Wise Roads

Weather Information System to Effectively Reduce Oilfield Delays and Disruption

Western Energy Roundtable | May 12, 2022 | Watford City, North Dakota









Starting the Project – The Problem

 Weight restrictions are placed during inclement weather

• Truck traffic is prohibited until conditions improve



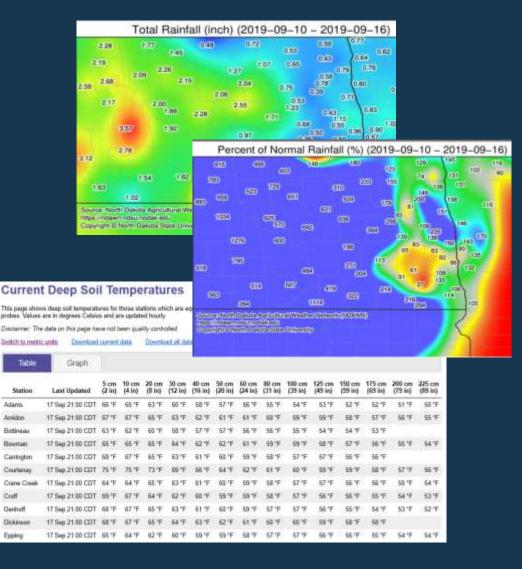




Starting the Project – The Solution

• Provide accurate weather information

• Identify exact roads that require weight restrictions







Starting the Project

- Expand existing NDAWN network
- Use high-density weather data
- Work with research partners, agriculture, and industry







Spring 2019 NDAWN Stations

- 8 total weather stations in "Big Four" Counties
- McKenzie and Dunn each had 1 station
- >40 miles between some stations

Bowman

County

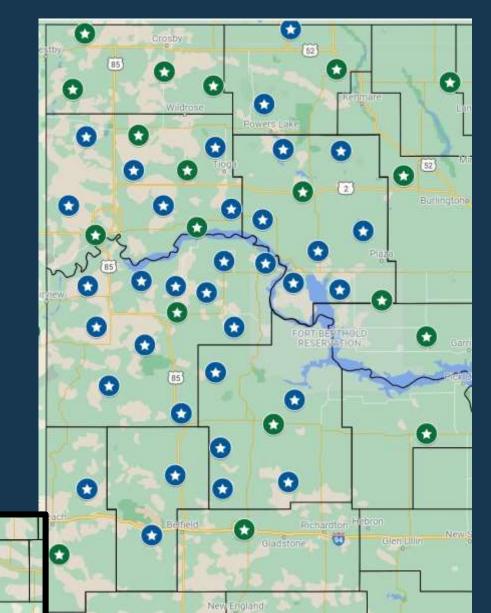






Current NDAWN Stations

 35 additional fullinstrumentation weather stations installed since June 2019





Bowman

County



Current NDAWN Stations

- 35 additional fullinstrumentation weather stations installed since June 2019
- 7 additional rain gauge only sites
- "Big Four" counties have a total of 42 stations

County

• ~12 mile spacing Bowman







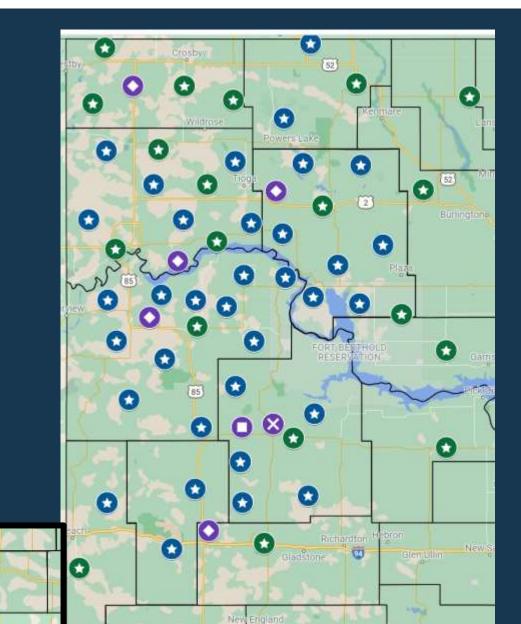
Wise Roads: Phase 4

- Adding additional rain gauge only sites
- If connected to AC power can measure snow & sleet

NESTERN

Bowman

County



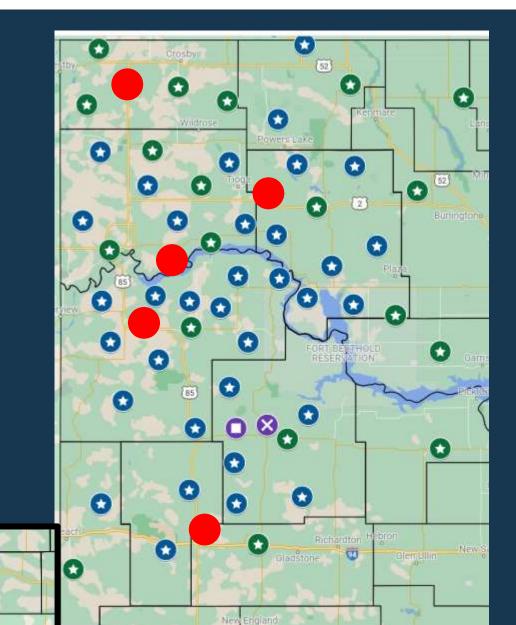
Wise Roads: Phase 4

- 5 Wise Roads stations connected to AC Power
- 1 in each Mountrail, Divide, Williams, Stark, McKenzie

NESTERN

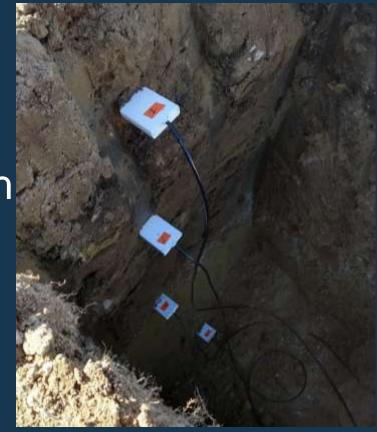
Bowman

County



Road Temperature & Moisture Probes

- Installed at four locations
- Probes installed at 4 depths: 6-8", 24", 48", 72" from surface
- Temperature and volumetric water content (VWC) measured at each depth
- Used for monitoring frost depth and moisture infiltration







Road Temperature & Moisture Probes

• Current Temperature and Moisture Data

WESTERN

DAKOTA ENERGY SOCIATION

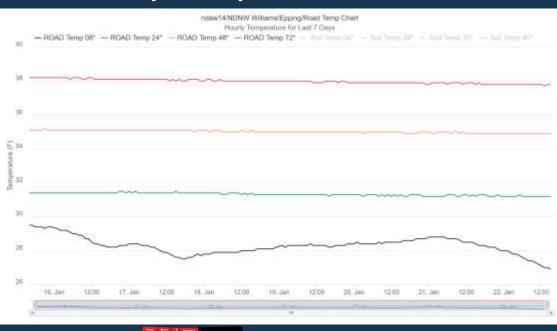
ROAD Temp 08"	ROAD Temp 24"	ROAD VWC 08"	ROAD VWC 24"				
26.9 F	31.2 F	12.4 %	36.2 %				
NORMAL	NORMAL	NORMAL	NORMAL				
↓ 1%	↓ 1%						
2021-01-22 15:00:00	2021-01-22 15:00:00	2021-01-22 15:00:00	2021-01-22 15:00:00				
ROAD Temp 48"	ROAD Temp 72"	ROAD VWC 48"	ROAD VWC 72"				
34.9 F	37.8 F	22.9 %	23.1 %				
NORMAL	NORMAL	NORMAL	NORMAL				
↑ 1%	1 %						
2021-01-22 15:00:00	2021-01-22 15:00:00	2021-01-22 15:00:00	2021-01-22 15:00:00				



Road Temperature & Moisture Probes

• Temperature data charts

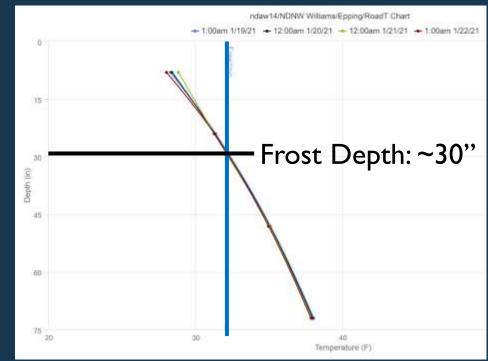
7 Day Temperature Chart



VESTERN

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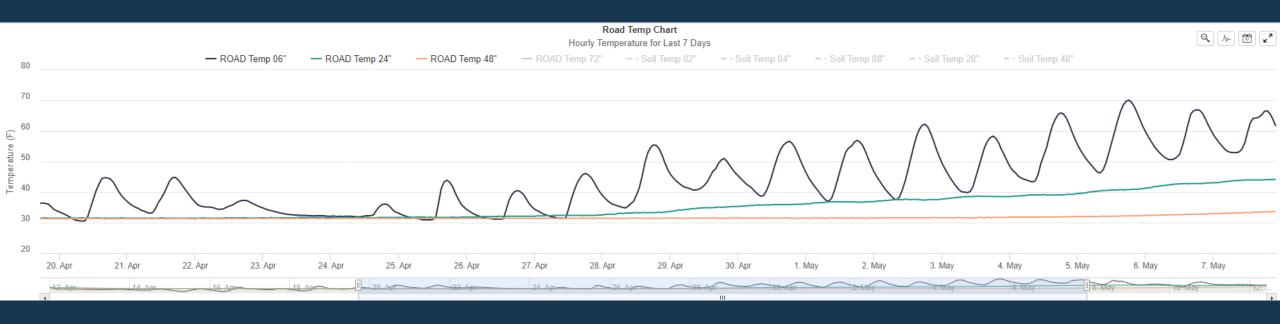
Temperature Profile





Road Temp Data – Rat Lake, Mountrail County

- 24" depth below 32F April 13 27
- 48" depth remained below freezing until May 5th







Road Moisture Data – Rat Lake, Mountrail County





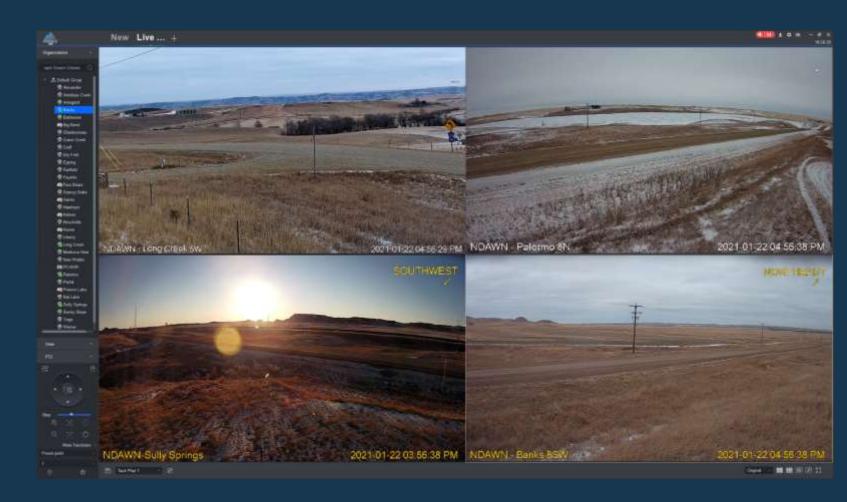
WESTERN DAKOTA

ENERGY

ASSOCIATION

Live Video Streaming

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







Rainfall Notifications

 Road managers receive email/text notifications when daily rainfall thresholds are reached

• Each county can set unique thresholds



NDSW Dunn/Hirschville/Campbell PakBus Logger/RG

Active Daily Total

Hirschville: .75" Daily Rain

Current value is 0.76 in [0.75" Rain]



or visit this link:

https://ndawn.eagle.io/ul/ndaw14/NDSW Dunn/Hirschville/Campbell PakBus Logger/RG Active Daily Total





Upper Missouri River Basin Project Update

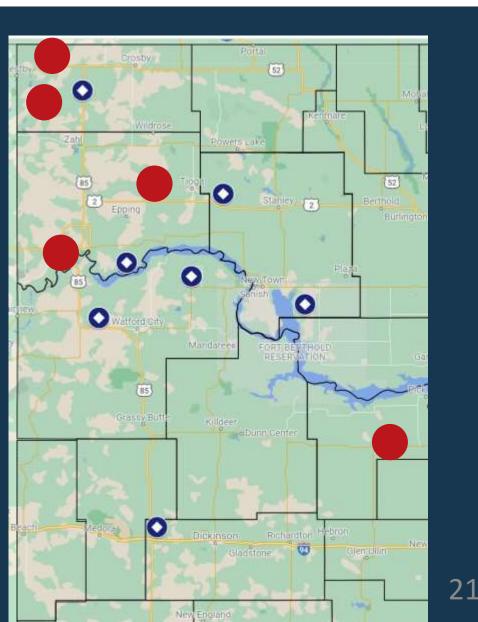






Missouri River Basin Project Update

 4 additional all-season precipitation gauges were installed in the region



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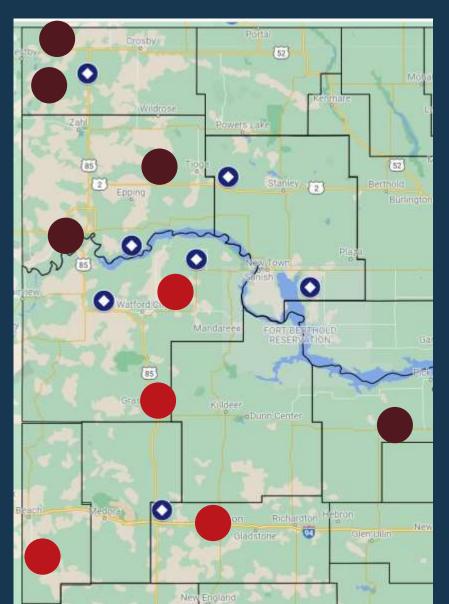


Missouri River Basin Project Update

- 4 additional all-season precipitation gauges were installed in the region
- 2022 Upgrades:
 - Grassy Butte
 - Keene
 - Dickinson
 - Beach
 - NE Montana







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Weather Data Resources

- WiseRoadsND.com
 - Current weather maps of western ND
 - Most recent camera images
 - Links to each station's individual data
- NDAWN.info
- NDAWN Inversion App
- NDDOT Roads Map
 - Website & App







WiseRoadsND.com



WEATHER STATION MAP





WiseRoadsND.com

• Weather station map

WEATHER INFORMATION SYSTEM TO EFFECTIVELY REDUCE OILFIELD DELAYS AND DISRUPTION

DEVELOPED BY WDEA IN PARTNERSHIP WITH NDAWN AND NOLTAP

ADS

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WEATHER STATION MAP

A DECOMPTING



SUBSURFACE ROAD PROBES

Noted Frodesc are installed in gravel much adjacent to select When Block Distances. One a probability of the miniparature and metalline following (Water Commodiat Data depths: 169, 201, 401, and 321.

Data to available at the following stations:

DUNN COUNTY: MEDICINE HOLE

MCRENZIE COUNTY: BANKS

MOUNTRAIL COUNTY: RAT LAKE

WILLIAMS COUNTY: EPPINE







WiseRoadsND.com

Weather station map

 Road probe dashboard links REAL NOAWN



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WEATHER STATION MAP IN DECTEM TO EFFECTIVELY RESIDER DILFIELD DECAYS AND DIDRIFTION

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

VELOPED BY WOFATN PARTNERSHIP WITH



SUBSURFACE ROAD PROBES

WILLIAMS COUNTY: EPPINE

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WiseRoadsND.com – Current Weather

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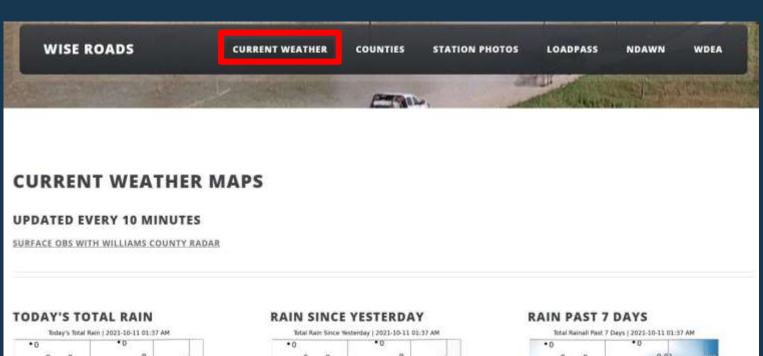
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- 1-, 2-, & 7-Day rain totals
- Current temp & wind
- Today's max & min temp
- Today's Peak wind gust







.0

5.00

4.00

3.00

2.50

2:00

1.50

1.00

0.75

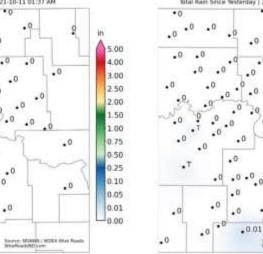
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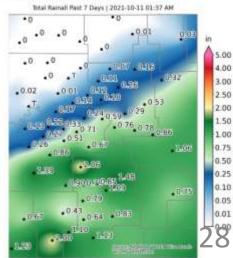
0.25

0.10

0.05

0.01





WiseRoadsND.com – Counties

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

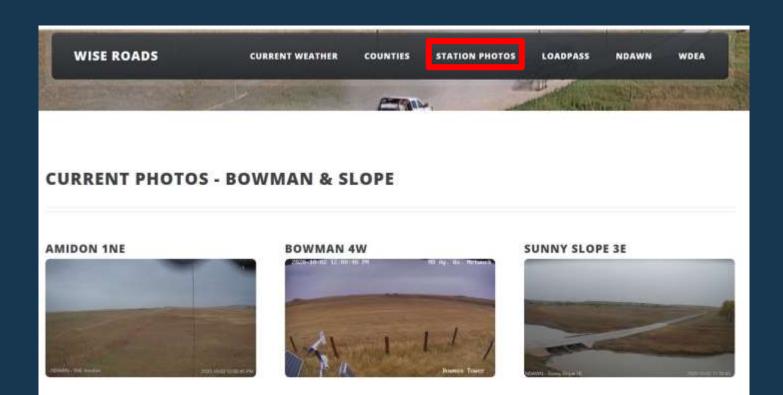
WISE ROADS	CURRENT WEATHER	COUNTIES	STATION PHOTOS	LOADPASS	NDAWN	WDEA
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MCKENZIE COUNTY				• Charbannes	, Arnegard W	. Hawkeye
WEATHER DATA	SOIL DATA			• Alexande	• Watto	erdCity
Alexander					 AntelopeCreek 	·
Antelope Creek	Antelope Creek					
Arnegard	Arnegard				• Gras	syButte
Banks					2-1	1
Charbonneau	Charbonneau					
Croff	Croff					





WiseRoadsND.com – Station Photos

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



CURRENT PHOTOS - BURKE & DIVIDE

GRENORA 8N

BATTLEVIEW 8NE





PORTAL 1SE

Jonathan Rosencrans

• Phone: 701-715-0236

• Email: jonathan.rosencrans@ndsu.edu









NDAWN.info

- Mobile friendly
- Weather, soil, & crop maps

Station photos

NORTH DAKOTA AGRICULTURAL WEATHER NETWORK

WESTERN

DAKOTA

ASSOCIATION



© North Dakota Aspicultural Weather Network, Design, HTML5 UP.

NDAWN.org – Current Weather

North Dakota Agricultural Weather Network											NDSU		NDSU A	griculture	1		School of Resource Sci	ences
	_			_	b	DAWN = Curre	ont weather											
NDAWN	Current V	Veathe	r															
HELP																		
WEATHER DATA	Show information																	
Current	Table	Мар																
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Deily	Show data from	additional he	ights															
Weekly				-											Curre	int		
Monthly		Ag		Air	Wind	Wind	Wind	Peak	Rel	Dew Point	Est. Wet-bulb	Fat	Inversion	Inversion	Bare	Turf Soil	Solar	Sea-level Baro
Yearly	Station	District	Last Updated	Temp		Dir	Speed	Gust	Hum	Temp	Temp	AT .	9/1.5 m	3/1 m	Temp		Rad	Press
NWS Daily Normals	Ada 1N	MN-NW	12 Dec 13:35 CST	• 5°	-3°	NW <	e 3 mph	¢ 4 mph	82 %	• 1°	• 4°	10	•	¢ -1,9°	33"	9 33°	¢ 253 W/m²	•
NWS Monthly Normals	10000 (2010)					ENE		1220 10		20102	1*		0.1*	20180	1212200			1029.1 mb
Monthly Report	Adams 5N	ND-NE	• 12 Dec 13:35 CST	2°	-8*	ALL LANGE COMPANY	4 mph	5 mph		-2°		41		-0.3*	25°	30*	288 W/m ²	
Deep Soil Temperatures	Alamo 2S	ND-NW	12 Dec 13:35 CST	12°	-1*	SSE >	9 mph	12 mph	85 %	9°	11=	1.	8.577	-0.2"	28°	28°	235 W/m²	
Soil Moisture	Amidon 1NE	ND-SW	12 Dec 13:35 CST	26°	16°	SSE)	9 mph	11 mph	86 %	22°	25°	4.	-1.7*	-0.9*	32°	33°	189 W/m ²	1016.6 mb
PPLICATIONS	Arnegard 9N	ND-WC	• 12 Dec 13:30 CST	140	4.	SE 🔪	6 mph	8 mph	90 %	110	13°	1.		-0.3*	25°	30*	118 W/m ²	***
CCOUNT	Baker 1N	ND-NC	12 Dec 13:35 CST	3ª	-17ª	ESE 🥎	14 mph	17 mph	83 %	-2°	2°	1"		-0,4*	32"	33°	180 W/m ^a	1019.7 mb
	Beach 9S	ND-SW	12 Dec 13:35 CST	22°	11*	SE 🔪	8 mph	12 mph	94 %	20°	21"	1*	19222	-0.2*	32°	32°	288 W/m ²	1019.5 mb
	Becker 1W	MN-C	• 12 Dec 13:35 CST	13ª	3°	NT	5 mph	7 mph	79 %	8°	12°	1*		-0.6*	33°	33*	147 W/m ²	
	Berthold 5NW	ND-NW	• 12 Dec 13:35 CST	8°	-5°	SE 🔪	7 mph	10 mph	85 %	4ª	7º	1*	3 355	-0.2*	27°	28°	246 W/m ²	
	Bottineau 14W	ND-NC	• 12 Dec 13:35 CST	5°	-13°	SE >	13 mph	16 mph	80 %	0°	4*	10		-0.3"	29"	29°	163 W/m ^a	1020.7 mb
	Daushalla (N)	KIPS ATLAL	• 10 Des 10.05 CCT	40	01	ce /	44 meh	14 mah	00 W	91	et	40		0.41	ner	ne+	180 M/m3	1010 2 mh





NDAWN.org – Current Weather

