Survey



The New York Times

<https://www.nytimes.com/2023/04/03/climate/california-storms-snowpack.html>



See What California's Record Snowpack Looks Like, Up Close

Sensors on low-flying planes can measure mountaintop snow with great precision, helping forecasters predict what will happen as it melts.

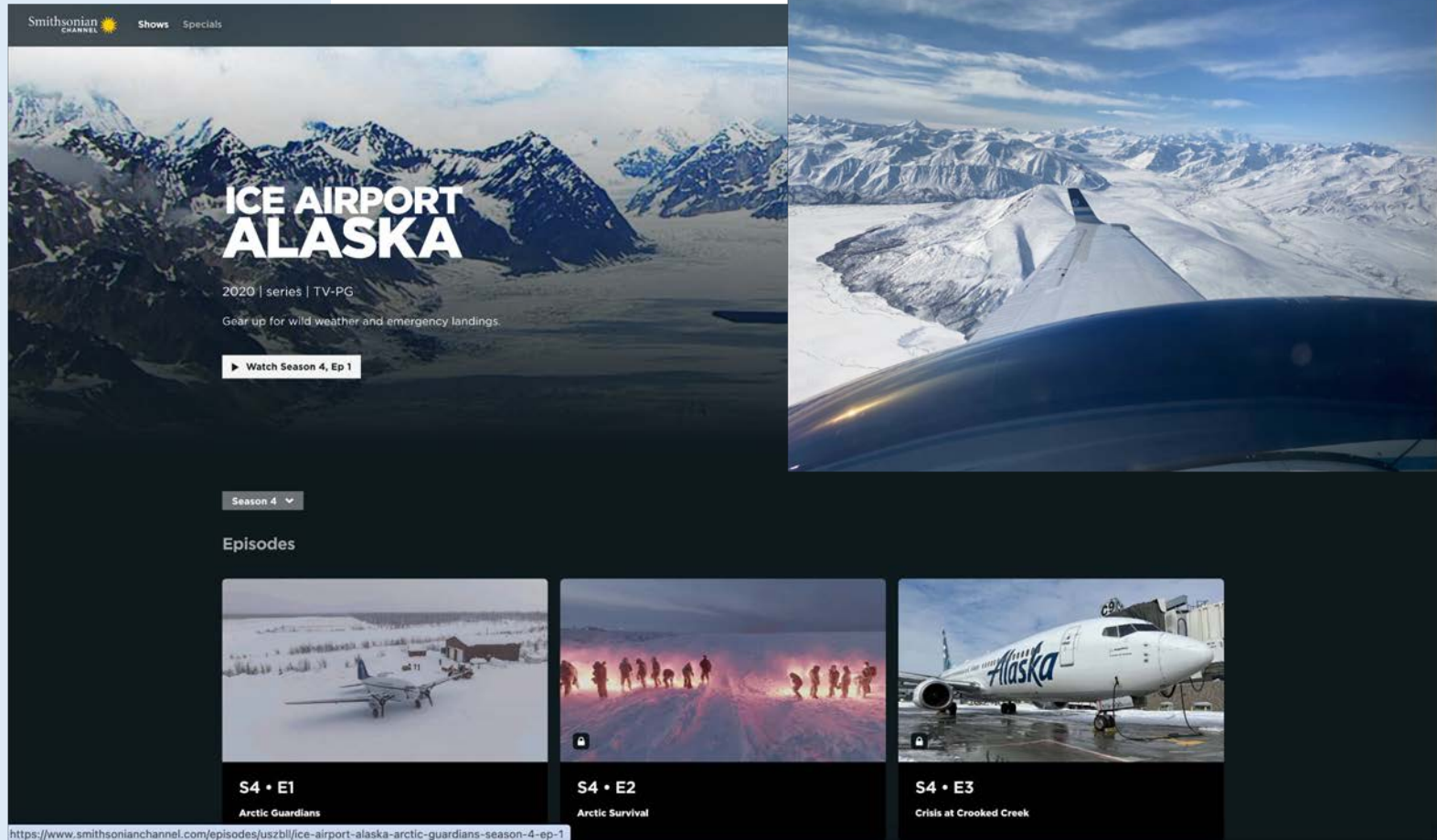
By Raymond Zhong Photographs and Video by Erin Schaff
April 3, 2023

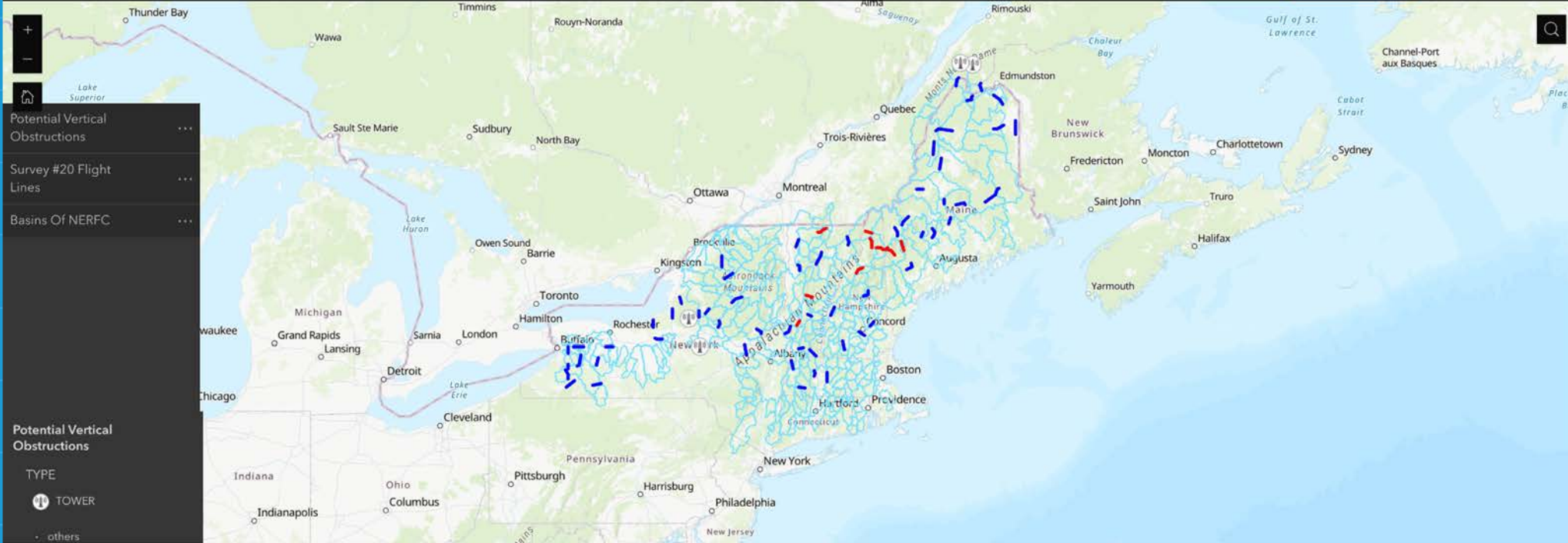
5 MIN READ

Departme



Airborne Snow Survey





VCGL, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Cincinnati

Powered by Esri

Survey #20 Flight Lines

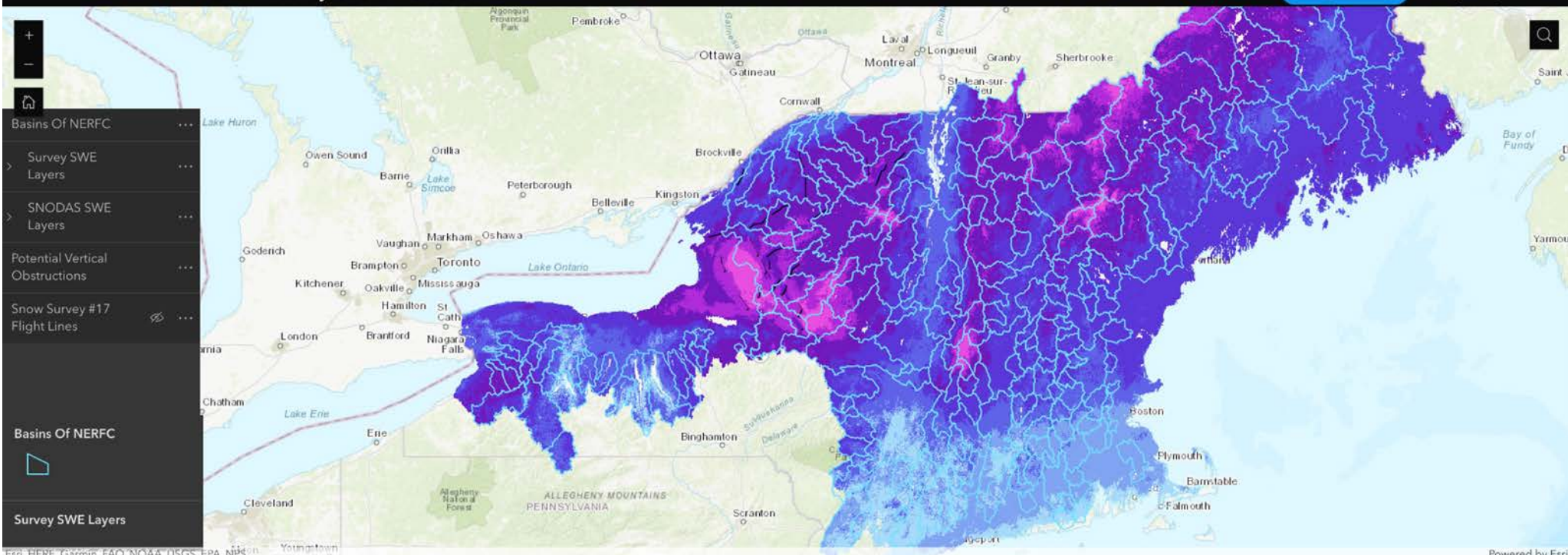
NAME	RIVER_BASI	STATE	RFC	WSFO	ELEV_FT
NY406	Cattaraugus Creek at Gow...	NY	NERFC	BUF	1394
NH103	Suncook River at North Ch...	NH	NERFC	GYX	558
ME100	Carrabassett River at Nort...	ME	NERFC	GYX	561

Total: 71 | Selection: 0

Survey Completion

No 100% (71)

No



Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS

Powered by Esri

Snow Survey #17 Flight Lines

NAME	RIVER_BASI	STATE	RFC	WSFO	ELEV_FT
NY104	Saranac River at Plattsburg	NY	NERFC	BTV	1,125
NY105	Au Sable River at Au Sable...	NY	NERFC	BTV	1,496
NY106	NYAAC	NY	NERFC	BTV	358

Total: 45 Selection: 0

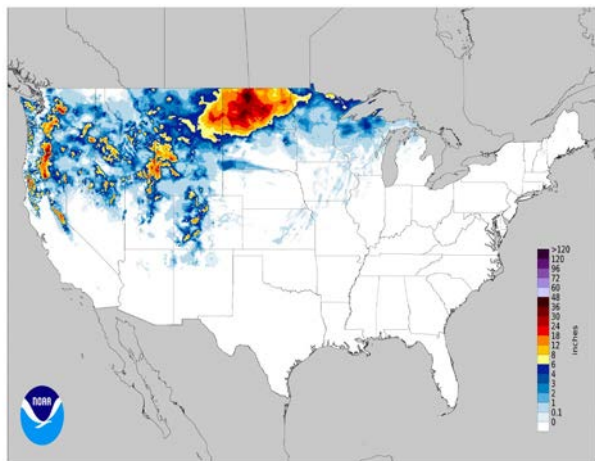
Survey Completion

Yes 51.111% (23)

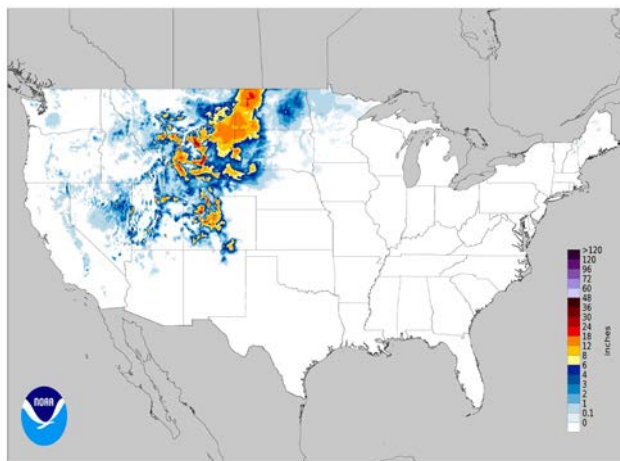


No 48.889% (22)

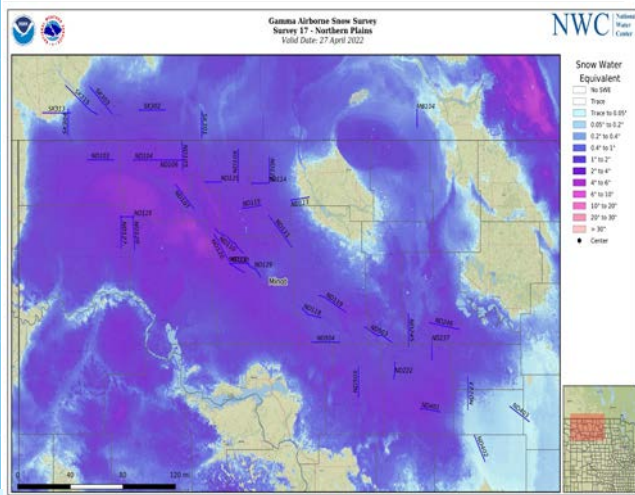
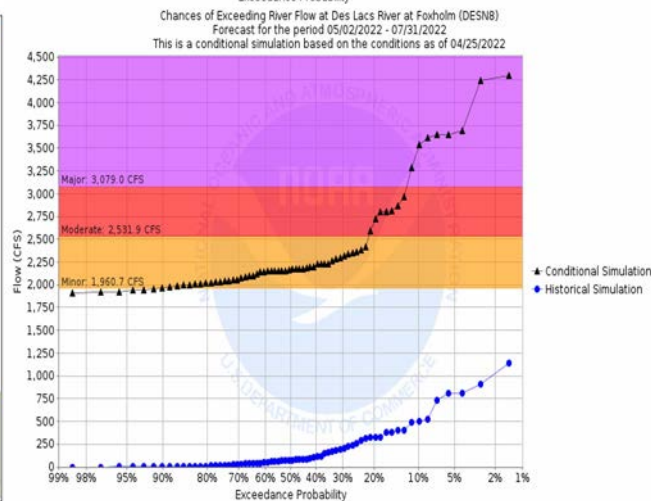
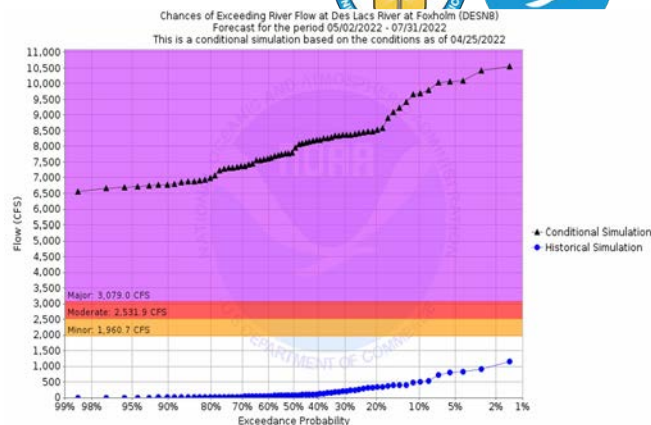
National Snowfall Analysis: 72-hour accumulation ending 2022-04-15 12 UTC
Issued 2022-04-17 10:37:09 UTC



National Snowfall Analysis: 72-hour accumulation ending 2022-04-25 12 UTC
Issued 2022-04-27 13:30:21 UTC

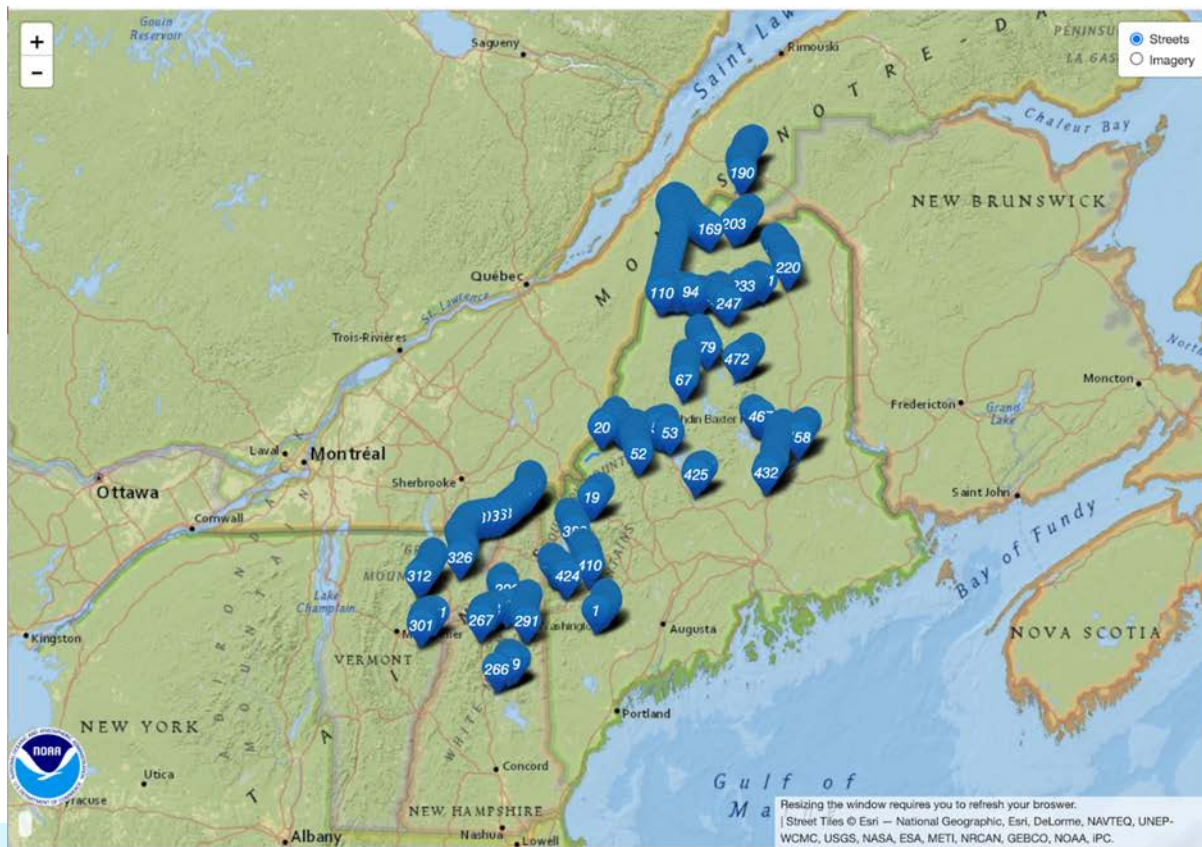


Souris River Basin





National Snow Analysis



Snow Survey
NWS Office of Water Prediction
Northeast Snow Survey Part 1
February 2020

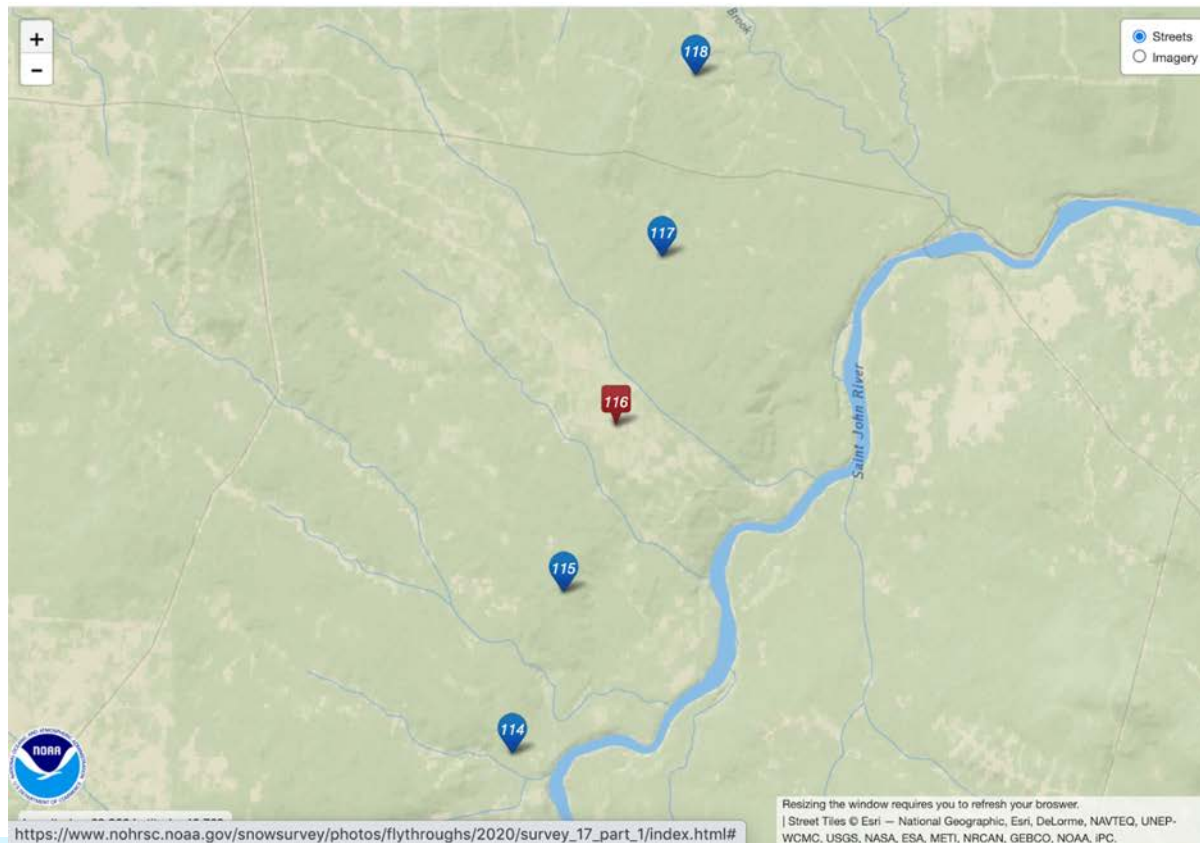


Date: 2020/02/24 Time: 09:03:29





National Snow Analysis



Snow Survey

NWS Office of Water Prediction
Northeast Snow Survey Part 1
February 2020

Date: 2020/02/24 Time: 11:21:25



Date: 2020/02/24 Time: 11:21:55





SARRIS River Ice Detection

Image Time: 2021-02-18 00:05:00

NWC National Water Center



River Classification

- Open Water
- Water-Ice
- Medium Confidence Ice
- High Confidence Ice

SARRIS is derived from Sentinel-1 imagery, courtesy of the European Space Agency and Alaska Satellite Facility. This is an experimental product and should not be used for determining safe ice for vehicle or pedestrian use.



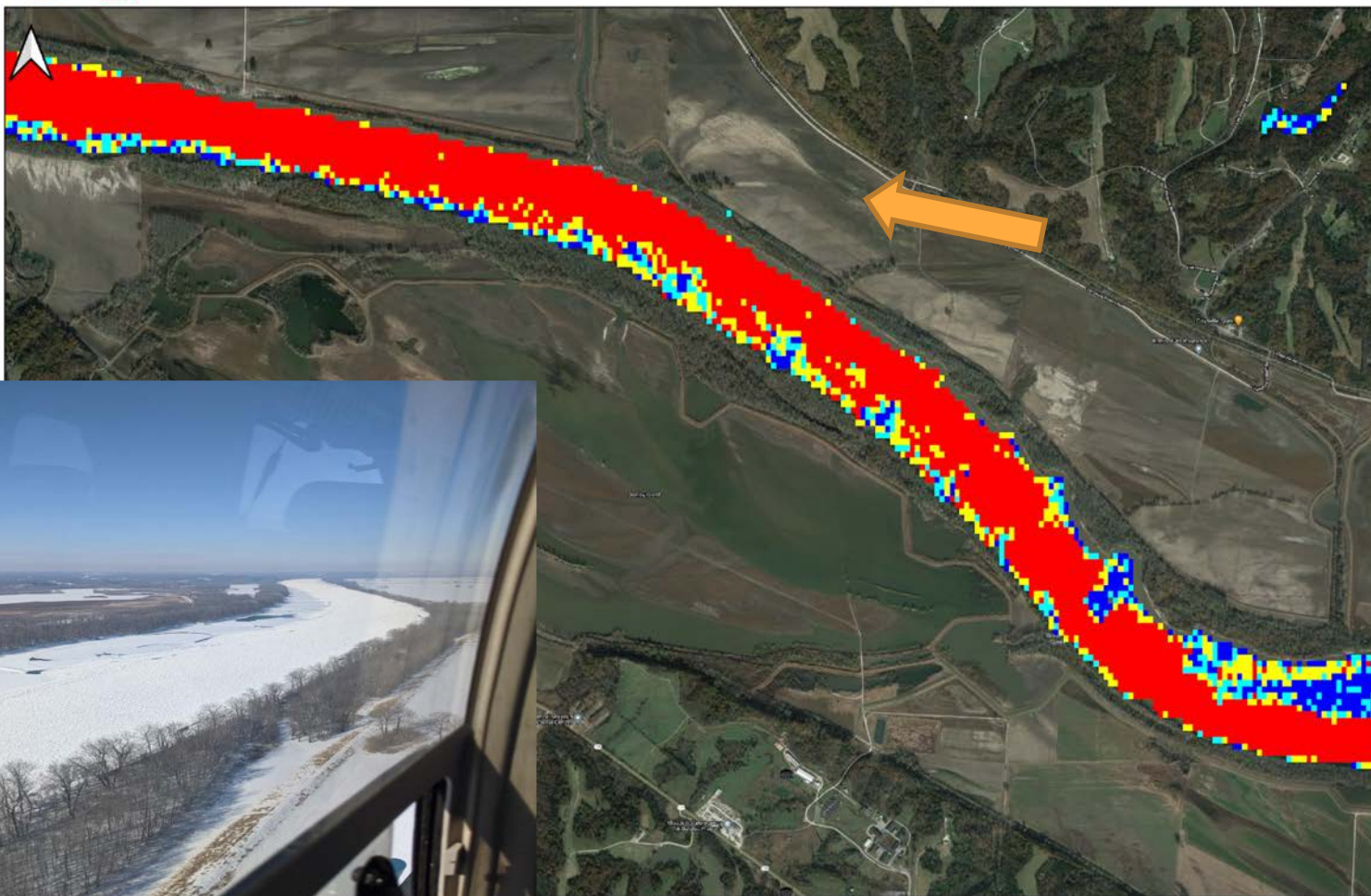
NATIONAL WEATHER SERVICE
Building a Weather & Water-Ready Nation



SARRIS River Ice Detection
Image Time: 2021-02-18 00:05:00
Missouri River Ice Jam above Jefferson, MO

NWC National Water Center

River Classification
■ Open Water
■ Water-Ice
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Image Time: 2021-02-18 00:05:00
Missouri River Ice Jam above Jefferson, MO

NWC National Water Center

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National Snow Analysis



Multisensor Snow Observations

Ground

Airborne

Satellite

Snow Modeling and Data Assimilation (SNODAS)

Numerical Weather
Prediction Inputs
(Forcing Engine)

Mass/Energy Balance
Model + Snow
Assimilation

Gridded Snow Characteristics:
CONUS + S. Canada
1 km² Spatial Resolution
1 Hour Temporal Resolution

Snow Information (Products)

Downloadable Maps

Interactive Mapping

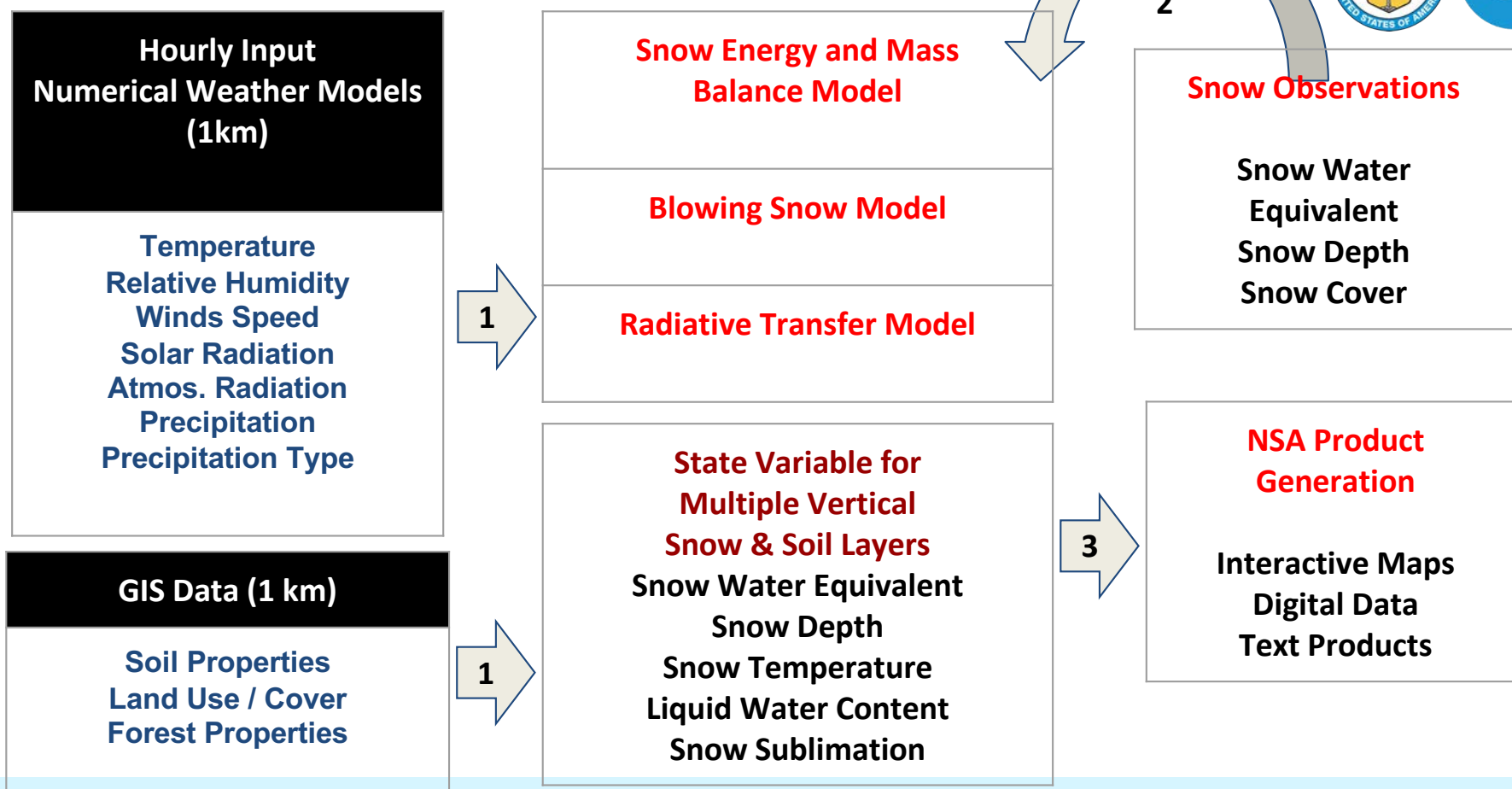
Text Products

Gridded Binary Files

Time Series Plots

Text Discussions

Snow Modeling Framework

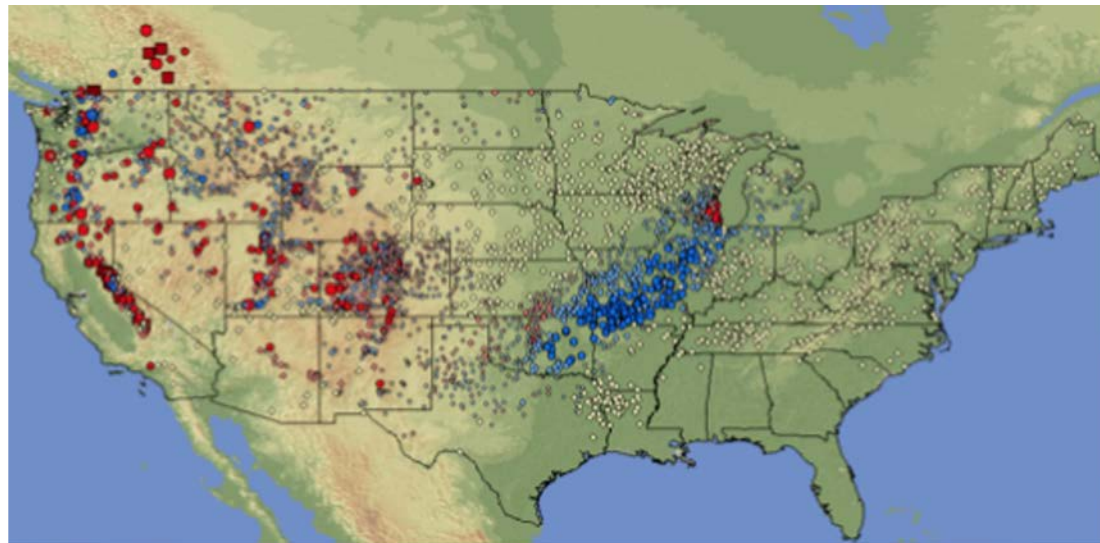




Snow Observational Assimilation



If pattern of differences is explainable, an update field is generated and used to nudge the model towards the observed state



Uncertainties in driving data

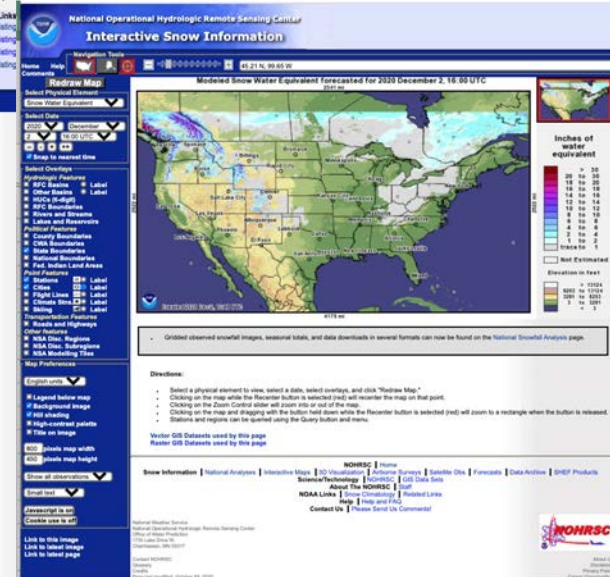
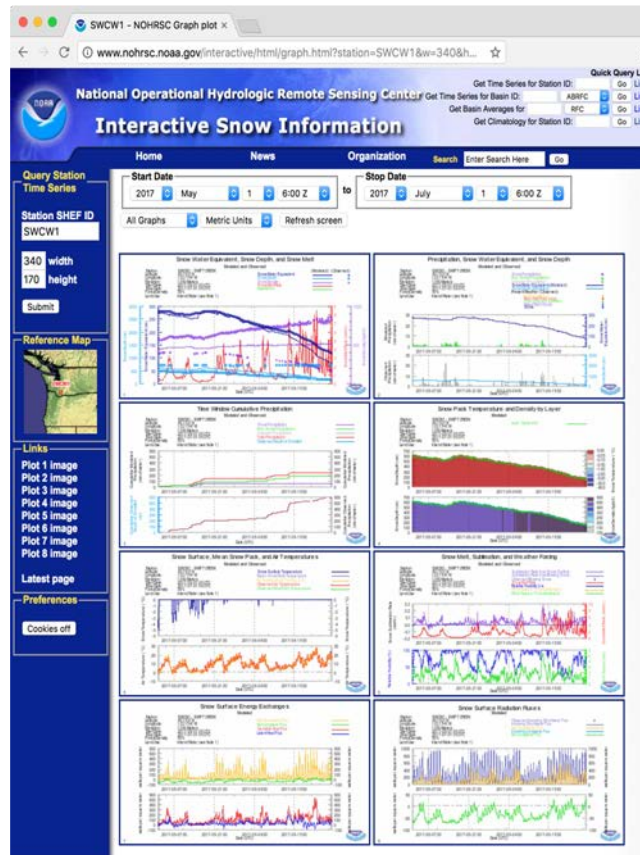
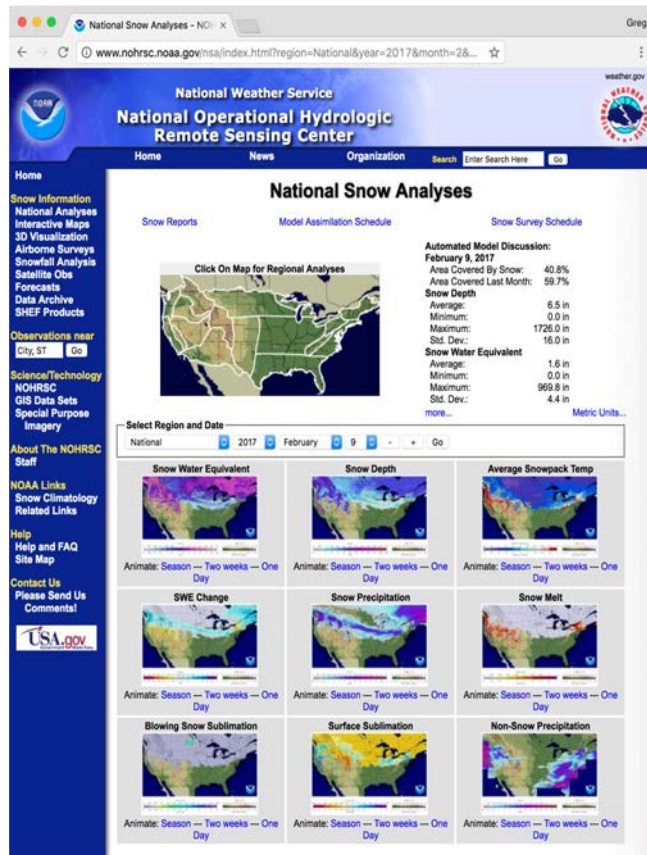
- Precipitation under / over estimation
- Typing issue; rain / snow
- Placement of storm track

Uncertainties due to model physics

- Melt problems due to temperature bias
- Sublimation rates
- Energy



Products and Services



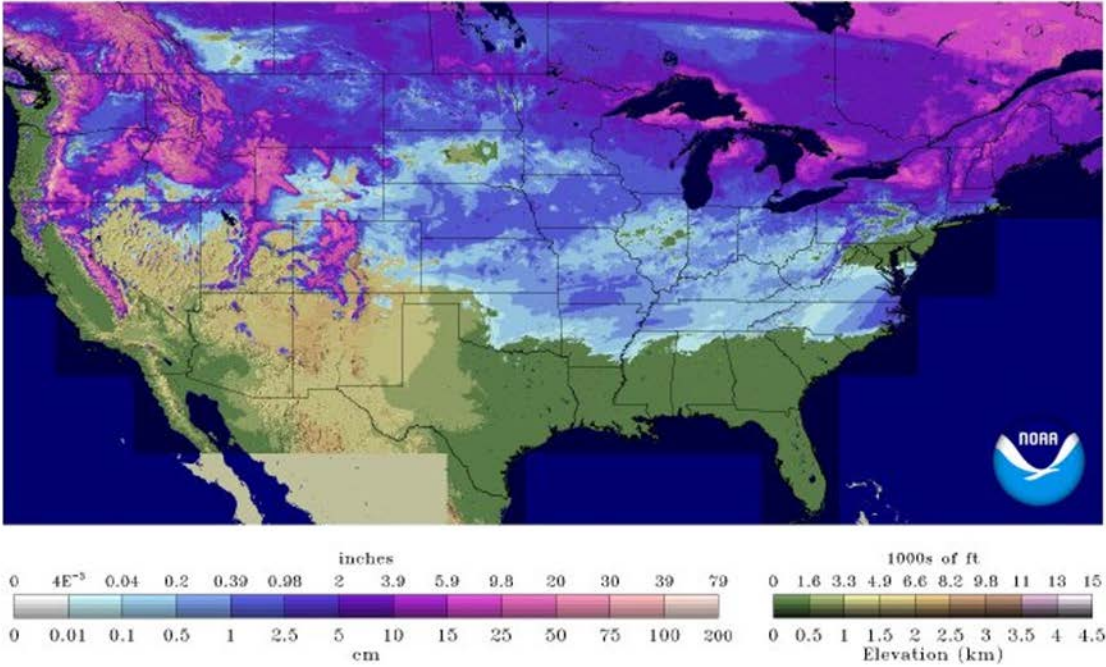


NOHRSC NSA


57.1% of CONUS snow covered on February 20, 2025

National Snow Analysis
OWP OFFICE OF WATER PREDICTION

Snow Water Equivalent
2025-02-20 06 UTC







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National Snow Analyses

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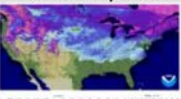
Click On Map for Regional Analyses

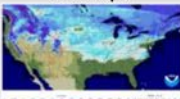


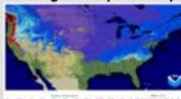
Automated Model Discussion:
February 20, 2025
Area Covered By Snow: 57.1%
Area Covered Last Month: 33.7%
Snow Depth
Average: 5.2 in
Minimum: 0.0 in
Maximum: 3112.0 in
Std. Dev.: 11.8 in
Snow Water Equivalent
Average: 1.3 in
Minimum: 0.0 in
Maximum: 1864.3 in
Std. Dev.: 4.1 in
[more...](#)[Metric Units...](#)


Select Region and Date


National2025February20-+Go


Snow Water Equivalent
Animate: Season --- Two weeks --- One Day


Snow Depth
Animate: Season --- Two weeks --- One Day


Average Snowpack Temp
Animate: Season --- Two weeks --- One Day


SWE Change
Animate: Season --- Two weeks --- One Day

Snow Precipitation
Animate: Season --- Two weeks --- One Day

Snow Melt
Animate: Season --- Two weeks --- One Day

Blowing Snow Sublimation
Animate: Season --- Two weeks --- One Day

Surface Sublimation
Animate: Season --- Two weeks --- One Day

Non-Snow Precipitation
Animate: Season --- Two weeks --- One Day

Snow Reports





Move toward the middle Atlantic coast. Four to six inches of snow are likely in the southern Great Lakes region, with up to a foot possible in northern Virginia through central Maryland. Light freezing rain is possible on the southern side of this snowband, roughly from western North Carolina through eastern Maryland.

Rapid deepening of the combined low will continue as the low moves offshore by Thursday. A foot of snowfall is likely over a small area of the East Coast, roughly from northern Virginia through eastern Massachusetts. At least 4 inches of snowfall is likely from Lake Erie through southern New Hampshire, south to eastern Virginia and in West Virginia. The system will be far enough to sea that little precipitation is expected on Thursday.

A weak surface low will move into the Southwest from the Pacific today and bring up to a half-foot of snowfall to the southern Sierra Nevada. Widespread light precipitation is expected across the Southwest tomorrow. By Thursday, the low and its associated upper trough will move into the southern Plains, and a surface low is expected to spin up in the northwestern Gulf Coast. Sufficiently-cold air will be in place over the southern Plains to cause up to 1/2 foot of snowfall along the lower Red River on Thursday, with 1/2 to 1 inch of rainfall possible farther south from eastern Texas through Mississippi. This system will move eastward across the northern Gulf during the rest of the week and is expected to hook northeastward to the East Coast by the weekend.

Snow Reports

Top Ten:

Metric Units...

Station ID	Name	Elevation (feet)	Snowfall (in)	Duration (hours)	Report Date / Time(UTC)
LCVP1	LAUREL CAVERNS	2717	34.000	48	2010-02-08 12
0620H_MADIS	ANGEL FIRE 0.2 SSE, NM	8530	13.000	24	2010-02-08 14
AGFN5	ANGEL FIRE - INACT	8648	12.000	24	2010-02-08 22
1539C_MADIS	QUIRAY 23 NNW, CO	7740	10.100	24	2010-02-08 15
URYC2	QUIRAY SPOTTER	7733	10.100	24	2010-02-08 15
7066A_MADIS	CRIPPLE CREEK 5.1 NW, CO	8533	10.000	24	2010-02-08 15
EADG2	EADS, CO	4226	10.000	24	2010-02-08 14
GARO1	UNKNOWN	1030	10.000	24	2010-02-08 12
WSAC2	SKI AREA	11345	10.000	24	2010-02-08 14
MSC14	MASON CITY #1	1132	5.000	12	2010-02-09 05

Note: these data are unofficial and provisional.

Zip codes (where available) of observations will be included in text files after October 7, 2008.

[Station Snowfall Reports](#)

[Station Snow Water Equivalent Reports](#)


[Station Snowdepth Reports](#)

Model Assimilation

A data assimilation as done across the upper Rio Grande through the Plains to Tennessee River basin on December 9. Our model over-produced snowfall from the most recent storm in this region, and there was some mis-typing of precipitation. Three-quarters to 1 1/4 inches of water was removed from the modeled snowpack in Kansas through western Missouri. One-half to 3/4 inch of water was also removed from the Llano Escabado and Caprock. Up to an inch of water was removed from Arkansas through western Tennessee.

NOHRSC Airborne Snow Survey Program

The Airborne program has no scheduled flights in this region for the week of February 08, 2010.



National Weather Service

National Operational Hydrologic Remote Sensing Center

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National Snow Water Equivalent Observations

from 2010-02-08 07:00 Z to 2010-02-09 06:00 Z

Note: these data are unofficial and provisional.
Latitude and longitude of observations will be included in text files after December 1, 2006.

Text file with Metric units

Text file with English units

Table with Metric Units

Station ID	Date (UTC)	Value (in)	Elevation (feet)	Station Description
LLPC1	2010-02-09 06	72.340	8248	LOWER LASSEN PEAK SNOW COURSE
EPDW1	2010-02-09 06	66.500	5249	21A07 - EASY PASS AM
SLTC1	2010-02-08 12	53.900	5712	SLATE CREEK
HRMC1	2010-02-08 12	47.100	6260	RED ROCK MOUNTAIN
SHMC1	2010-02-08 12	46.800	6411	SHIMMY LAKE GOES
HIGC1	2010-02-08 12	45.200	5922	HIGHLANDS LAKES GOES
BKWR1	2010-02-09 06	44.800	4033	BUCKINGHORSE
SDPC1	2010-02-08 12	44.100	6827	SAND FLAT
SWCW1	2010-02-09 06	42.400	4491	SWIFT CREEK
BNKC1	2010-02-08 12	41.000	5046	BONANZA KING
BKLC1	2010-02-09 06	40.800	5771	BUCKS LAKE
HRMC1	2010-02-09 06	40.700	4534	HARKNESS FLAT
BTMC1	2010-02-08 12	40.300	5299	STOUTS MEADOW GOES
TAHQ2	2010-02-09 06	38.770	5184	TAHTSA LAKE WEST SNOW PILLOW
AFBW1	2010-02-09 06	38.300	5151	PARADISE
MTQ2	2010-02-09 06	37.800	5180	MOUNT COOK
SZKQ2	2010-02-09 06	37.200	3583	SFUZZUM CREEK SNOW PILLOW
CWRQ2	2010-02-09 06	36.900	5141	CHILLWACK RIVER SNOW PILLOW
LLSC1	2010-02-09 06	36.620	8274	LAKE LOIS
MRSW1	2010-02-09 06	36.500	5413	MORSE LAKE
TENQ2	2010-02-09 06	36.500	5482	TENQUILLE LAKE
LYLW1	2010-02-09 06	35.800	6516	LYMAN LAKE
AZUQ2	2010-02-09 06	35.750	5331	AZURE RIVER
LELC1	2010-02-09 06	34.600	9606	LEAVITT LAKE
REDQ2	2010-02-09 06	34.200	6818	REDFISH CREEK
HRSC1	2010-02-08 12	34.100	8609	HORSE MEADOWS
MOUQ2	2010-02-09 06	33.620	4941	MOLSON CREEK SNOW PILLOW
TSAQ2	2010-02-09 06	33.460	4482	TSAI CREEK
MOBC1	2010-02-08 12	33.100	8703	MIDDLE BOULDER 1 SNOW COURSE
POBW1	2010-02-09 06	31.900	4629	PARK CREEK RIDGE
CAYW1	2010-02-09 06	31.800	5364	CAYUSE PASS
MRTW1	2010-02-09 06	31.000	3650	MARTEN RIDGE
YNUV1	2010-02-08 12	31.000	6752	VAN VLECKV. REMARKS=
WHSW1	2010-02-09 06	30.800	5007	WATERHOLE
MELC1	2010-02-08 12	30.300	7513	MEADOW LK SNOW COURSE

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Nearest observations to
Aberdeen, SD

Note: these data are unofficial and provisional.

Location and Date
Enter your "City, ST (or Latitude, Longitude)"

Closest 5 observations near Aberdeen, SD Latest between 2020-02-26 06:00 UTC
45.46°N, -98.49°W (Elevation: 1302 ft) and 2020-02-27 06:00 UTC

Raw Snowfall Observations

Station ID	Name	Elev. (ft)	Raw Snowfall (in)	Duration (hours)	Date (UTC)	Distance
SD-BR-11	ABERDEEN 1.5 SSW, SD	1306	0.00	24	2020-02-26 13	1.3 mi SSW
ABES2	ABERDEEN 3E	1296	0.00	6	2020-02-26 12	3.6 mi E
ABES2	ABERDEEN 3E	1296	0.00	24	2020-02-26 12	3.6 mi E
ABR	ABERDEEN, SD	1299	0.00	24	2020-02-26 12	3.6 mi E
SD-SP-6	TURTON 0.0 NNE, SD	1325	0.00	24	2020-02-26 13	34.4 mi SE

Snow Depth Observations

Station ID	Name	Elev. (ft)	Snow Depth (in)	Date (UTC)	Distance
ABES2	ABERDEEN 3E	1296	6.00	2020-02-26 12	3.6 mi E
ABR	ABERDEEN, SD	1299	6.00	2020-02-26 12	3.6 mi E
BRIS2	BRITTON, SD	1335	10.00	2020-02-26 13	41.9 mi ENE
ROSS2	ROSCOE, SD	1811	5.00	2020-02-26 13	42 mi W
DOLS2	DOLAND	1345	9.00	2020-02-26 14	43.5 mi SE

Snow Water Equivalent Observations

No observations within 62 miles

Raw Precipitation Observations

Station ID	Name	Elev. (ft)	Raw Precipitation (in)	Duration (hours)	Date (UTC)	Distance
E7560_MADIS	EW7560 ABERDEEN	1309	0.00	1	2020-02-26 16	1.5 mi NW
E7560_MADIS	EW7560 ABERDEEN	1309	0.00	24	2020-02-26 16	1.5 mi NW
AMCS2	MOCCASIN CREEK AT ABERDEEN	1289	0.00	1	2020-02-26 16	1.6 mi E
AMCS2	MOCCASIN CREEK AT ABERDEEN	1289	0.00	24	2020-02-26 16	1.6 mi E
KABR	ABERDEEN REGIONAL AIRPORT	1296	0.00	6	2020-02-26 12	3.5 mi ESE





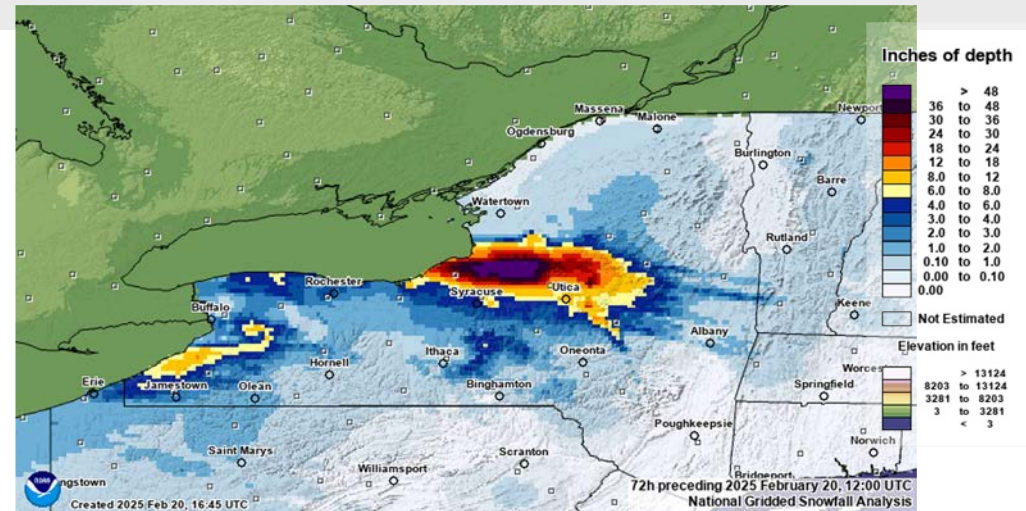
OWP Winter Hydrology Update

20 February, 2025

Lake Effect Snow! Rivers Receding

Key Messages

- Rivers are receding through the region
- Lake Effect Snow 5-6' Snow Observed
 - NRCC Snow Data & Products from NOAA's NOHRSC- February 27 at 9:30 AM



NEW

Important Updates

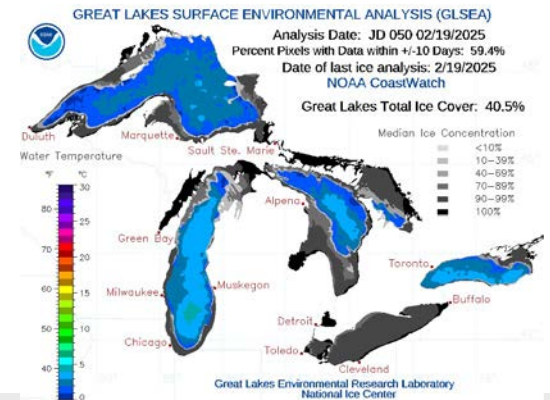
- Twin Otter positioned in WV pending maintenance and weather - Will be transiting to New York / Northeast once WV completed.

Next Scheduled Update

- 27 February 2025



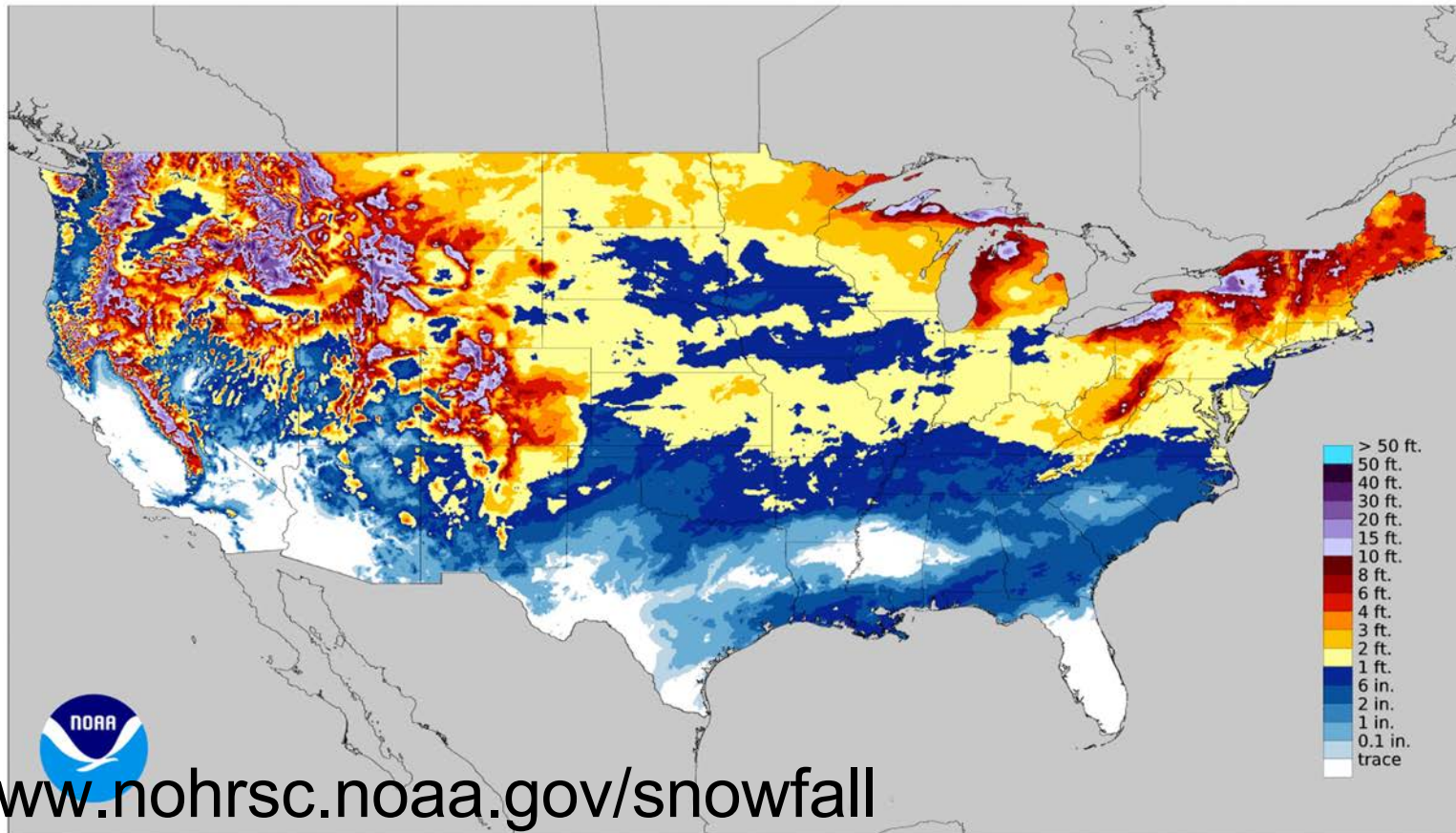
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Atmospheric Administration
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National Snowfall Analysis: accumulation from 2024-09-30 to 2025-02-26

Issued 2025-02-27 00:04:55 UTC

January 14th, 2025



www.nohrsc.noaa.gov/snowfall

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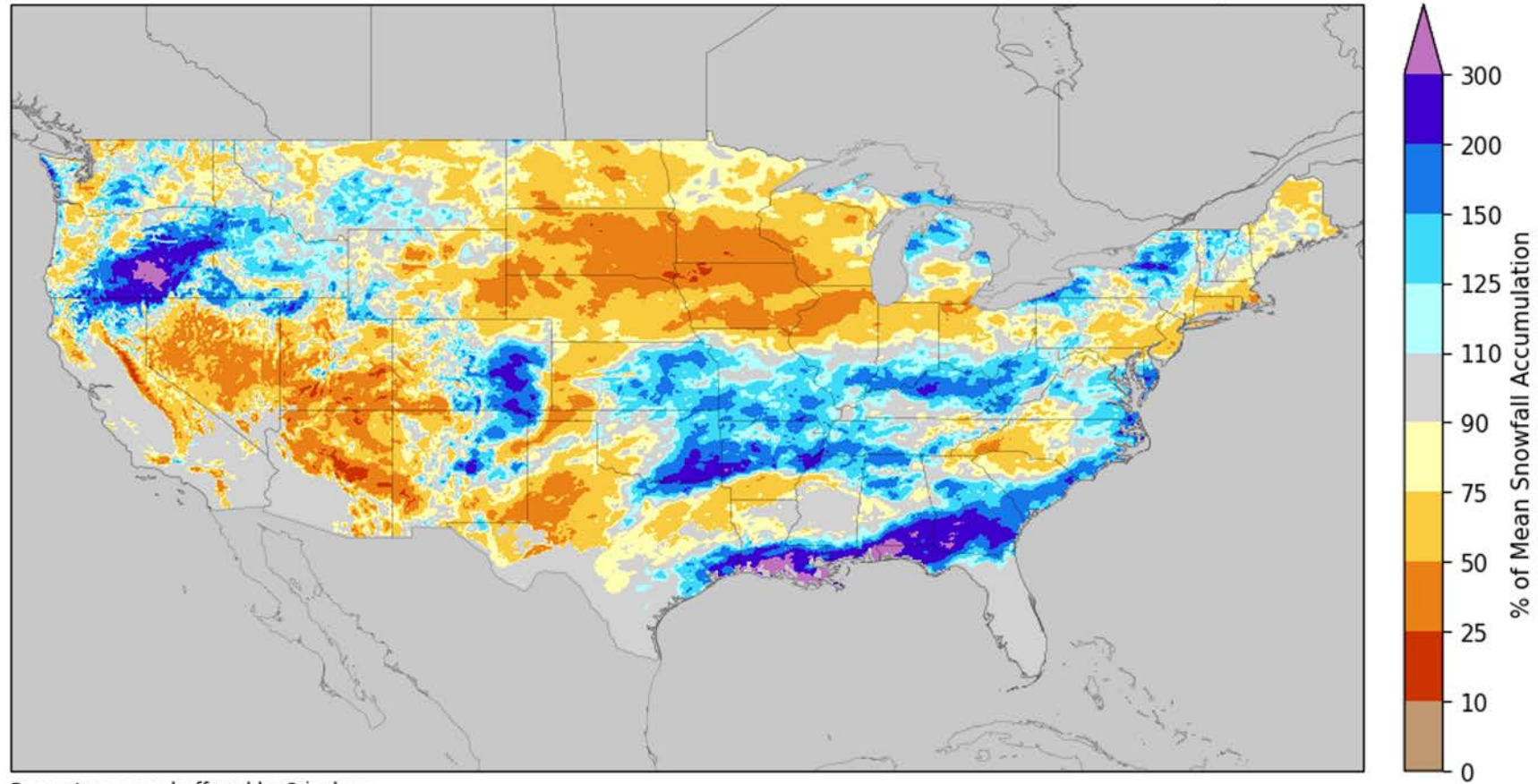


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National Snowfall Analysis:

Percent of 15-Year (2009/10-2023/24) Mean Accumulation for October 1, 2024 - February 25, 2025

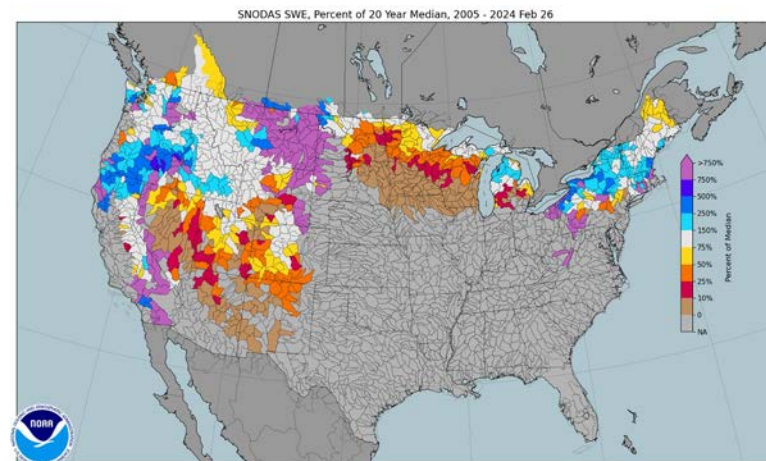
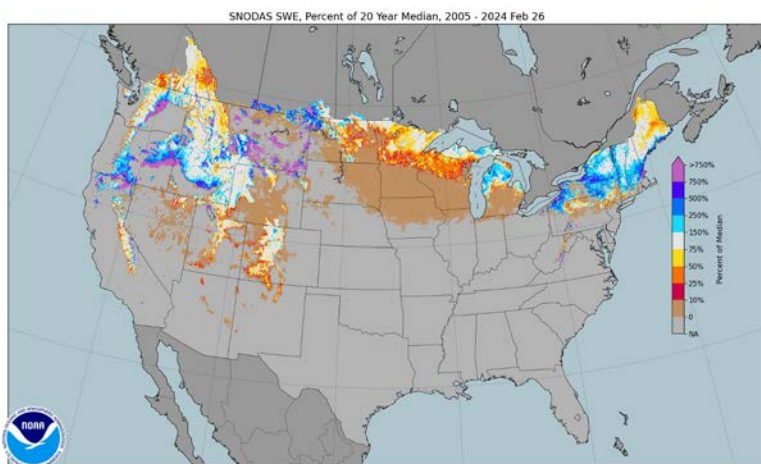
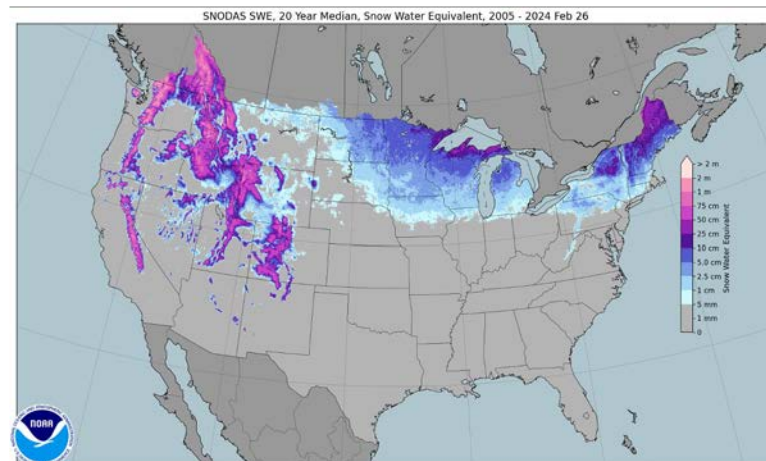
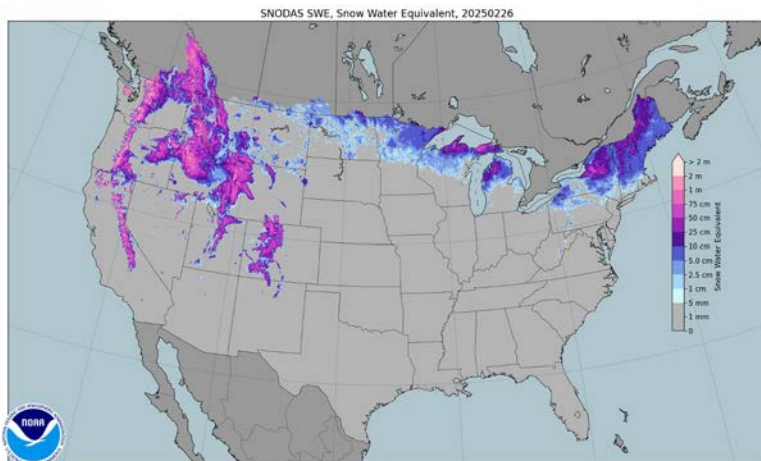


Percentages are buffered by 3 inches.



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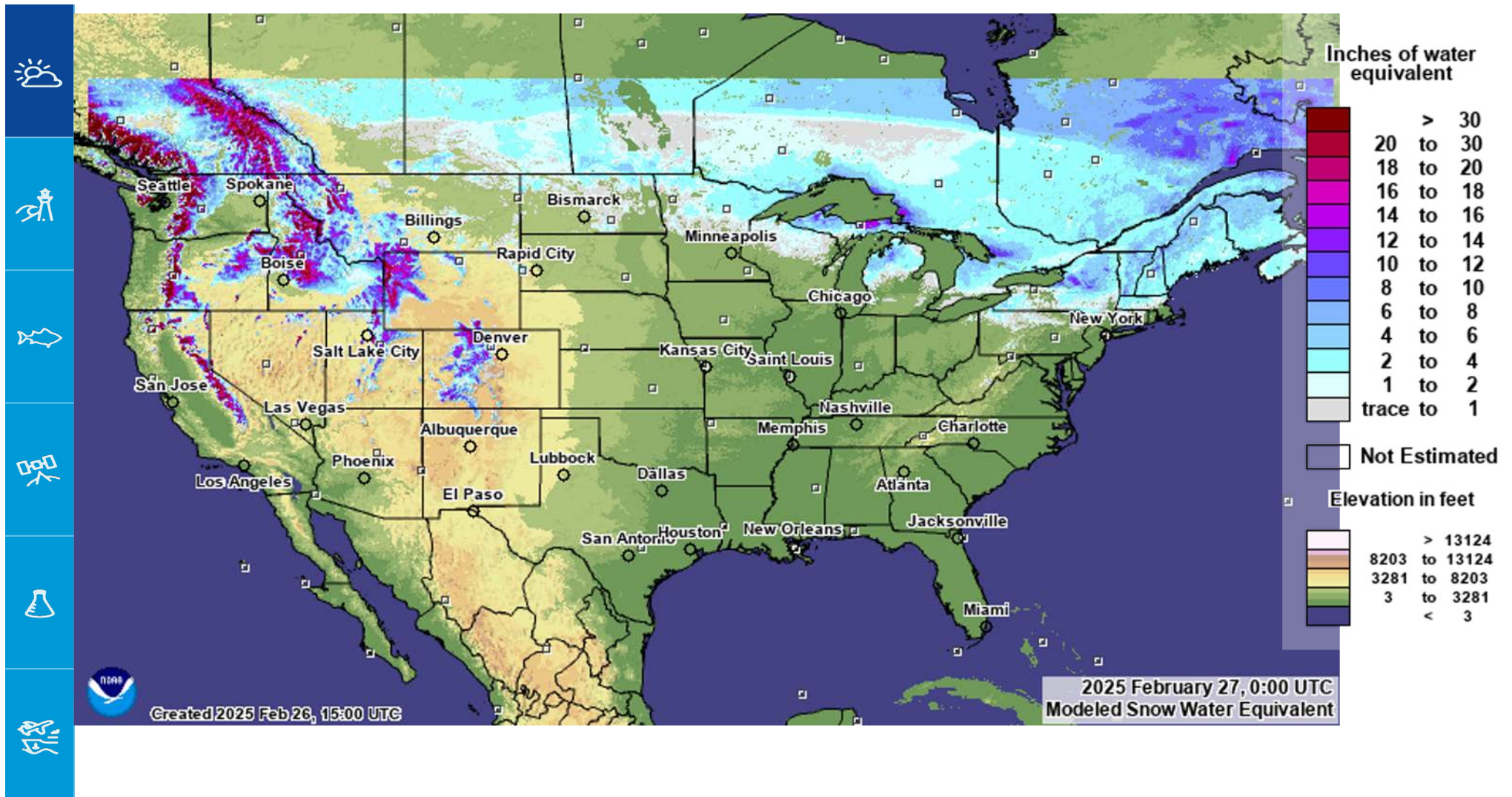
www.nohrsc.noaa.gov/normals



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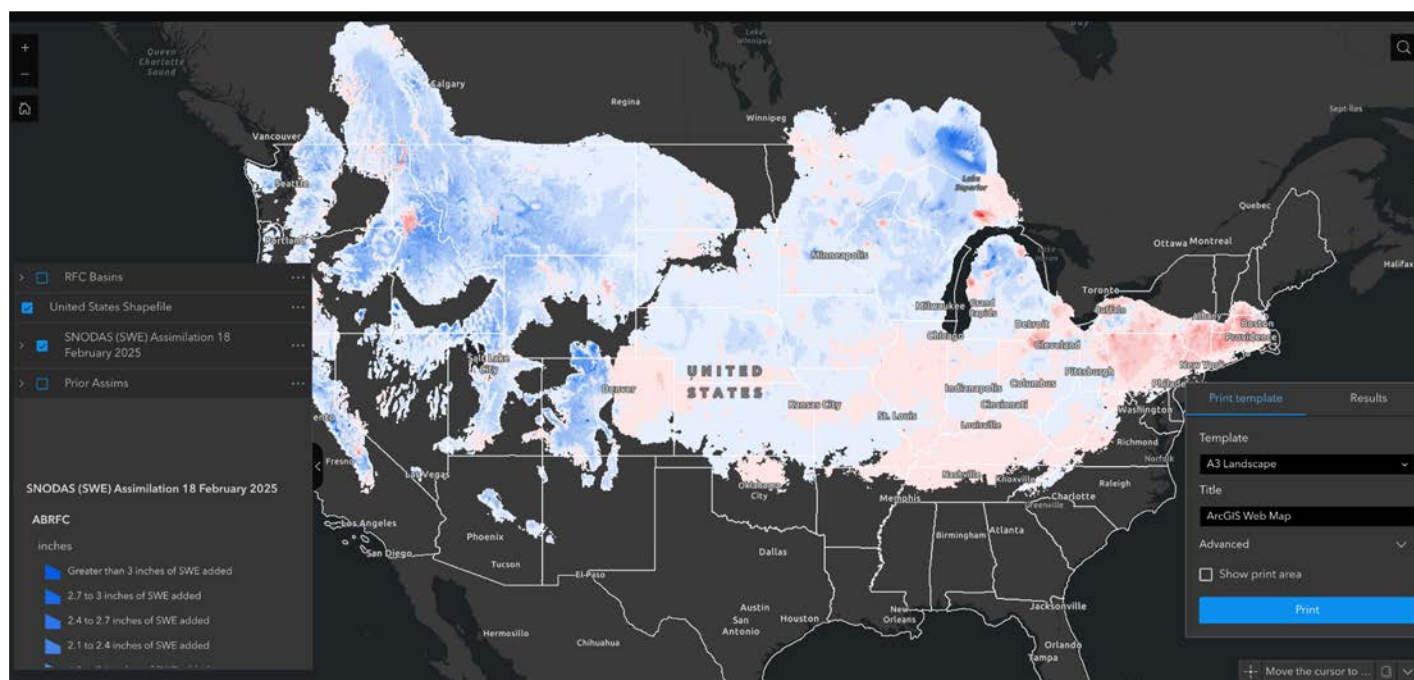
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20 February, 2025

Assimilations Since Last Meeting

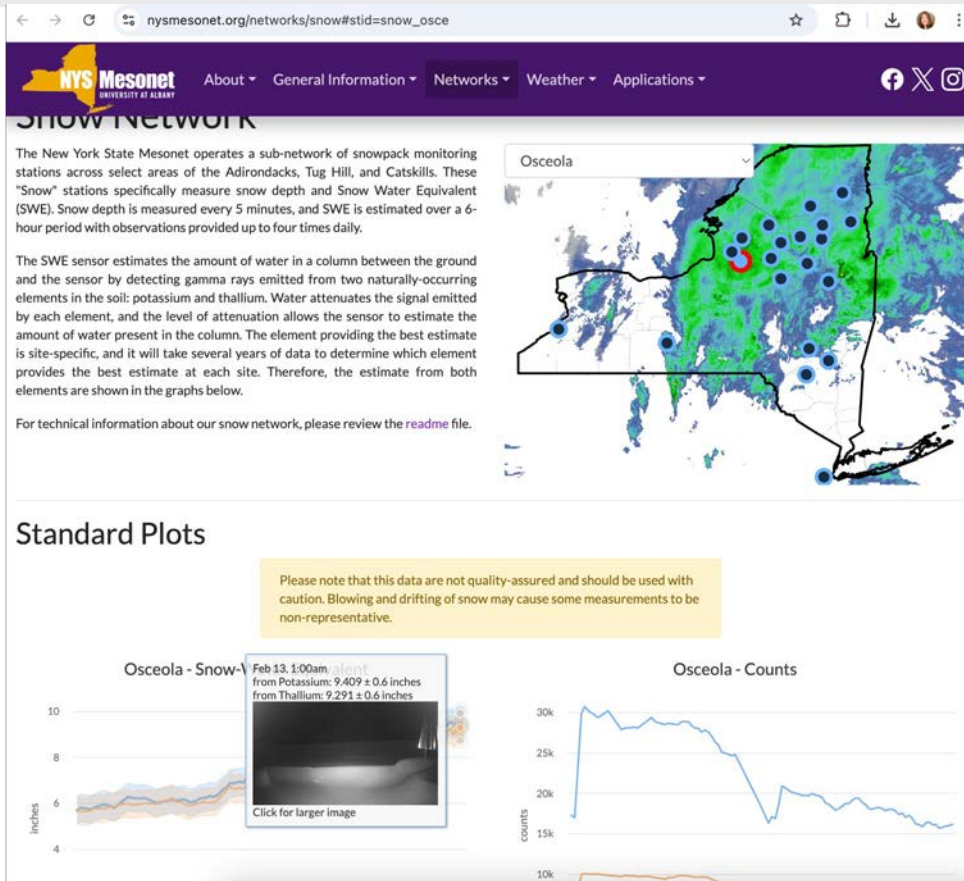


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20 February, 2025



	A	B	C	D	E	F	G	H	I	J	K
1	SNOW_BRA	Brant	42.59494	-79.02154	0.06731	-9999	2025	2	10	12	
2	SNOW_CLAR	Claryville	41.9792	-74.5171	0.07112	-9999	2025	2	10	12	
3	SNOW_COLE	Cold Brook	43.26189	-74.98475	0.13589	-9999	2025	2	10	12	
4	SNOW_CRO	Croghan	43.97496	-75.201	0.21336	-9999	2025	2	9	12	
5	SNOW_EDIN	Edinburg	43.22839	-74.112	0.09271	-9999	2025	2	10	12	
6	SNOW_HARI	Harrisburg	43.80392	-75.68873	0.19177	-9999	2025	2	10	12	
7	SNOW_ILAK	Indian Lake	43.79067	-74.23933	0.08763	-9999	2025	2	10	12	
8	SNOW_NEW	Newcomb	43.97329	-74.22273	0.09906	-9999	2025	2	10	12	
9	SNOW_NHU	North Hudson	44.0131	-73.70516	0.08382	-9999	2025	2	10	12	
10	SNOW_OLD	Old Forge	43.74149	-74.97833	0.19431	-9999	2025	2	10	12	
11	SNOW_OSC	Osceola	43.49915	-75.71175	0.23368	-9999	2025	2	10	12	
12	SNOW_PISE	Piseco	43.46474	-74.50432	0.09525	-9999	2025	2	10	12	
13	SNOW_RAQ	Raquette Lake	43.82275	-74.62509	0.13716	-9999	2025	2	10	12	
14	SNOW_RED	Redfield	43.62136	-75.87813	0.19558	-9999	2025	2	10	12	
15	SNOW_ROX	Roxbury	42.3312	-74.46918	0.06477	-9999	2025	2	10	12	
16	SNOW_TAN	Tannersville	42.17071	-74.11343	0.09271	-9999	2025	2	10	12	
17	SNOW_TUP	Tupper Lake	44.22128	-74.43826	0.11811	-9999	2025	2	10	12	
18	SNOW_TYR	Tyrone	42.40319	-77.0535	0.03175	-9999	2025	2	10	12	
19	SNOW_WFN	Whiteface N	44.39324	-73.85883	0.08382	-9999	2025	2	10	12	
20	SNOW_WGA	Woodgate	43.53241	-75.1586	0.13843	-9999	2025	2	10	12	
21											
22											
23											
24											



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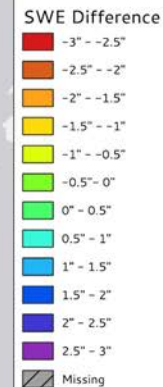
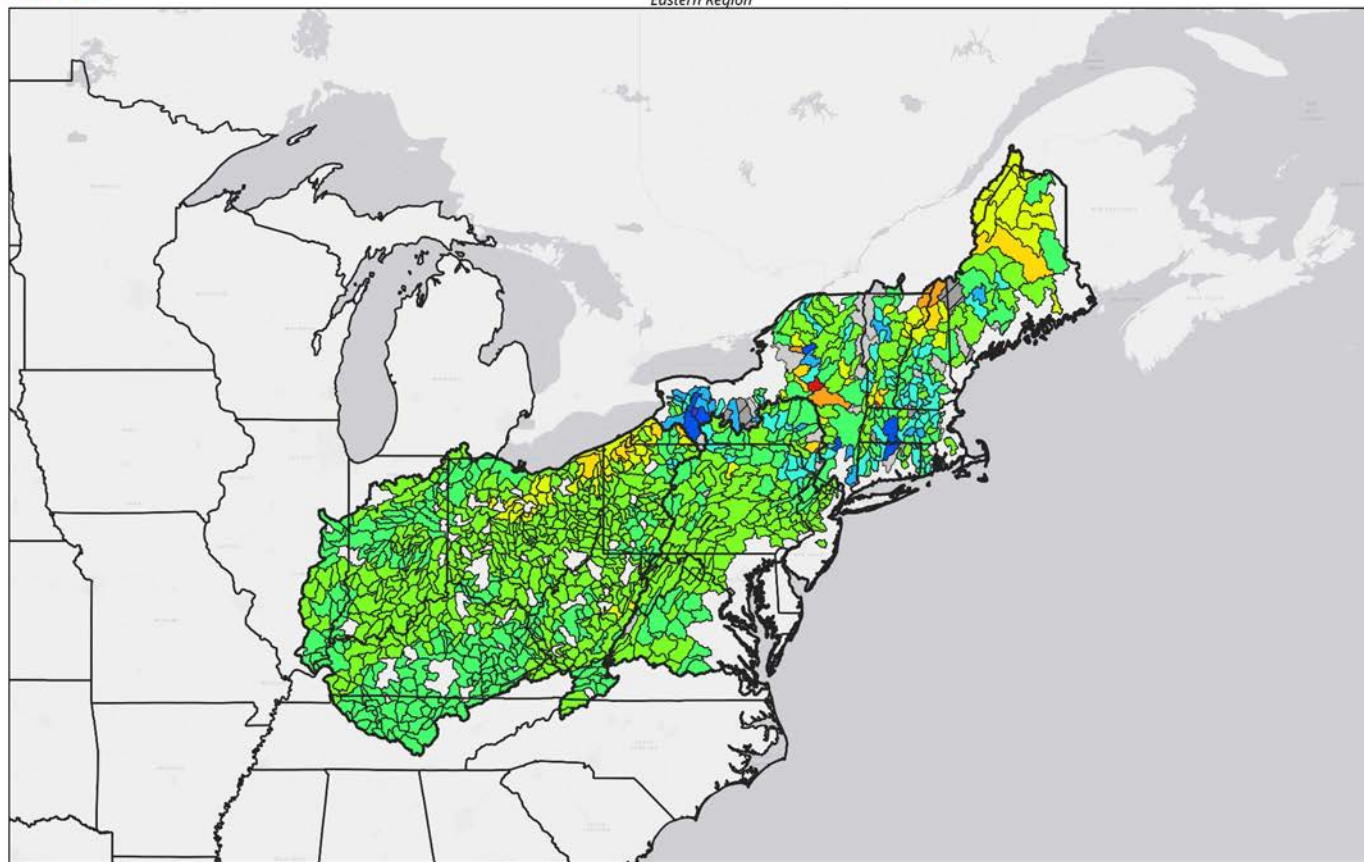


20 February, 2025



SNOW17 - SNODAS
Valid Date: 2025-02-20
Eastern Region

NWC National Water Center



Delta of SNOW17 and SNODAS. Warmer colors indicate SNODAS is modeling higher SWE, cooler colors indicate SNOW17 is modeling higher SWE.



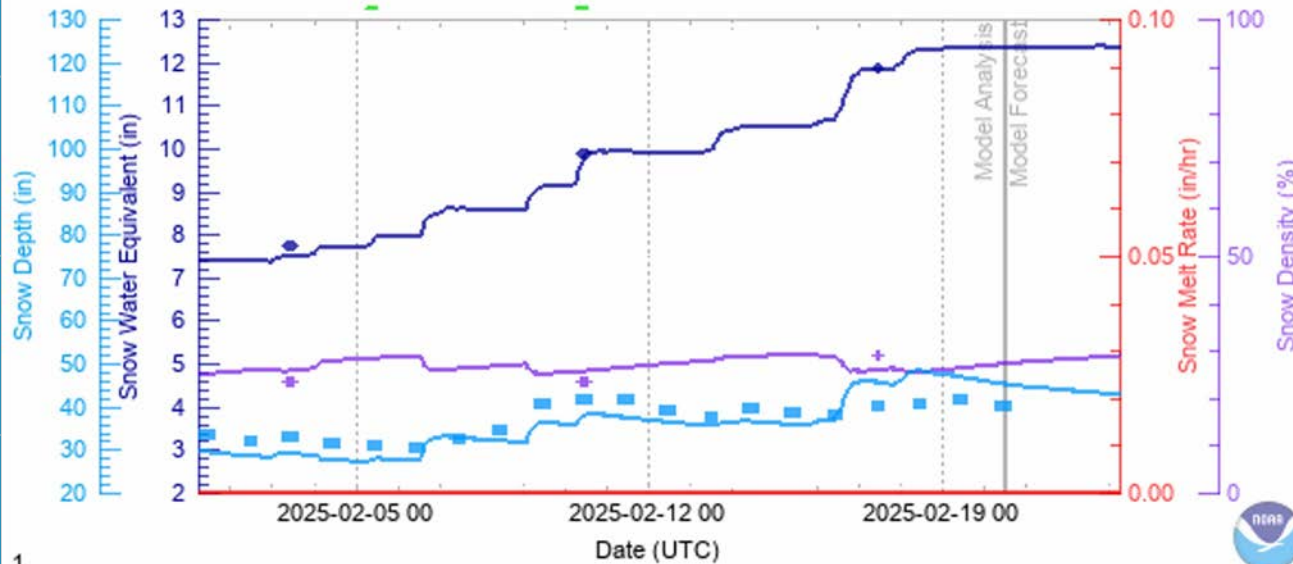
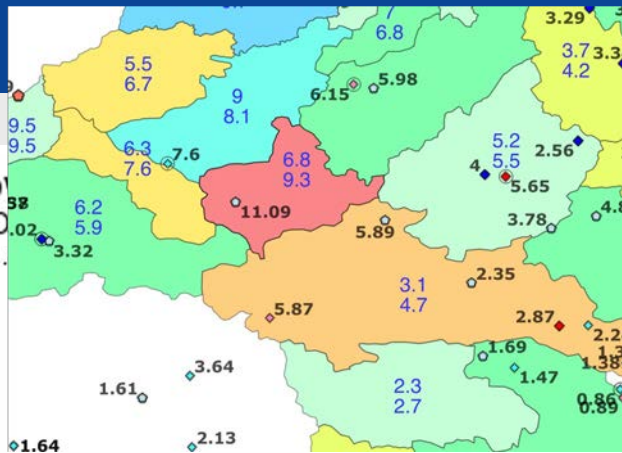
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Snow Water Equivalent, Snow Depth, and Snow Melt Rate

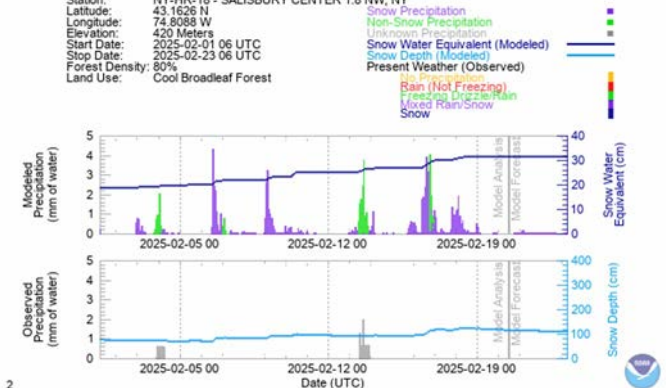
Station: NY-HR-18 - SALISBURY CENTER 1.8 NW, NY
Latitude: 43.1626 N
Longitude: 74.8088 W
Elevation: 420 Meters
Start Date: 2025-02-01 06 UTC
Stop Date: 2025-02-23 06 UTC
Forest Density: 80%
Land Use: Cool Broadleaf Forest



Precipitation, Snow Water Equivalent, and Snow Depth

Modeled and Observed

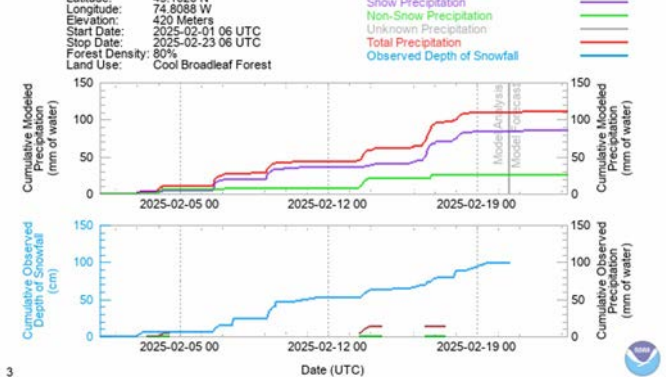
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Elevation: 420 Meters
Start Date: 2025-02-01 06 UTC
Stop Date: 2025-02-23 06 UTC
Forest Density: 80%
Land Use: Cool Broadleaf Forest



Time Window Cumulative Precipitation

Modeled and Observed

Station: NY-HR-18 - SALISBURY CENTER 1.8 NW, NY
Latitude: 43.1626 N
Longitude: 74.8088 W
Elevation: 420 Meters
Start Date: 2025-02-01 06 UTC
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Forest Density: 80%
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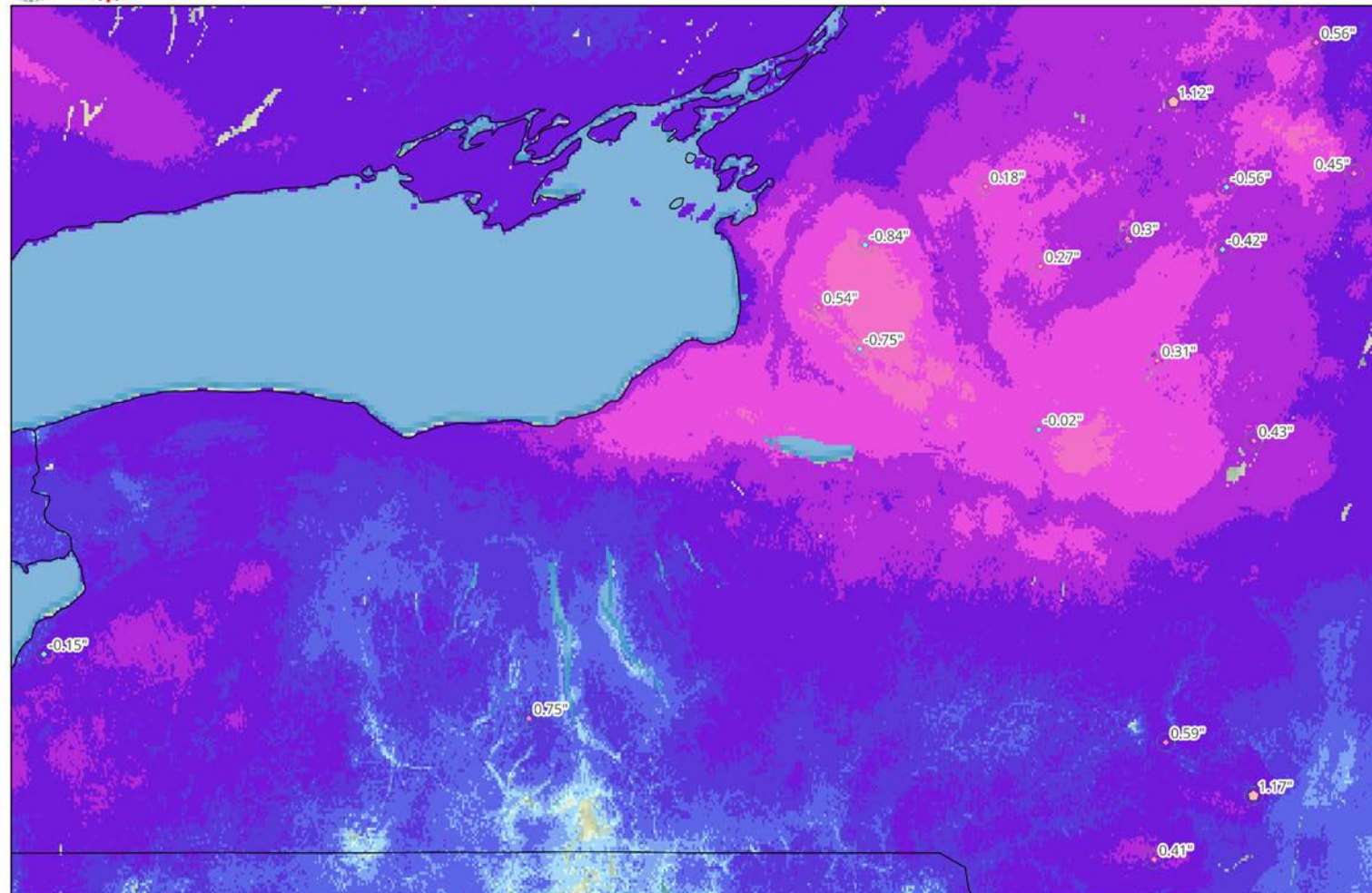
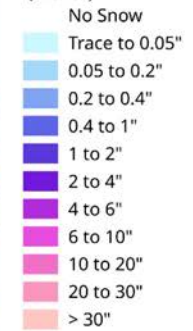


National Water Model Snow Water Equivalent - NY Mesonet Snow Survey

Valid: 20 February 2025 06Z

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Snow Water Equivalent (Inches)



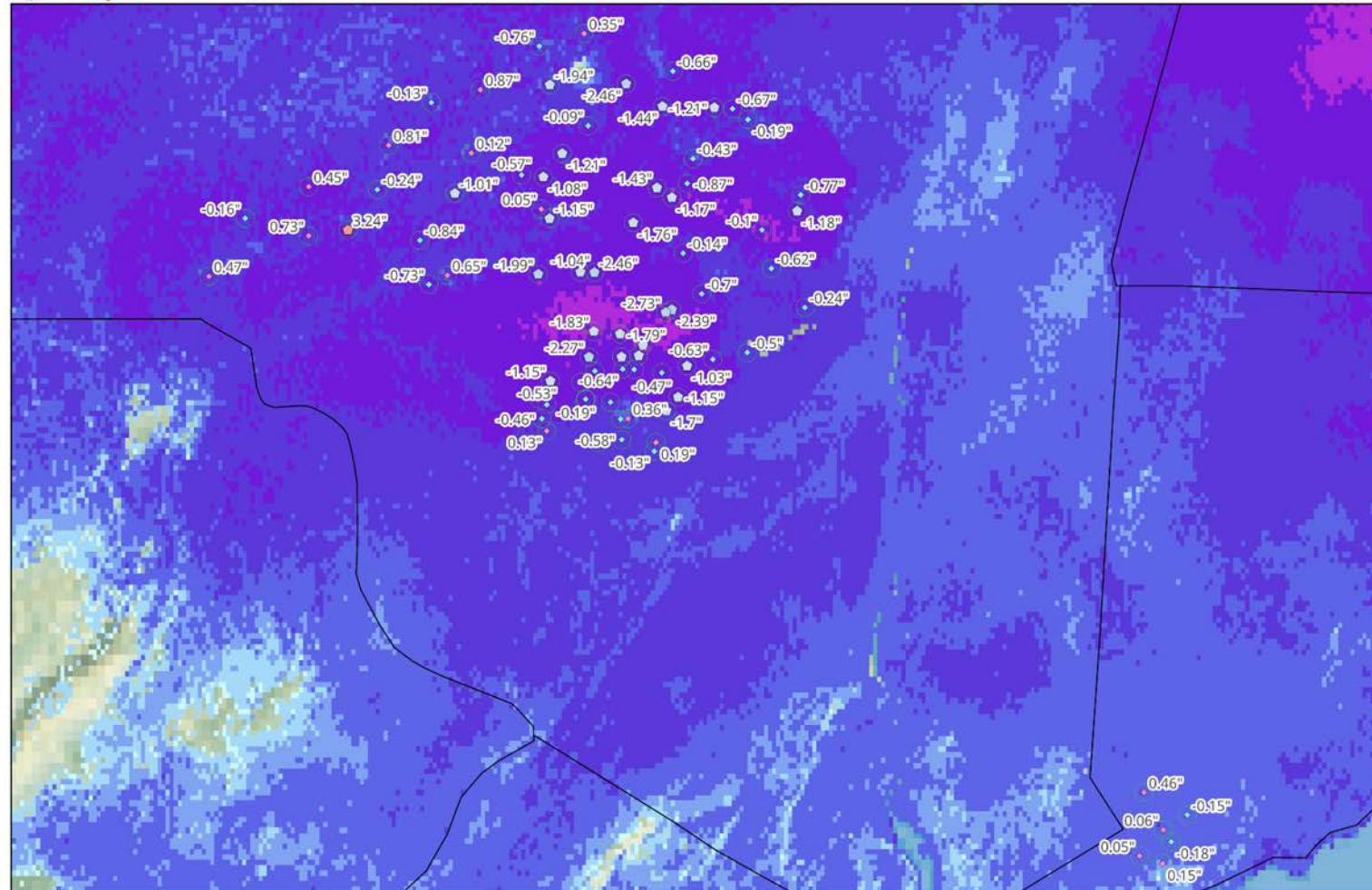


National Water Model Snow Water Equivalent - NYCDEP Snow Survey

Valid: 20 February 2025 06Z

NWC National Water Center

Snow Water Equivalent (Inches)





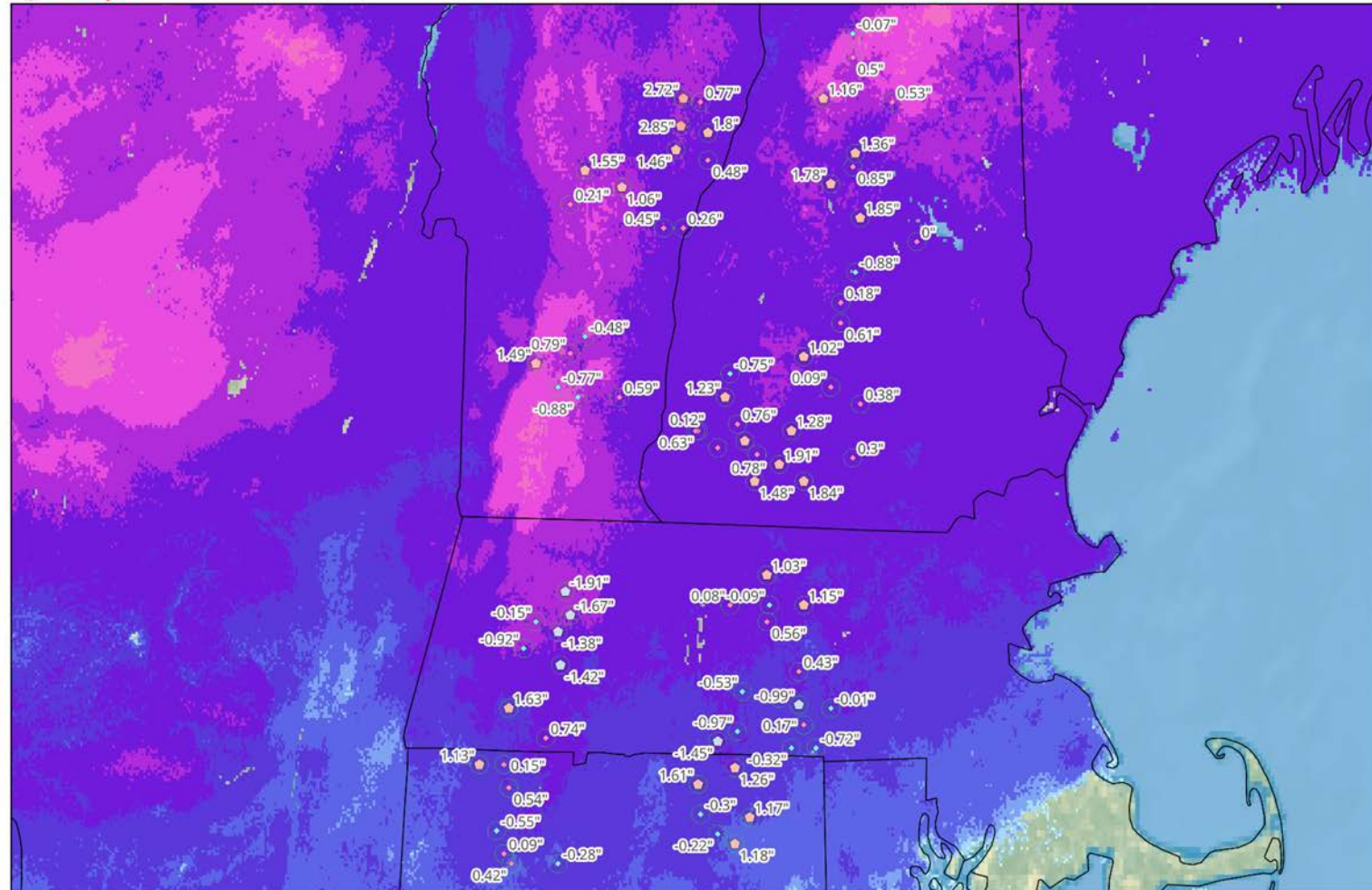
National Water Model Snow Water Equivalent -NEACE Snow Survey

Valid: 20 February 2025 06Z

NWC National Water Center

Snow Water Equivalent (Inches)

- No Snow
- Trace to 0.05"
- 0.05 to 0.2"
- 0.2 to 0.4"
- 0.4 to 1"
- 1 to 2"
- 2 to 4"
- 4 to 6"
- 6 to 10"
- 10 to 20"
- 20 to 30"
- > 30"

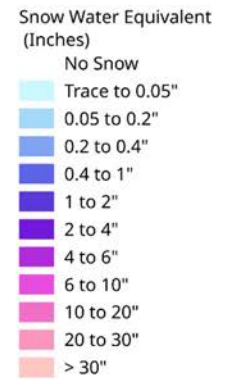




National Water Model Snow Water Equivalent - Maine Snow Survey

Valid: 20 February 2025 06Z

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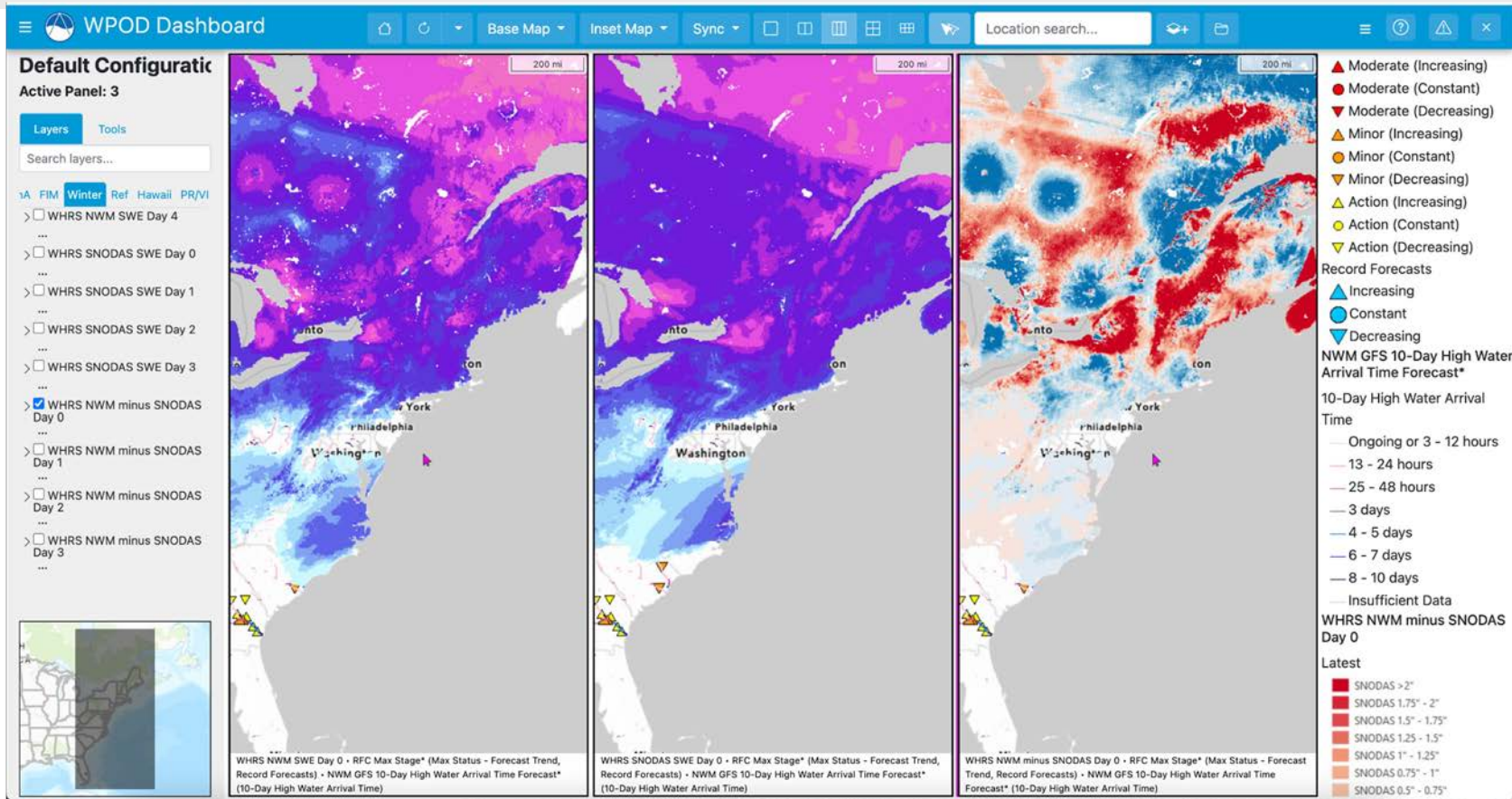
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20 February, 2025



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Wednesday, January 22, 2025 at 03:34:43 UTC



SARRIS for Alaska

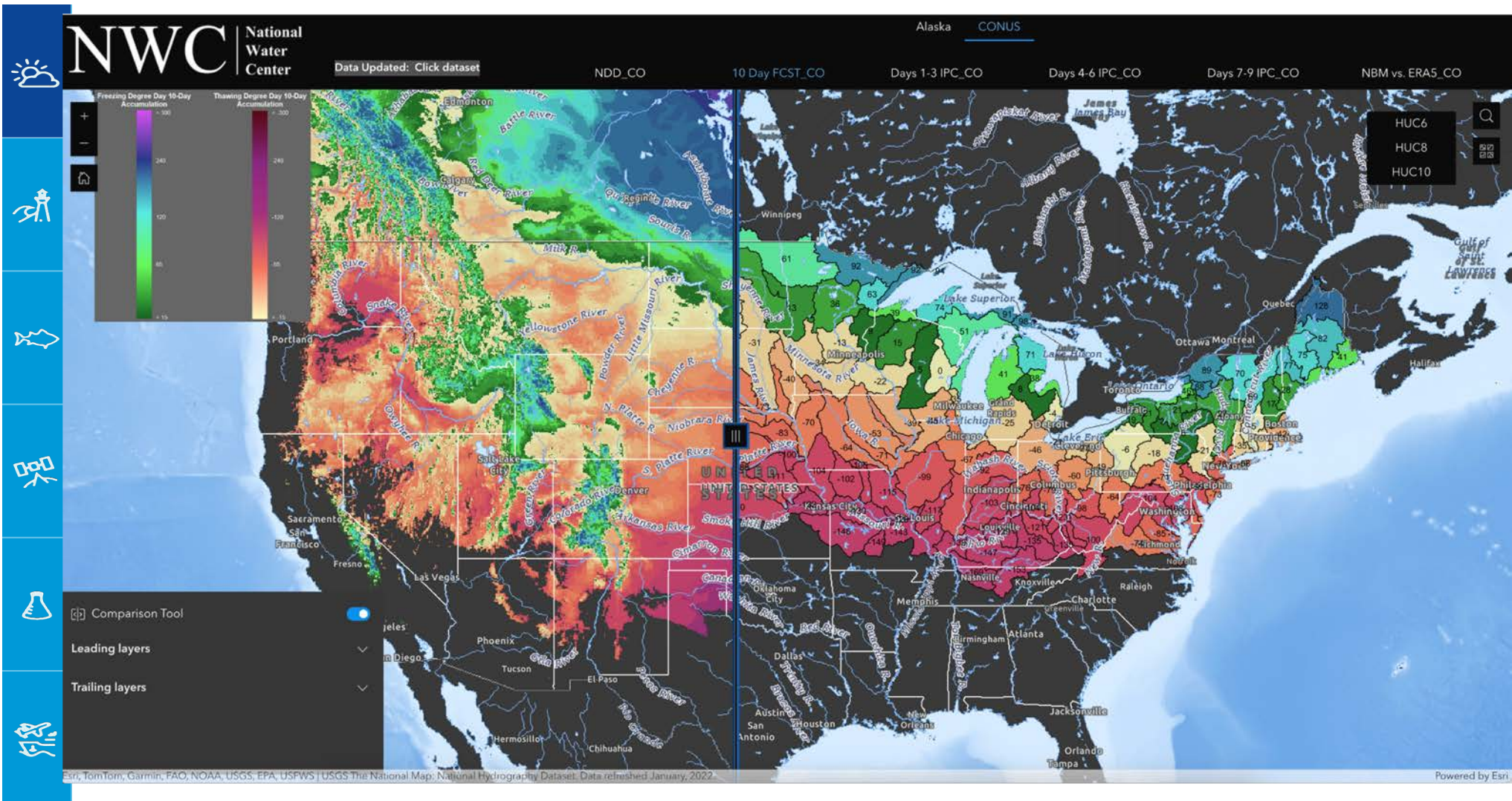
ArcGIS Online Application for SARRIS in Alaska. Application is updated as Sentinel-1 SAR is acquired and processed into SARRIS.

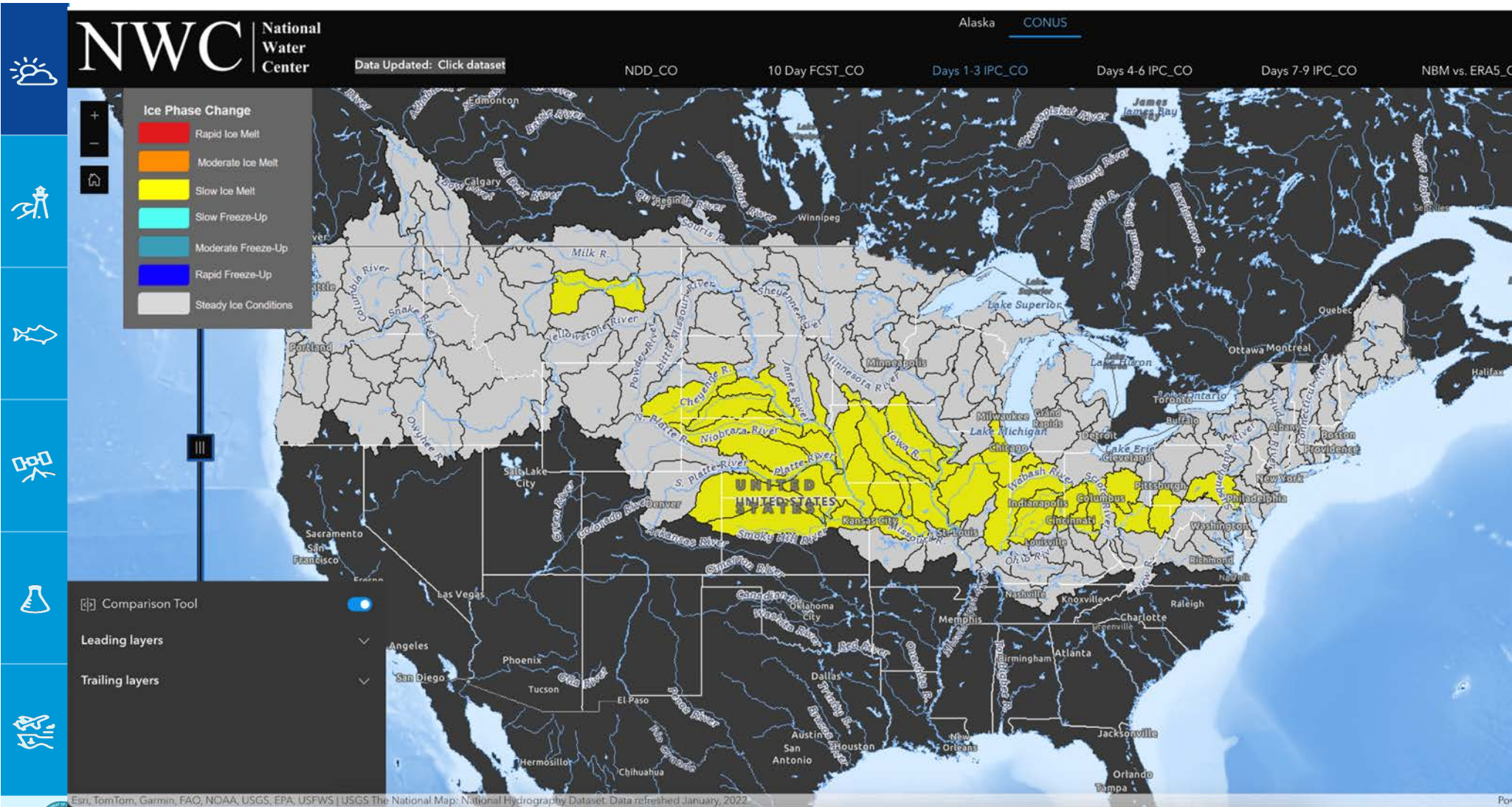


SARRIS for CONUS

ArcGIS Online Application for SARRIS in the Continental US. Application is updated as Sentinel-1 SAR is acquired and processed into SARRIS.



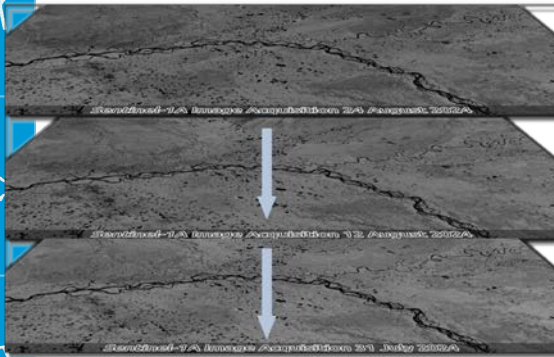




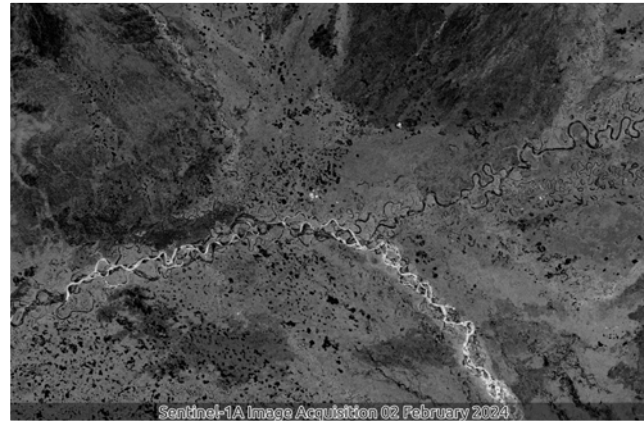
SARRIS Overview



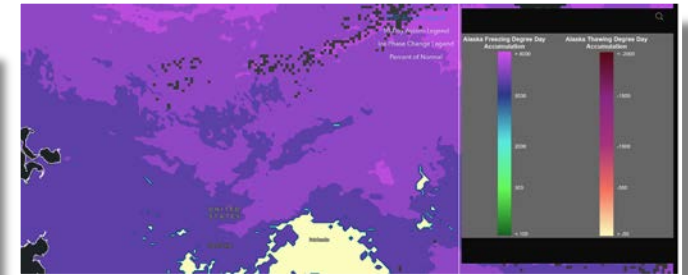
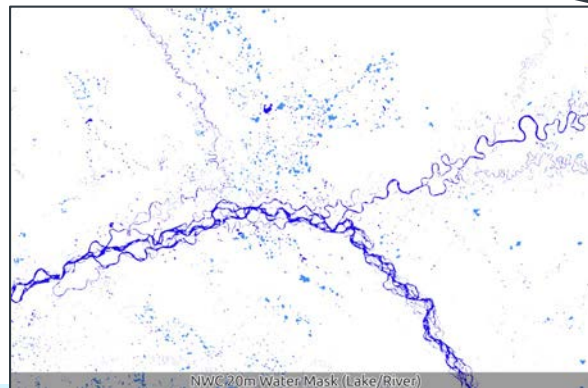
Synthetic Reference Image



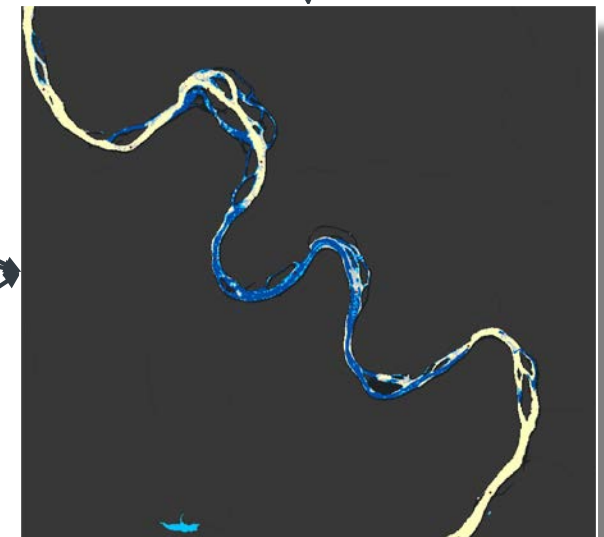
Mean	Standard Deviation
Minimum	Maximum



Winter Acquisition



A Priori Knowledge



SARRIS Change Detection Analysis



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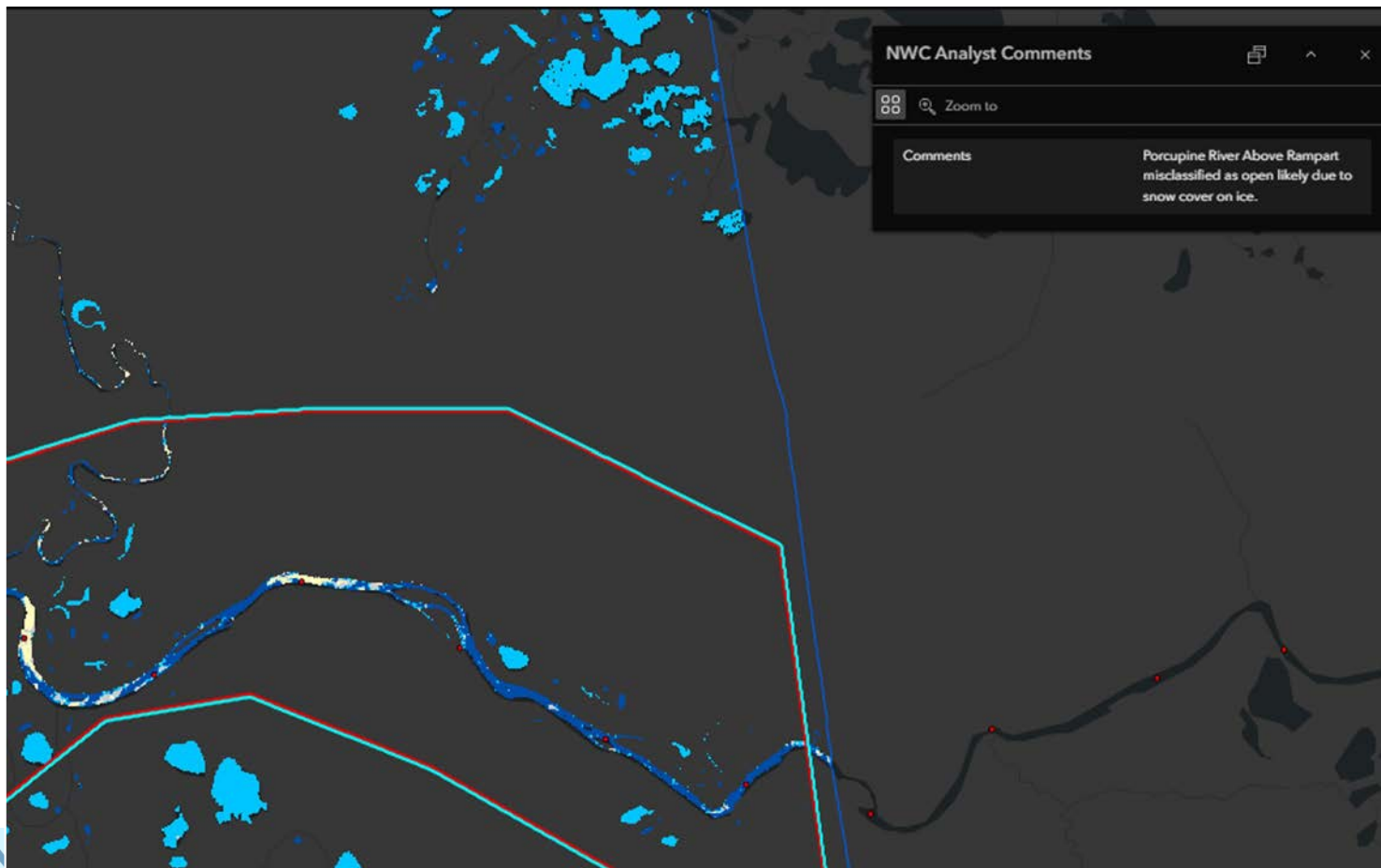
SARRIS App for WY 2025



NWC National Water Center



Analyst Notes



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Analyst Notes and Discussion Section

NWC National Water Center

Background

The National Water Center (NWC) Synthetic Aperture Radar River Ice Surveillance (SARRIS) is a remote sensing technique to detect and map river and lake ice by employing imagery acquired by ESA's Copernicus Sentinel-1 series of Synthetic Aperture Radar (SAR) satellites. SAR images the earth's surface by illuminating the surface with active microwave energy and recording the amount of backscatter that returns. It is essentially radar but instead of objects being detected by range and bearing, in SAR the range and bearing are known, and the magnitude and intensity of the returned energy is recorded.

Water is considered a specular reflector, meaning that it is highly reflective in the microwave portion of the electro-magnetic spectrum. As the satellite is imaging the earth's surface by aiming its antenna to the right of the image path, specular reflectors return a lot of energy back into space but away from the satellite, yielding very dark and data poor pixels. Ice, however, tends to reflect more energy back to the spacecraft due to cracks in the crystalline structure, trapped air bubbles, and the water/ice boundary. SARRIS is predicated on ice generally returning more microwave energy to the spacecraft than liquid water and compares each image with a composite synthetic reference image constructed using known ice-free images.

Synthetic Aperture Radar River Ice Surveillance (SARRIS)

SARRIS

Analyst Notes and Documentation

FDD

WY 2024 APRFC River Ice Notes

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Editing

Outline

Headings you add to the document will appear here.

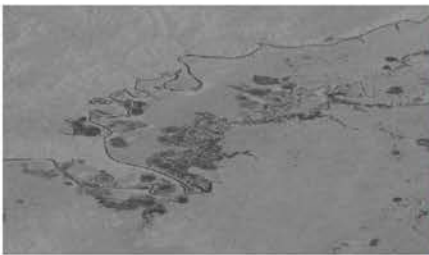
Noatak: The Noatak is classified from its headwaters to just upstream of Little Cottonwood Creek. The river appears to be an alternating mix of ice and open water, with more ice than open water upstream of the confluence with the Aniak River. Downstream of this point, the river appears to be more ice than open water with some fractured ice classifications mixed in with the smooth ice classifications.

Kobuk: The Kobuk is classified from its headwaters to downstream of the Kallarichuk River. Upstream of Kobuk, the river has very little remaining ice, with mostly open water classifications. There is one interesting area of fractured ice, with a few embedded jumbled ice pixels, upstream of Kobuk that might be where some ice is jammed (though that cannot be determined for sure from SARRIS). However, even if the ice is jammed here, there is very little ice behind it to cause additional problems and no flooding was seen in the raw Sentinel-1 data. Downstream of Kobuk, the river is an alternating mix of ice and open water.

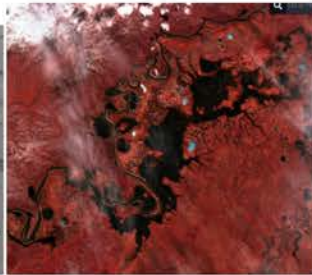
Koyukuk: The Koyukuk is classified from the confluence with Glacier Creek and downstream. Besides some residual, very small, ice pockets, the river is mostly open water.

Yukon: The Yukon is classified from Ruby (River Mile 575) to River Mile 170. There appears to be a run of ice from Ruby to River Mile 145. Then the river is mostly open water with remnant brash ice to near Koyukuk (River Mile 492). Downstream of Koyukuk, there is a long run of ice, with intermittent areas of open water until River Mile 260. My thought based on Sentinel-2 from the 13th is some of these smooth ice classifications may be wind related, although it could be very thin ice runs as well. Several of the jams (confirmed by River Watch) are classified as fractured ice downstream of Nulato (near River Mile 460-470). Other areas of fractured ice and possible jams were located between River Mile 400 to River Mile 355. Downstream of River Mile 260, the river appears to be mostly open.

Innoko / Iditarod: These rivers appear to be ice free (where classified in SARRIS), although there are some smooth ice classifications likely related to wind and alluvial sands. Based on Sentinel-2 from the 13th, I would lean toward wind. However, they were included for the flooding that can be made out in the raw Sentinel-1 VV imagery, as shown below. This flooding appears to be mostly due to snowmelt, given the lack of ice.



Sentinel-1 (2024-05-14 17:02 UTC)



Sentinel-2 (2024-05-13 22 UTC)

Kuskokwim: The Kuskokwim is classified downstream of River Mile 320. There is wind contamination in the upper portion of this river, upstream of River Mile 215. This stretch of the river is completely ice free based on River Watch, FEOI, and Sentinel-2 Downstream of River Mile 215, the river appears to be more properly classified as open water (although there are still some small smooth ice classifications from wind). There are some false positive smooth ice classifications downstream of River Mile 50 due to the lower water level compared to the summer time images, allowing the sensor to signal on the alluvial sands here.

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What's Next?





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Thank You!



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Economic Cost of Snow

Why is this work important?

- Water resources derived from seasonal snowpacks affect nearly \$1.7 trillion (16%) of the Nation's GDP



- **Snow Melt Flooding Cost \$13 Billion Missouri River and North Central Flooding March of 2019. ** NCEI**
- Snow Removal Exceeds \$2 billion/ Yr
- Road closures that cause lost retail trade, wages, and tax revenue exceeds \$10 billion / day

“... improved snow information and services have potential benefits greater than \$1.3 billion annually.”

“... investments that make only modest improvements in snow information will have *substantial economic payoffs.*”