

Wise Roads

Weather Information System to Effectively Reduce Oilfield Delays and Disruptions

Jonathan Rosencrans
NDACE Annual Conference
January 28th, 2021



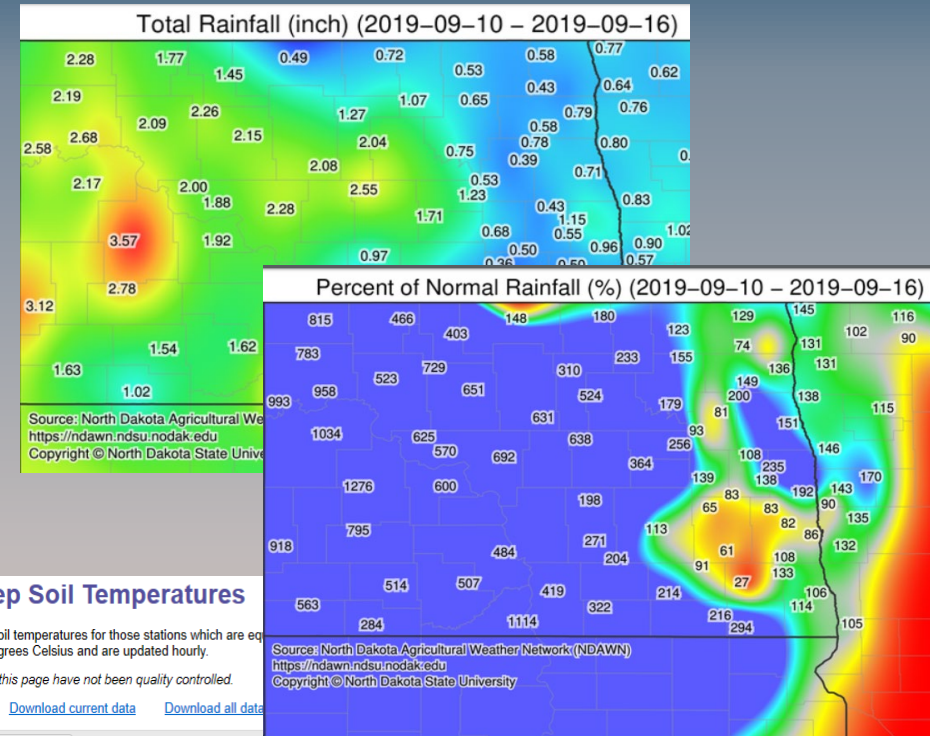
Problem

- When inclement weather strikes, local governments impose weight restrictions on gravel roads that prohibit the movement of oilfield truck traffic until road conditions improve



Solution

- Provide accurate weather information to assist road managers to precisely identify roads that require temporary weight restrictions and exclude those that do not.
- Provide weather forecasts to assist planning operations



Current Deep Soil Temperatures

This page shows deep soil temperatures for those stations which are equipped with probes. Values are in degrees Celsius and are updated hourly.

Disclaimer: The data on this page have not been quality controlled.

[Switch to metric units](#) [Download current data](#) [Download all data](#)

Table	Graph															
Station	Last Updated	5 cm (2 in)	10 cm (4 in)	20 cm (8 in)	30 cm (12 in)	40 cm (16 in)	50 cm (20 in)	60 cm (24 in)	80 cm (31 in)	100 cm (39 in)	125 cm (49 in)	150 cm (59 in)	175 cm (69 in)	200 cm (79 in)	225 cm (89 in)	
Adams	17 Sep 21:00 CDT	66 °F	65 °F	63 °F	60 °F	58 °F	57 °F	56 °F	55 °F	54 °F	53 °F	52 °F	52 °F	51 °F	50 °F	
Amidon	17 Sep 21:00 CDT	67 °F	67 °F	65 °F	63 °F	62 °F	61 °F	61 °F	60 °F	59 °F	59 °F	58 °F	57 °F	56 °F	55 °F	
Bottineau	17 Sep 21:00 CDT	63 °F	62 °F	60 °F	58 °F	57 °F	57 °F	56 °F	56 °F	55 °F	54 °F	54 °F	53 °F			
Bowman	17 Sep 21:00 CDT	65 °F	65 °F	65 °F	64 °F	62 °F	62 °F	61 °F	59 °F	59 °F	58 °F	57 °F	56 °F	55 °F	54 °F	
Carrington	17 Sep 21:00 CDT	68 °F	67 °F	65 °F	63 °F	61 °F	60 °F	59 °F	58 °F	57 °F	57 °F	56 °F	56 °F			
Courtenay	17 Sep 21:00 CDT	75 °F	75 °F	73 °F	69 °F	66 °F	64 °F	62 °F	61 °F	60 °F	59 °F	59 °F	58 °F	57 °F	56 °F	
Crane Creek	17 Sep 21:00 CDT	64 °F	64 °F	65 °F	63 °F	61 °F	60 °F	59 °F	58 °F	57 °F	57 °F	56 °F	56 °F	55 °F	54 °F	
Croft	17 Sep 21:00 CDT	69 °F	67 °F	64 °F	62 °F	60 °F	59 °F	59 °F	58 °F	57 °F	56 °F	56 °F	55 °F	54 °F	53 °F	
Denhoff	17 Sep 21:00 CDT	68 °F	67 °F	65 °F	63 °F	61 °F	60 °F	59 °F	57 °F	57 °F	56 °F	55 °F	54 °F	53 °F	52 °F	
Dickinson	17 Sep 21:00 CDT	68 °F	67 °F	65 °F	63 °F	63 °F	62 °F	61 °F	60 °F	60 °F	59 °F	58 °F	58 °F			
Epping	17 Sep 21:00 CDT	65 °F	64 °F	62 °F	60 °F	59 °F	59 °F	58 °F	57 °F	57 °F	56 °F	56 °F	55 °F	54 °F	54 °F	

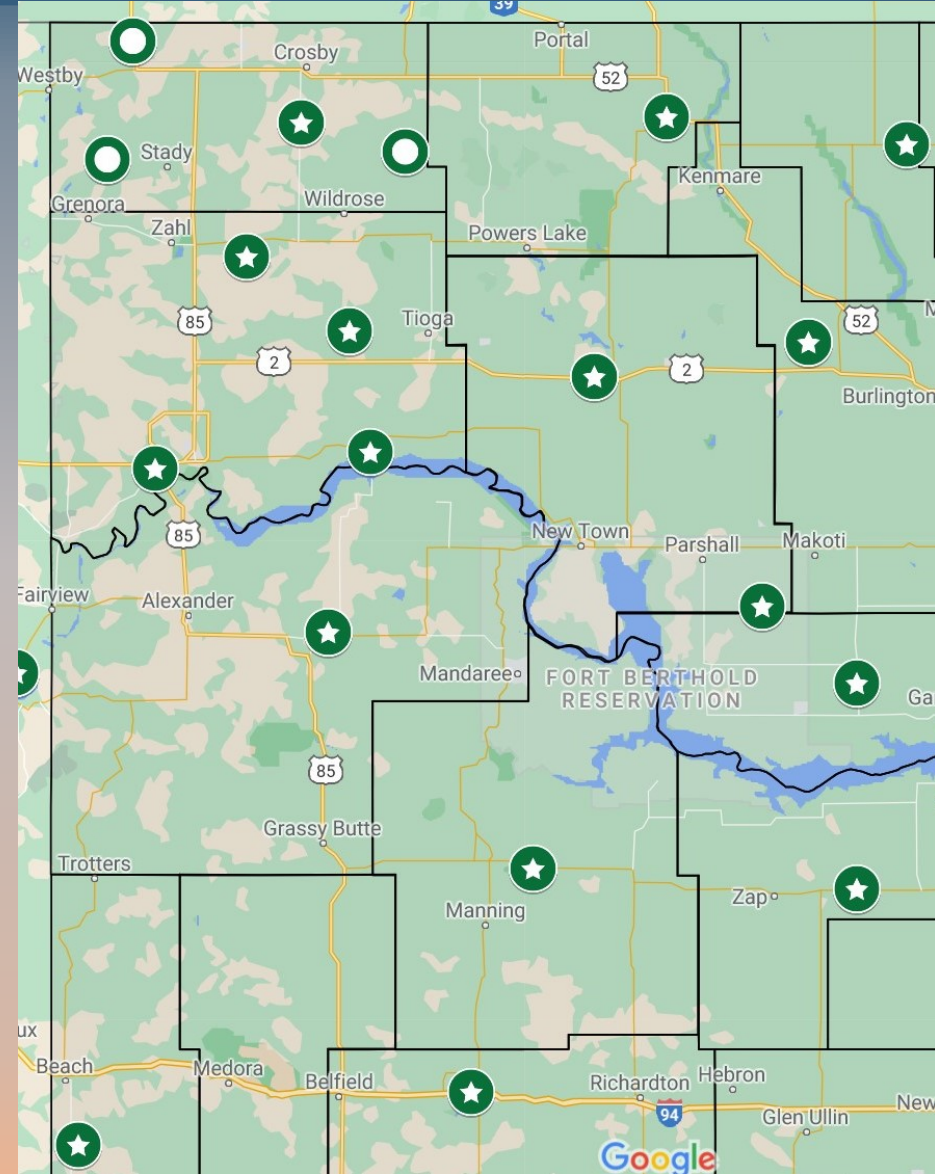
Wise Roads Project

- Expand the existing NDAWN network in oil producing counties
- Use high-density weather data, particularly rainfall, to precisely place weight restrictions
- Maximize benefit by working with research partners, agriculture and industry



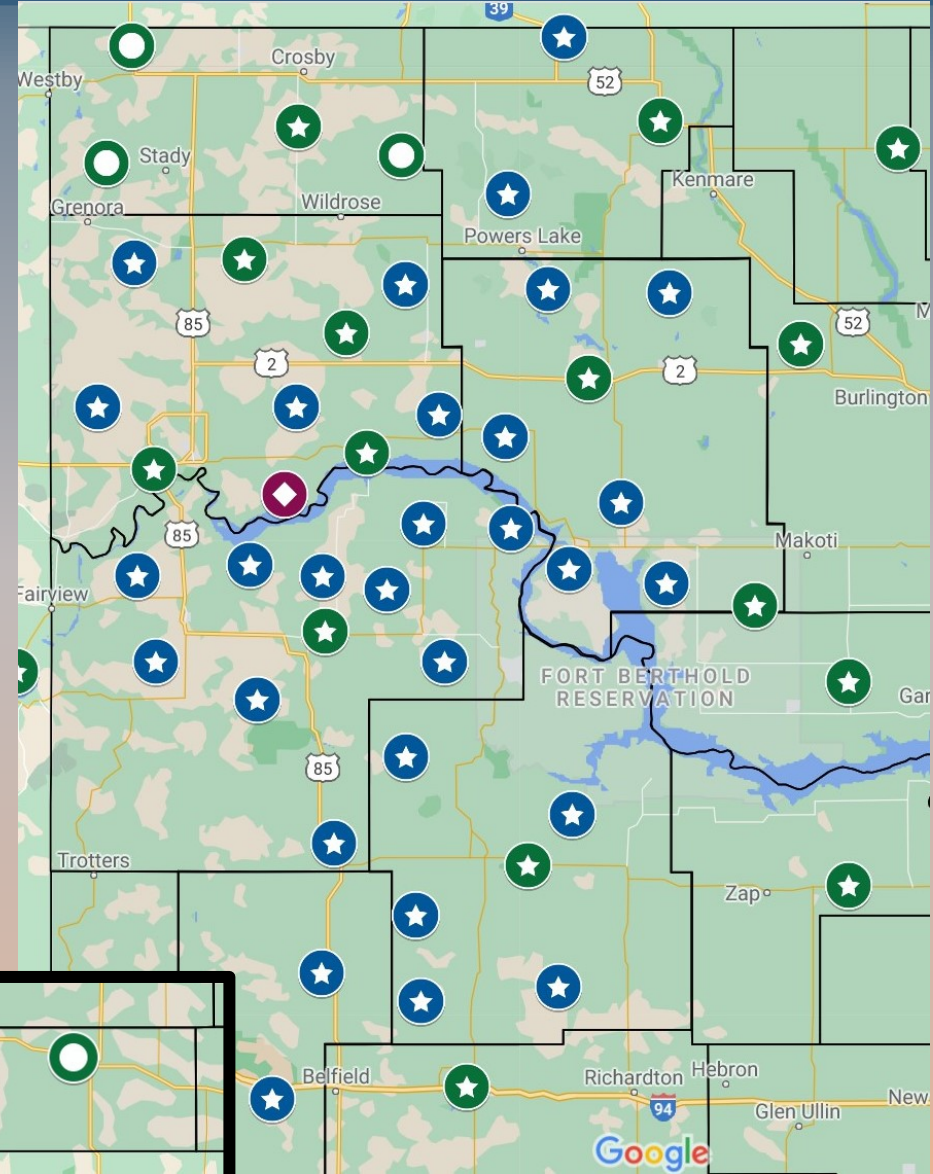
Spring 2019 NDAWN Stations

- 8 total weather stations in “Big Four” counties
- McKenzie and Dunn County each only had 1 station
- >40 miles between some stations



Current NDAWN Stations

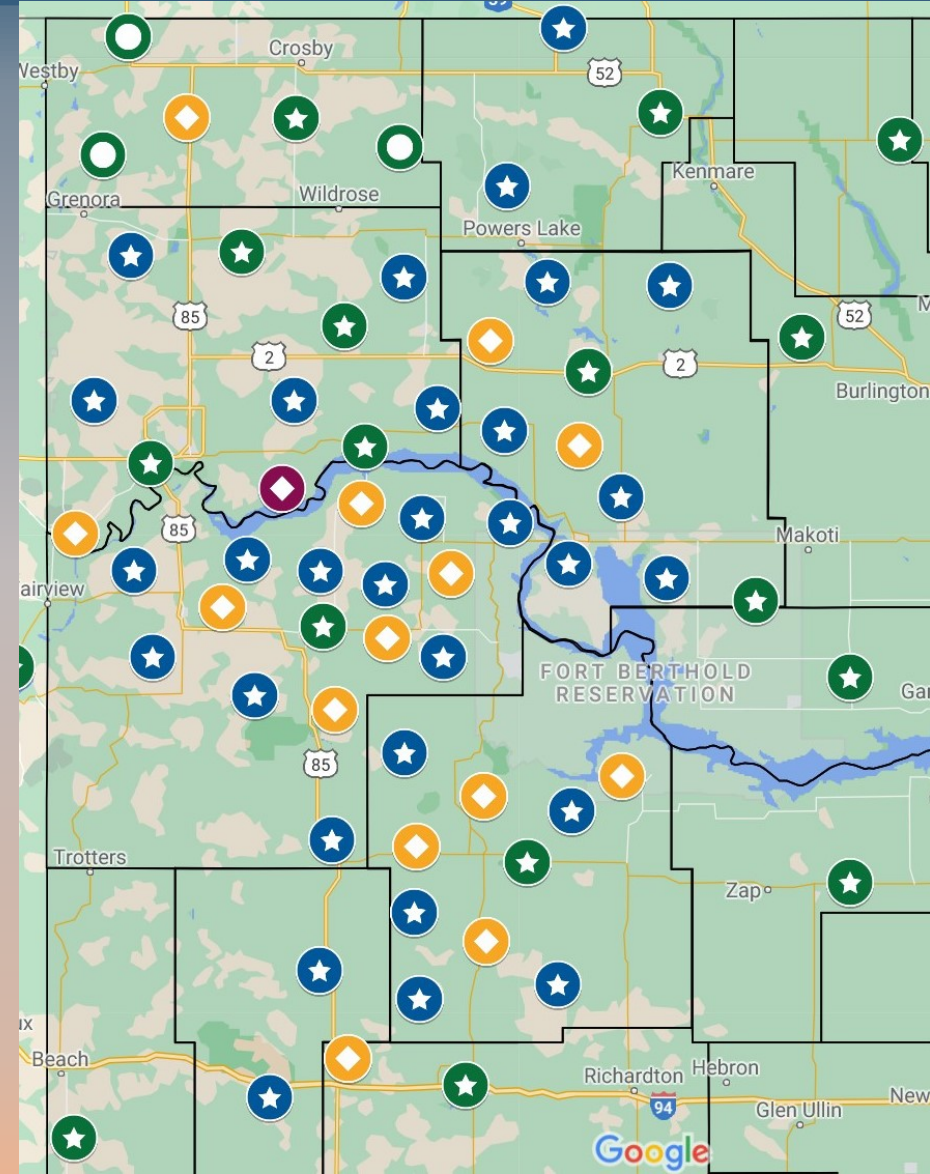
- 32 additional weather stations installed since June 2019
- “Big Four” counties have a total of 35 stations
- ~12 mile spacing



Bowman
County

Wise Roads: Phase 4

- Rain gauge & camera
- Placed at existing oil locations
- Connected to AC power
- Moisture in snow & sleet can be measured with heated rain gauge



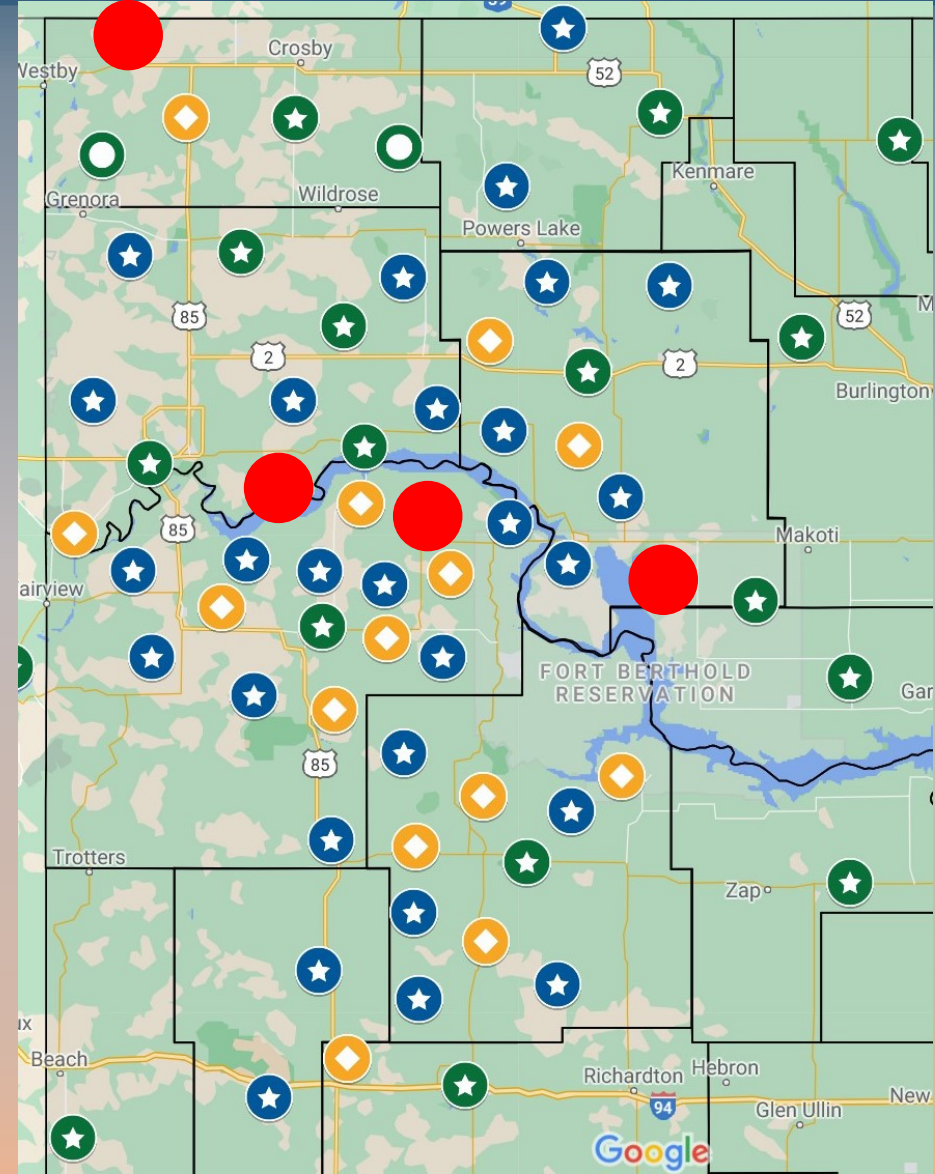
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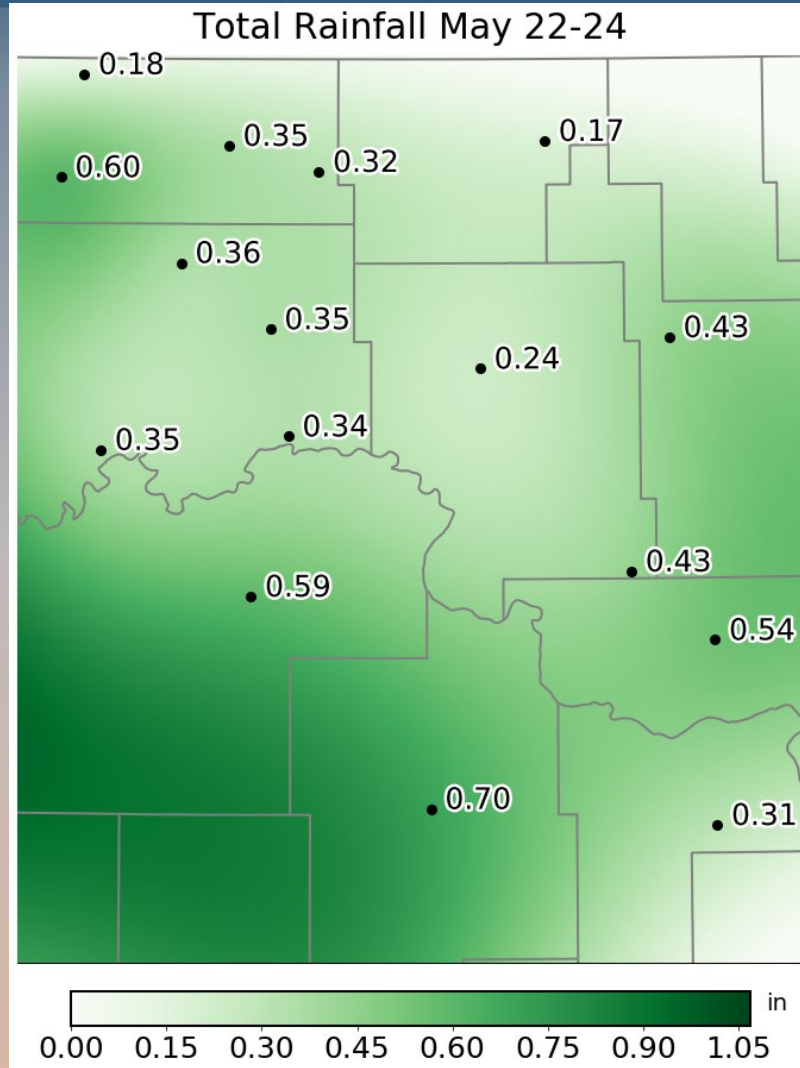


Wise Roads: Phase 4

- Only 4 weather stations currently measure moisture content of winter precipitation
 - Wet Snow
 - Early season rain

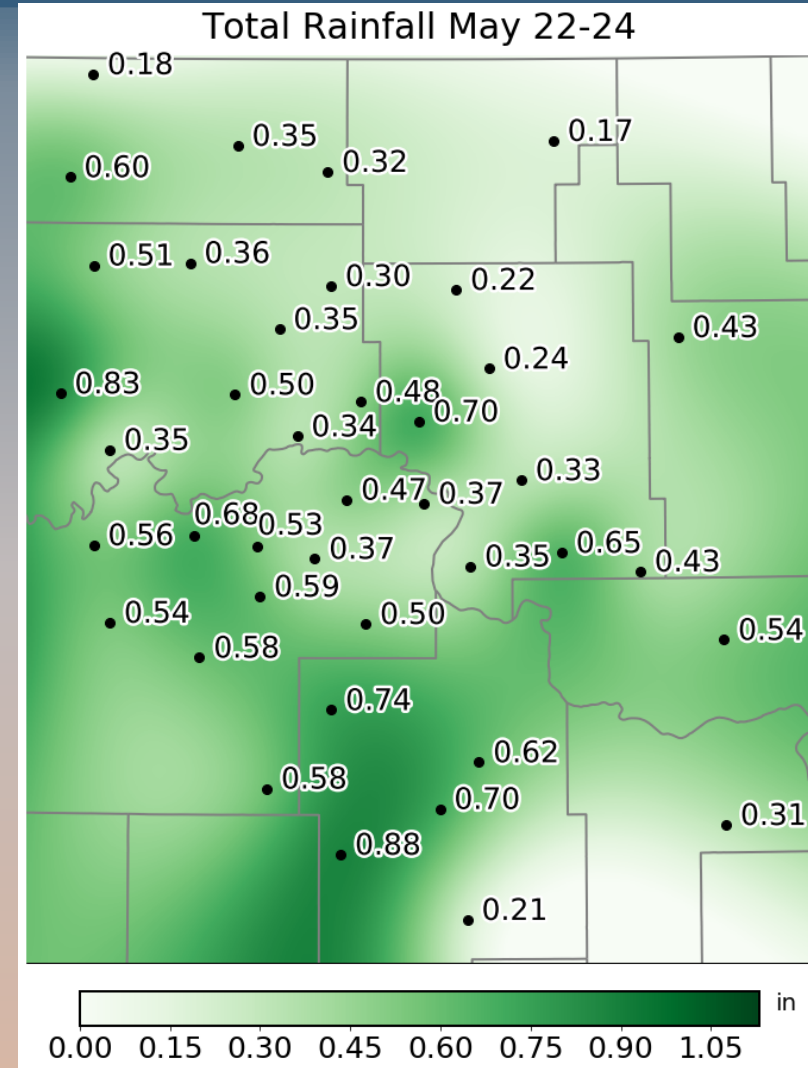
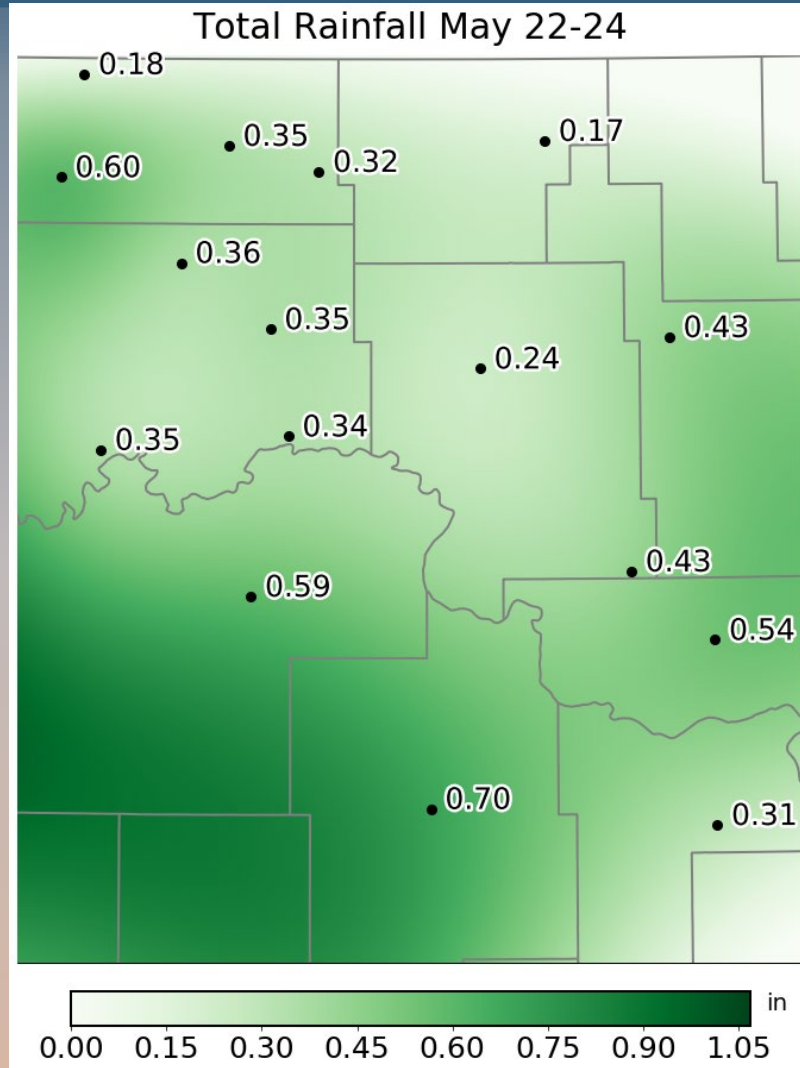


A More Complete Picture



- What the map would have looked like without Wise Roads

A More Complete Picture

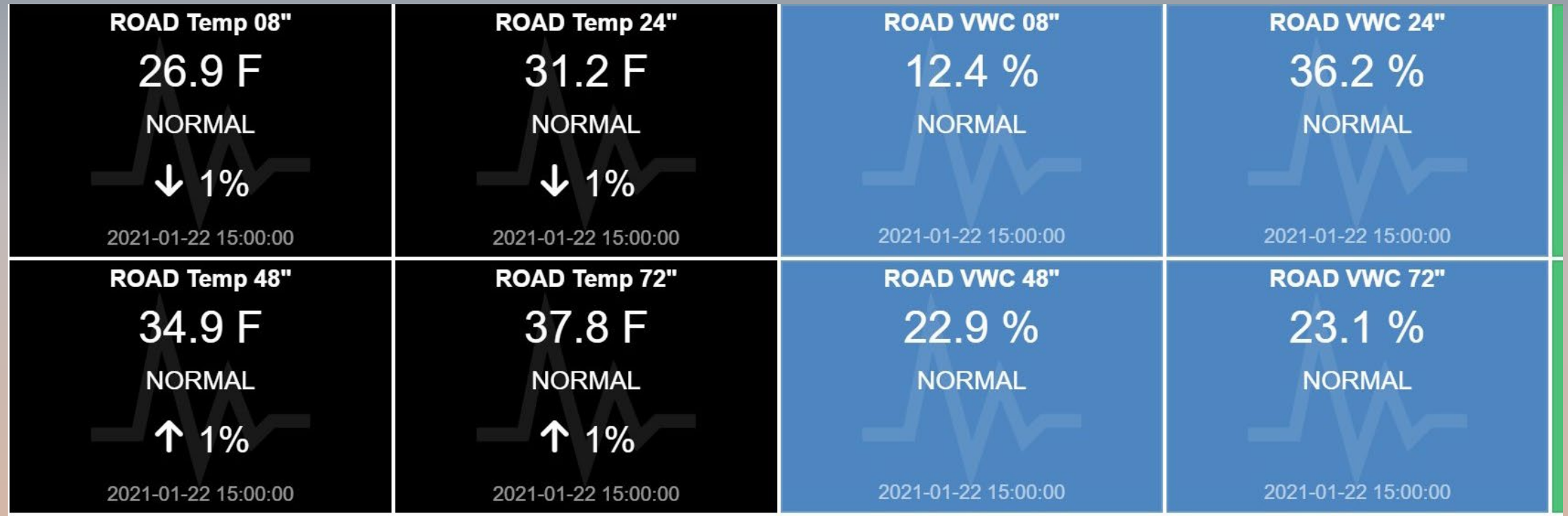


Road Temperature & Moisture Probes

- Installed in two gravel roads this fall: Epping, Medicine Hole
 - 2 more installations planned for 2021
- Probes installed at 6-8", 24", 48", 72" depths from surface
 - Cannot put in surface sensors
- Temperature and volumetric water content (VWC) measured at each depth
- Will be used for monitoring frost depth and moisture infiltration

Road Temperature & Moisture Probes

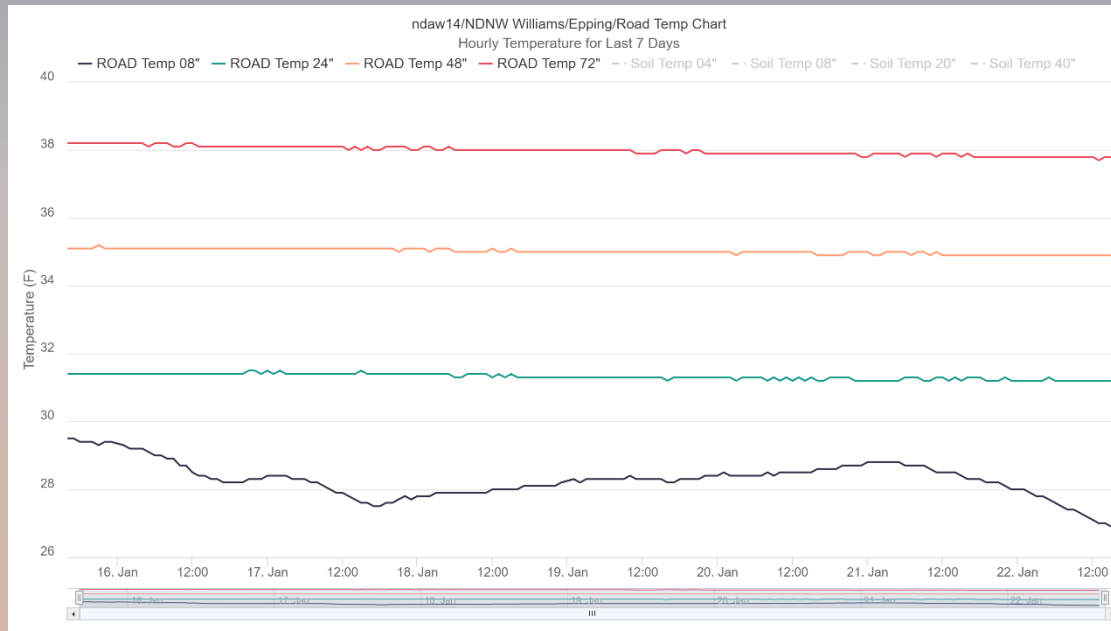
- Current Temperature and Moisture Data



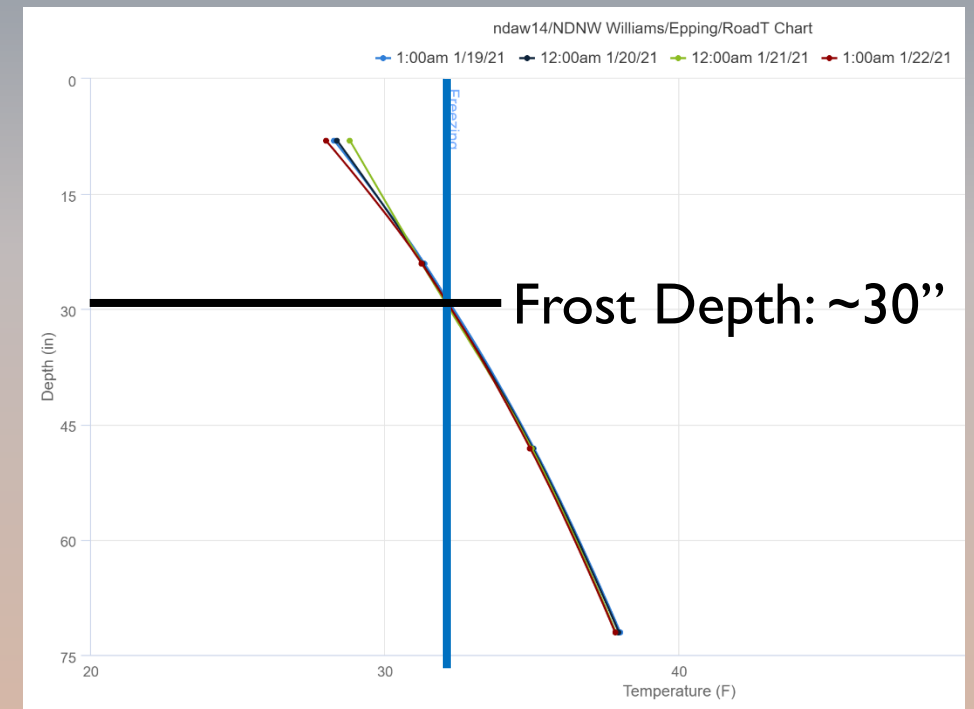
Road Temperature & Moisture Probes

- Temperature data charts

7 Day Temperature Chart



Temperature Profile



Live Video Streaming

- Available on PC/Mac and mobile devices
- Live video with Pan/Tilt/Zoom capability



Weather Data Resources

- WiseRoadsND.com
 - Current weather maps of western ND
 - Most recent camera images
 - Links to each station's individual data
- NDAWN Website (NDAWN.org)
 - 10 original Wise Roads weather stations available
- Stationname.ndawn.org (ex. Hawkeye.ndawn.org)
 - Current & historical data for an individual station



WISE ROADS

CURRENT WEATHER

COUNTIES

STATION PHOTOS

LOADPASS

NDAWN

WDEA

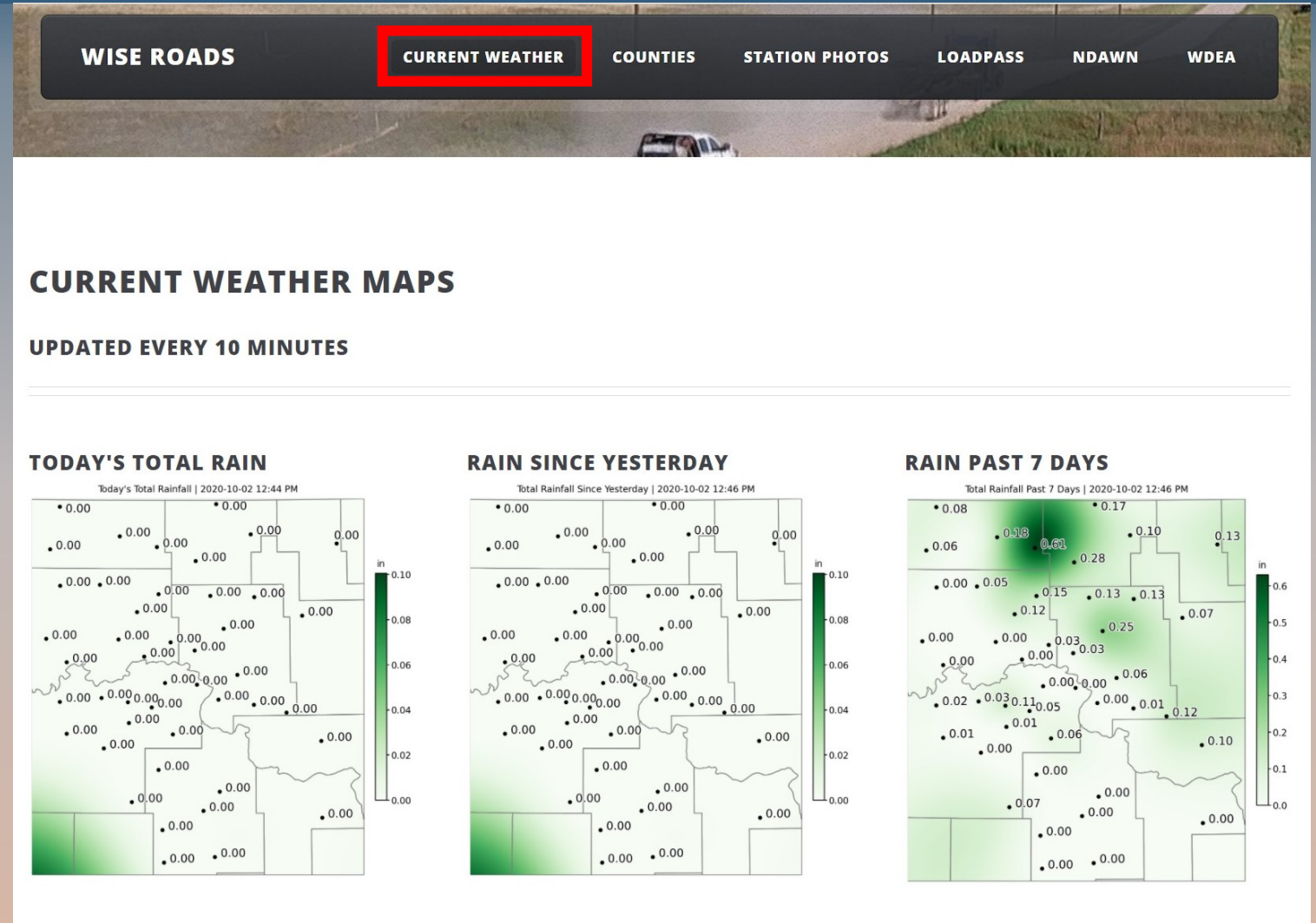
**WEATHER INFORMATION SYSTEM TO EFFECTIVELY
REDUCE OILFIELD DELAYS AND DISRUPTION**

DEVELOPED BY WDEA IN PARTNERSHIP WITH NDAWN AND NDLTAP

WEATHER STATION MAP

WiseRoadsND.com – Current Weather

- 1-, 2- & 7-Day rain totals
- Current temp & wind
- Today's max & min temp
- Today's peak wind gust



WiseRoadsND.com – Counties

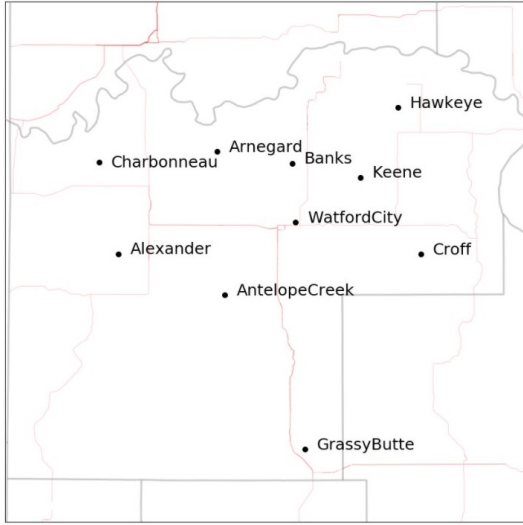
- Maps showing all stations in the county
- Links to weather and soil data
- Latest camera images
- Road probe data

WISE ROADS **CURRENT WEATHER** **COUNTIES** **STATION PHOTOS** **LOADPASS** **NDAWN** **WDEA**

MCKENZIE COUNTY

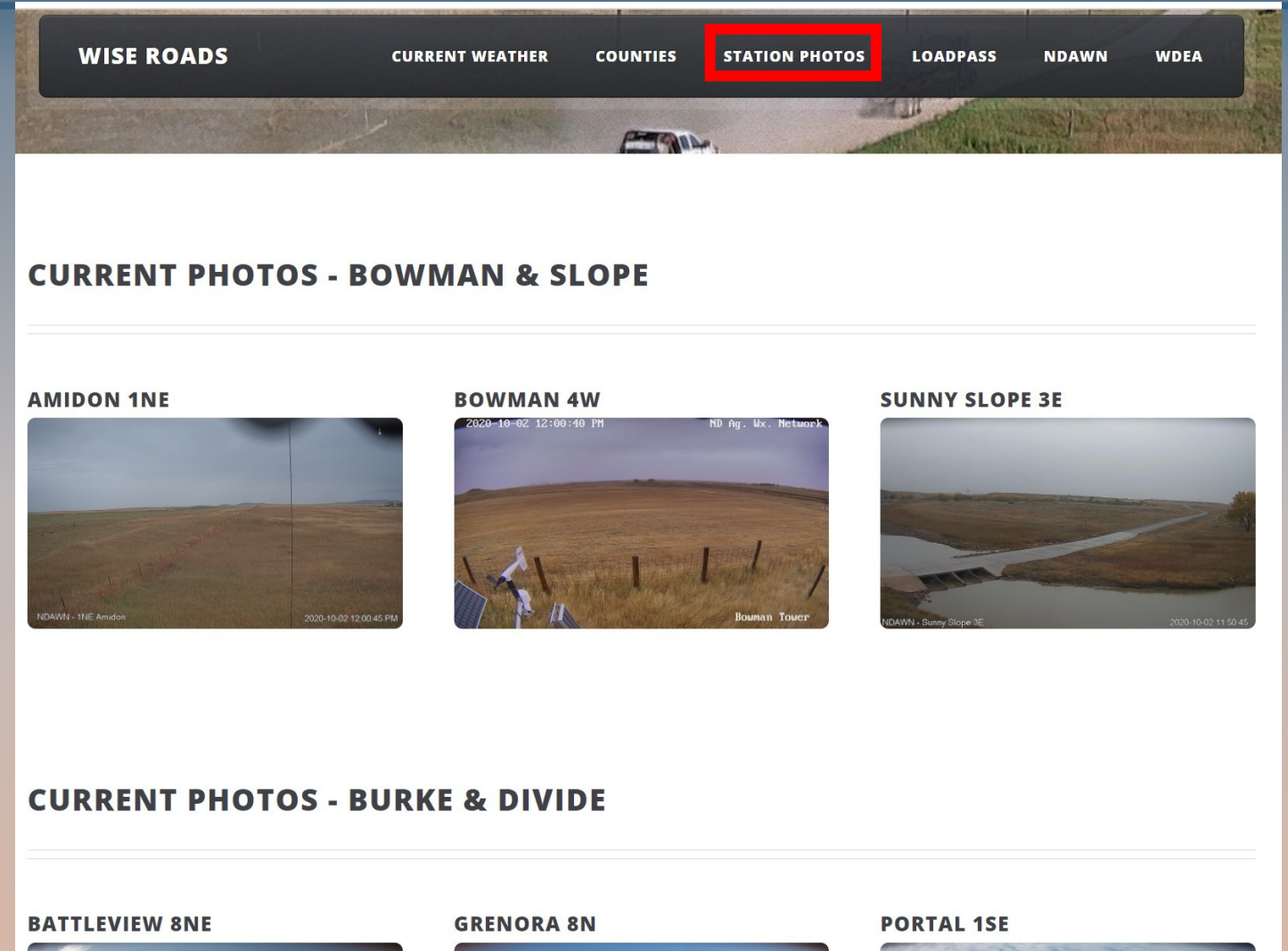
MCKENZIE COUNTY RAIN DASHBOARD

WEATHER DATA	SOIL DATA
Alexander	
Antelope Creek	Antelope Creek
Arnegard	Arnegard
Banks	
Charbonneau	Charbonneau
Croff	Croff




WiseRoadsND.com – Station Photos

- Latest camera images sorted by county
- All images are in HD and downloadable



NDAWN.org – Current Weather



[NDSU](#)[NDSU Agriculture](#)[NDSU School of Natural Resource Sciences](#)

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[NWS Monthly Normals](#)

[Monthly Report](#)

[Deep Soil Temperatures](#)

[Soil Moisture](#)

[APPLICATIONS](#)

[ACCOUNT](#)

Current Weather

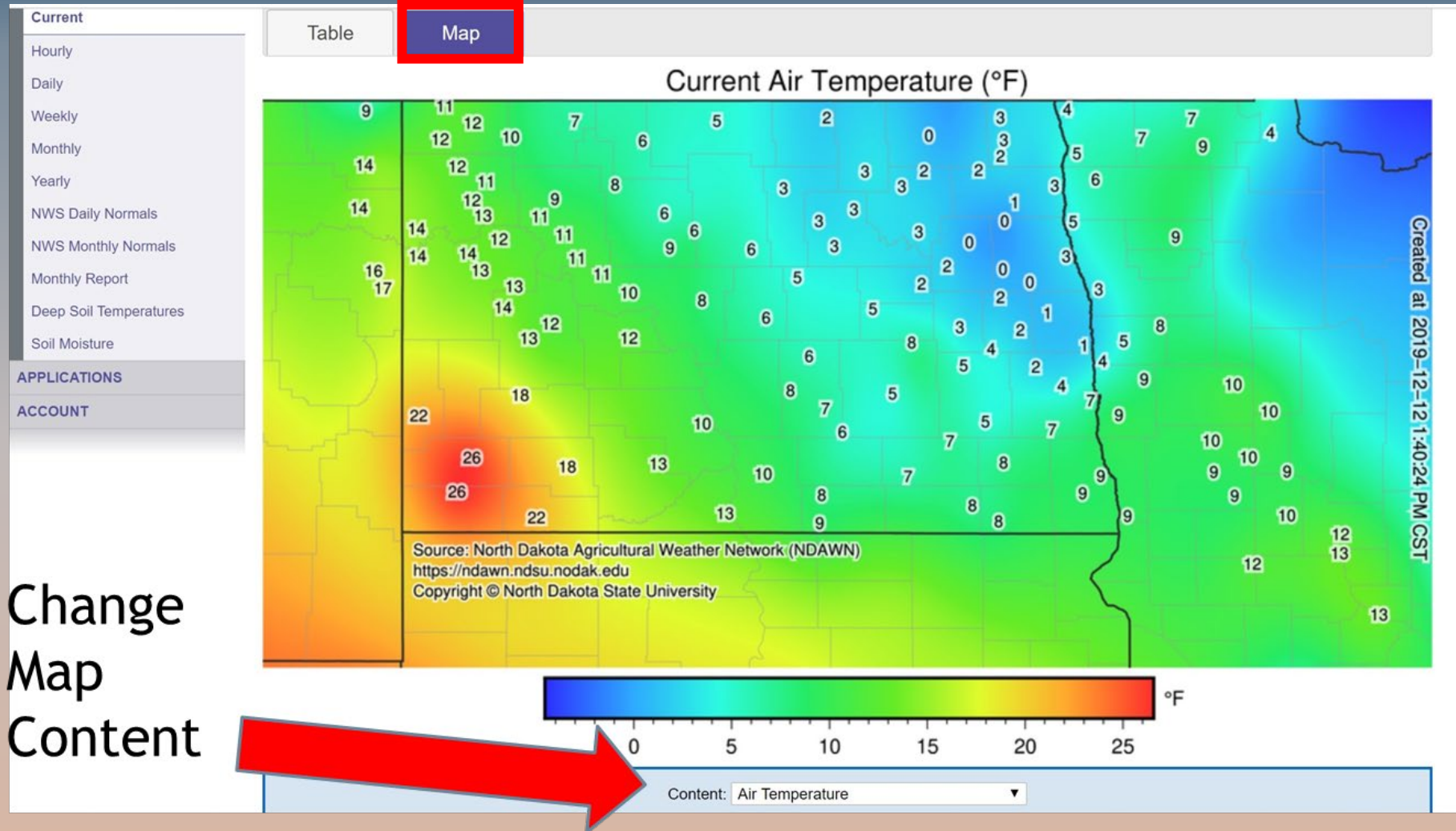
[Show information](#)

[Table](#)[Map](#)

☒ Show data from additional heights

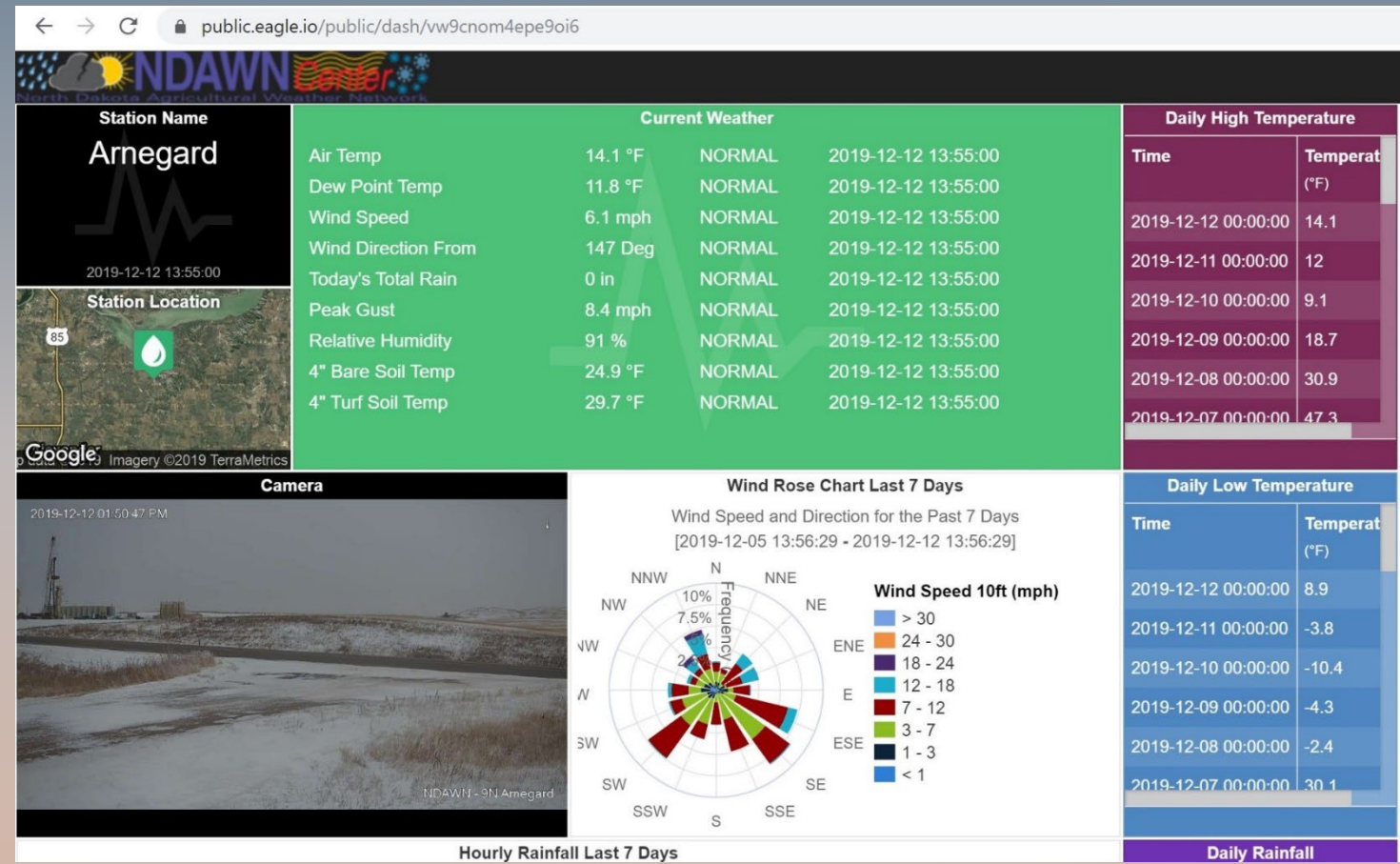
Current																	
Station	Ag District	Last Updated	Air Temp	Wind Chill	Wind Dir	Wind Speed	Peak Gust	Rel Hum	Dew Point Temp	Est. Wet-bulb Temp	Est. ΔT	Inversion 9/1.5 m	Inversion 3/1 m	Bare Soil Temp	Turf Soil Temp	Solar Rad	Sea-level Baro Press
Ada 1N	MN-NW	12 Dec 13:35 CST	5°	-3°	NW	3 mph	4 mph	82 %	1°	4°	1°	---	-1.9°	33°	33°	253 W/m²	---
Adams 5N	ND-NE	12 Dec 13:35 CST	2°	-8°	ENE	4 mph	5 mph	85 %	-2°	1°	1°	0.1°	-0.3°	25°	30°	288 W/m²	1029.1 mb
Alamo 2S	ND-NW	12 Dec 13:35 CST	12°	-1°	SSE	9 mph	12 mph	85 %	9°	11°	1°	---	-0.2°	28°	28°	235 W/m²	---
Amidon 1NE	ND-SW	12 Dec 13:35 CST	26°	16°	SSE	9 mph	11 mph	86 %	22°	25°	1°	-1.7°	-0.9°	32°	33°	189 W/m²	1016.6 mb
Arnegard 9N	ND-WC	12 Dec 13:30 CST	14°	4°	SE	6 mph	8 mph	90 %	11°	13°	1°	---	-0.3°	25°	30°	118 W/m²	---
Baker 1N	ND-NC	12 Dec 13:35 CST	3°	-17°	ESE	14 mph	17 mph	83 %	-2°	2°	1°	---	-0.4°	32°	33°	180 W/m²	1019.7 mb
Beach 9S	ND-SW	12 Dec 13:35 CST	22°	11°	SE	8 mph	12 mph	94 %	20°	21°	1°	---	-0.2°	32°	32°	288 W/m²	1019.5 mb
Becker 1W	MN-C	12 Dec 13:35 CST	13°	3°	N	5 mph	7 mph	79 %	8°	12°	1°	---	-0.6°	33°	33°	147 W/m²	---
Berthold 5NW	ND-NW	12 Dec 13:35 CST	8°	-5°	SE	7 mph	10 mph	85 %	4°	7°	1°	---	-0.2°	27°	28°	246 W/m²	---
Bottineau 14W	ND-NC	12 Dec 13:35 CST	5°	-13°	SE	13 mph	16 mph	80 %	0°	4°	1°	---	-0.3°	29°	29°	163 W/m²	1020.7 mb
Boulevard 1N	ND-NW	12 Dec 13:35 CST	7°	0°	SE	11 mph	14 mph	82 %	3°	6°	1°	---	-0.4°	26°	26°	150 W/m²	1019.2 mb

NDAWN.org – Current Weather



Weather Data Dashboards

- Stationname.ndawn.org
 - ex. Croff.ndawn.org
- Current weather
- Historical daily high/low/rainfall
- Camera image



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