

# - WISE ROADS 2022 -

## Gravel Road Update



Wednesday, October 12, 2022  
WDEA Annual Meeting

Curtis W. Glasoe, PLS/PE  
701-260-9459  
curt.glasoe@ndsu.edu

Research conducted by the North Dakota Local Technical Assistance Program (NDLTAP), a Program of the Upper Great Plains Transportation Institute, in partnership with the Western Dakota Energy Association (WDEA) and the North Dakota Department of Transportation (NDDOT).



















**FOR SALE**  
**Social Distancing Service Dogs**  
**\*Only 4 left, message me!**



# Wise Roads

*'Weather Information System to Effectively  
Reduce Oilfield Delays and Disruptions'*





# Problem:

## Muddy Gravel Roads Can't Carry Loads

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





How can  
technology turn  
this into a  
**Smart  
Road?**





# Wise Roads Project

- ✓ Work with research partners, agriculture, and Industry to maximize benefit
- ✓ Install research-grade weather stations in areas with heavy oilfield traffic
- ✓ Make data publicly available through NDAWN, LoadPass and other sites
- ✓ Provide training to road managers through LTAP













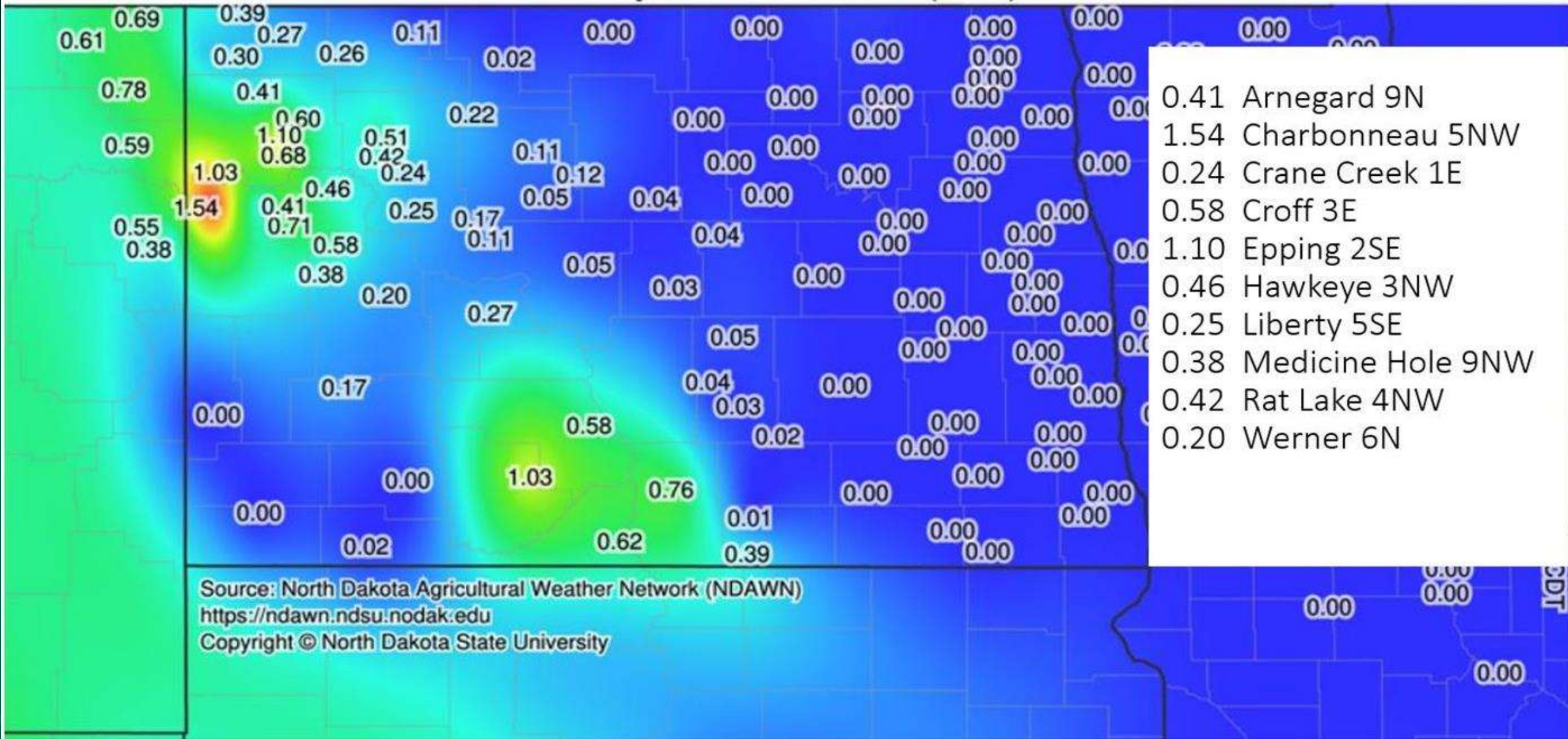








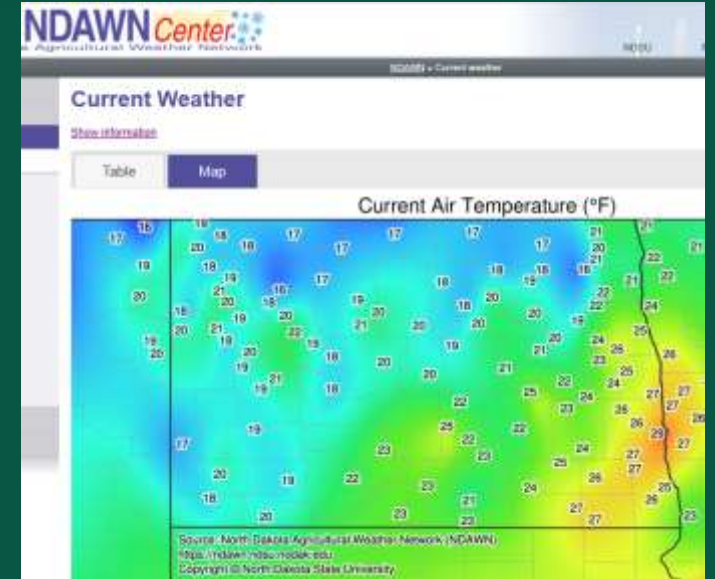
# Today's Total Rainfall (inch)



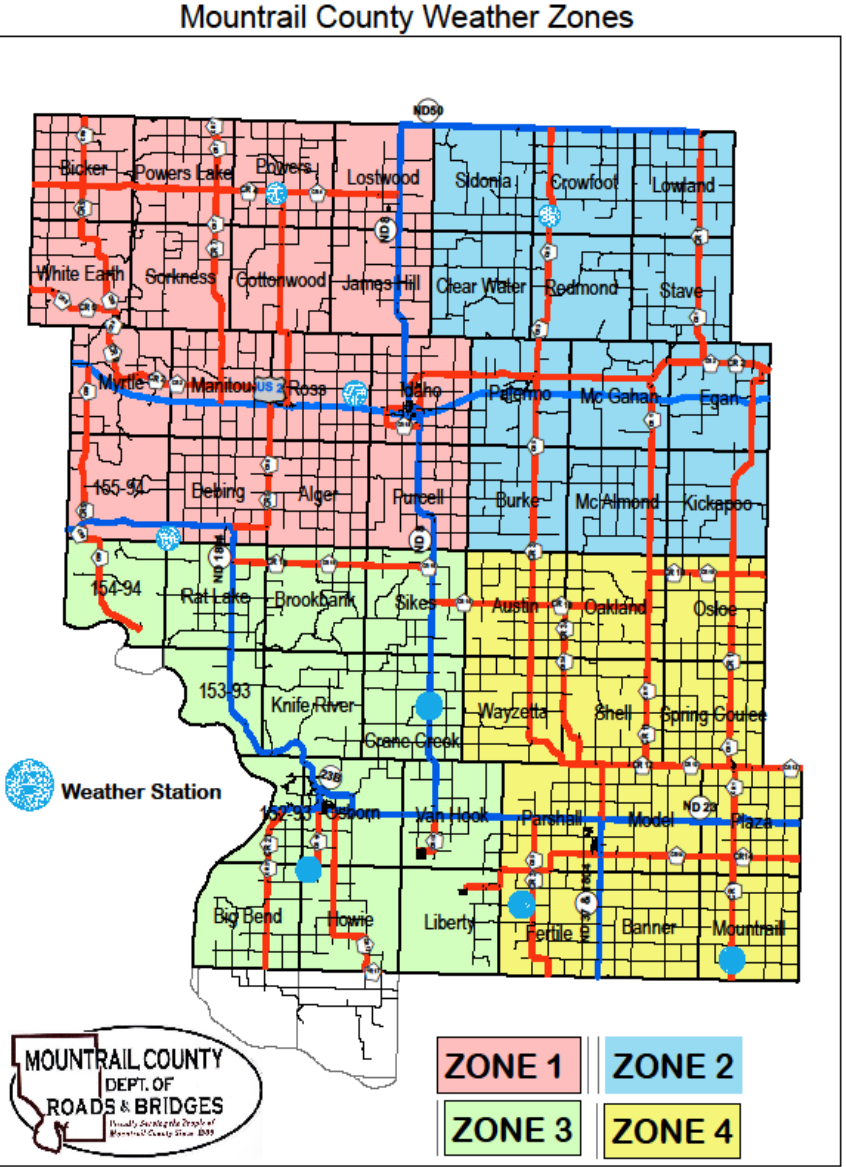
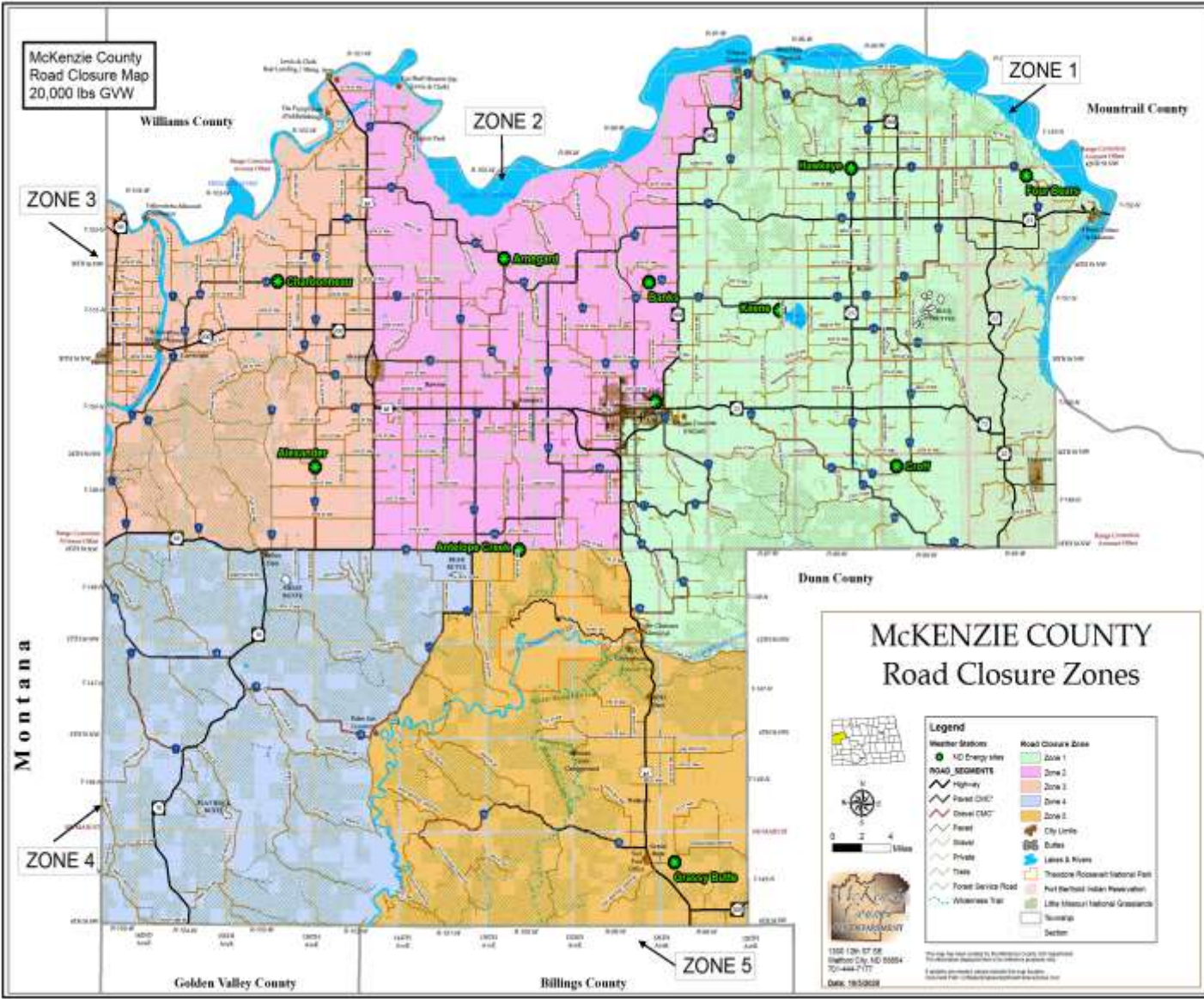
The new stations can be identified by the precipitation numbers on the map. The names are either related to a nearby community or the township in which the station is located.

# EXPECTATIONS OF THE PROJECT

- ▶ County Road Departments can use the weather data to determine the area of impact for weight restrictions
- ▶ County Road Departments use weather station locations to create/modify road “zones” for issuing restrictions
- ▶ Forecast and weather accessible from:
  - ▶ Ndenergy.org and LoadPassPermits.com
  - ▶ NDAWN (ndawn.ndsu.nodak.edu)
  - ▶ County Websites
  - ▶ UGPTI - GRIT







# History

- Watford City Western Energy Roundtable
- Industrial Commission Funds Wise Road Launch
- 2019 – 18 weather stations added
- 2020 – 14 weather stations, 2 road probes added
- 2021 – 10 weather stations, 2 road probes added
- 2022 – 6 weather stations, 2 to go.



# Roadway Condition Assessments



WISE ROADS DATA SHEET

201-1230  
 10/11/21  
 11/18/21  
 11

Station Name: RAV LAKE Date: 11/18/21  
 Road Number: 96 NHT NW Team Members: CURT GLASOE  
 Location: Latitude: 48°18'49" Longitude: 102°41'56" County: ADAMS COUNTY  
 Posted Speed Limit          MPH ADT          how counted         

5' 50" / 11'



Existing Road template measurements

Crown left 3% Crown right 4%

Does road meet county standard template?  Yes  No

1 1 2 3 4 5 6 1

2 1/2", 2 X", 3 5", 4 5", 5 X", 6 6"

Gravel thickness sample location

2' from Shoulder - depth wheel track off centerline off centerline wheel track 2' shoulder

Collect gravel samples, take to Braun Intertec, Dickinson, ND Obtain Gradation, and P.I.;

Collect subsoil sample?? Soil classification

Float - pounds per mile?? measure 0 - VERY LITTLE ONLY ON GRAVEL EDGE

1-1-CL

1 - 0-12 inches??



1 - 2 foot

1 - 4 foot

1 - 6 foot

Locations of ground sensor probes

NDSU

UPPER GREAT PLAINS  
 TRANSPORTATION INSTITUTE  
 NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM



WISE ROADS

TOWARD 365



GRAVEL ROADWAY EVALUATION FORM

Reported by: CURT GLASOE Phone #: 701 260 9457 Date: 11/18/21

WEATHER STATION SITE:

Dunn County, Medicine Hole          McKenzie County, Hawkey         

Mountrial County, RAV LAKE X Williams County, Epping         

WEATHER CONDITIONS:

Temperature: 24 Sky: Clear (clear or cloudy) Wind: 15 (direction, speed)

ROAD CONDITIONS:

Gravel Layer Rating:	Good <input checked="" type="checkbox"/>	Fair <input type="checkbox"/>	Poor <input type="checkbox"/>
Crown Rating:	Good <input checked="" type="checkbox"/>	Fair <input type="checkbox"/>	Poor <input type="checkbox"/>
Washboard Rating:	Good (none exist) <input type="checkbox"/>	Fair <input checked="" type="checkbox"/>	Poor <input type="checkbox"/>
Rutting Rating:	Good (no ruts) <input checked="" type="checkbox"/>	Fair <input type="checkbox"/>	Poor <input type="checkbox"/>
Pothole Rating:	Good (none) <input checked="" type="checkbox"/>	Fair <input type="checkbox"/>	Poor <input type="checkbox"/>
Float Rating:	Excessive <input type="checkbox"/>	Some <input type="checkbox"/>	None <input checked="" type="checkbox"/>
Ditches:	Good drainage <input checked="" type="checkbox"/>	Fair <input type="checkbox"/>	Poor <input type="checkbox"/>
Water in ruts on shoulders:	None <input checked="" type="checkbox"/>	Some spots <input type="checkbox"/>	Long segments <input type="checkbox"/>

COMMENTS: ROAD GOOD SHAPE - SOME MINOR WASHT  
BOARDING - GOOD HARD SURFACE 12" CEMENT BASE  
VERY HARD - CLASS 13 w/ DUST ADJUSTMENT

Note: Submit by email to North Dakota LTAP at [ndltap@ugpti.org](mailto:ndltap@ugpti.org)

Questions? Contact Curt Glasoe at [curt.glasoe@ndsu.edu](mailto:curt.glasoe@ndsu.edu) or 701 260 0459

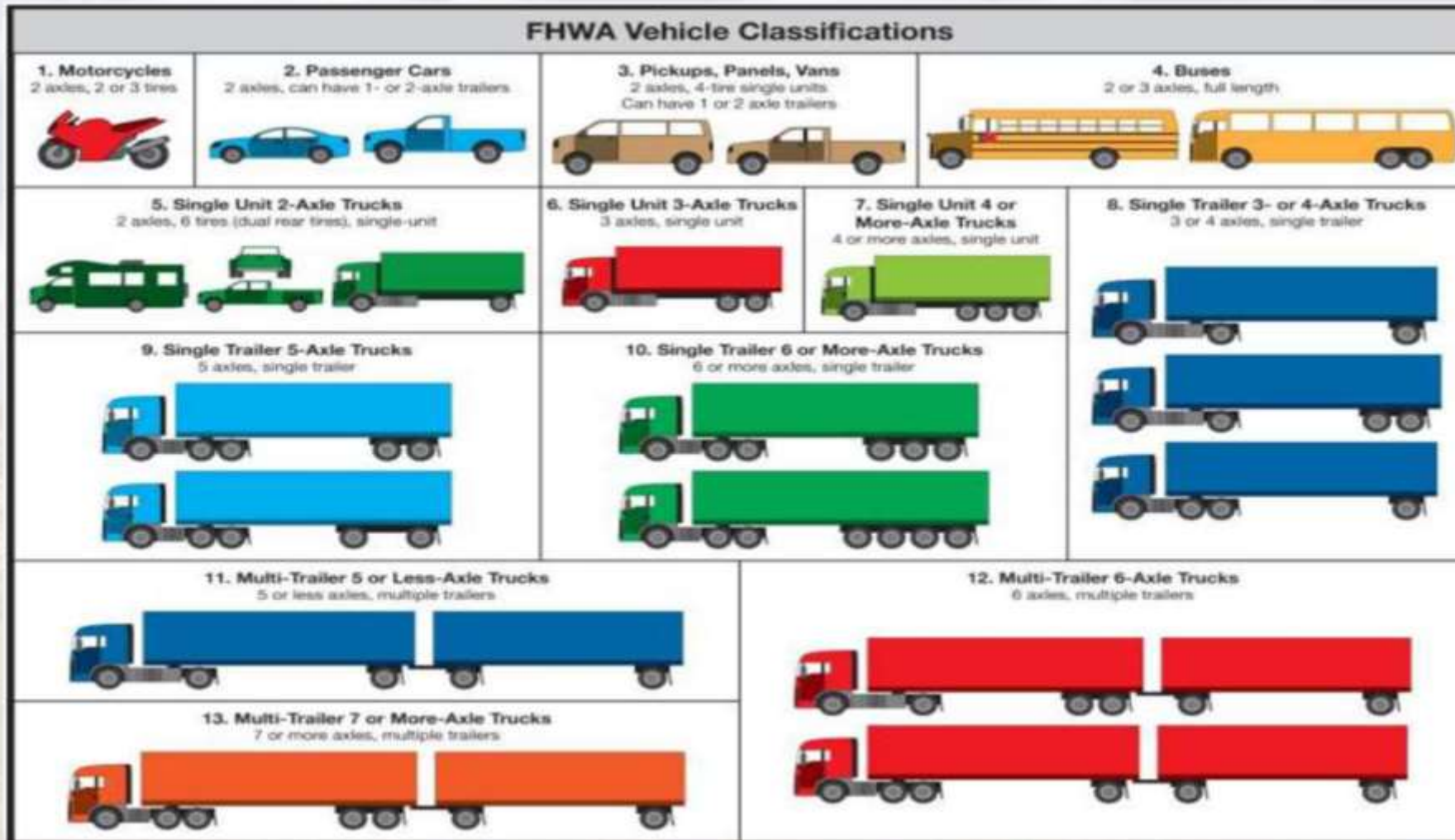




## RAT LAKE PROBE

INSTALLATION 11- 2021

# Vehicle classes





INSTRUMENTS THAT HELP YOU MAKE THE GRADE

# SLOPE METER NO. 2

THIS PRECISION INSTRUMENT MOUNTED ON HIGHWAY  
CONSTRUCTION MACHINERY WILL SHOW THE  
SETTING OF THE BLADE FOR A DESIRED SLOPE.

MANUFACTURED BY

**SLOPE METER, INC.**

MINNEAPOLIS, MN 55432

U.S. PATENT NO. 2,357,817 SEPT. 12, 1944; CANADIAN NO.

U.S.A.

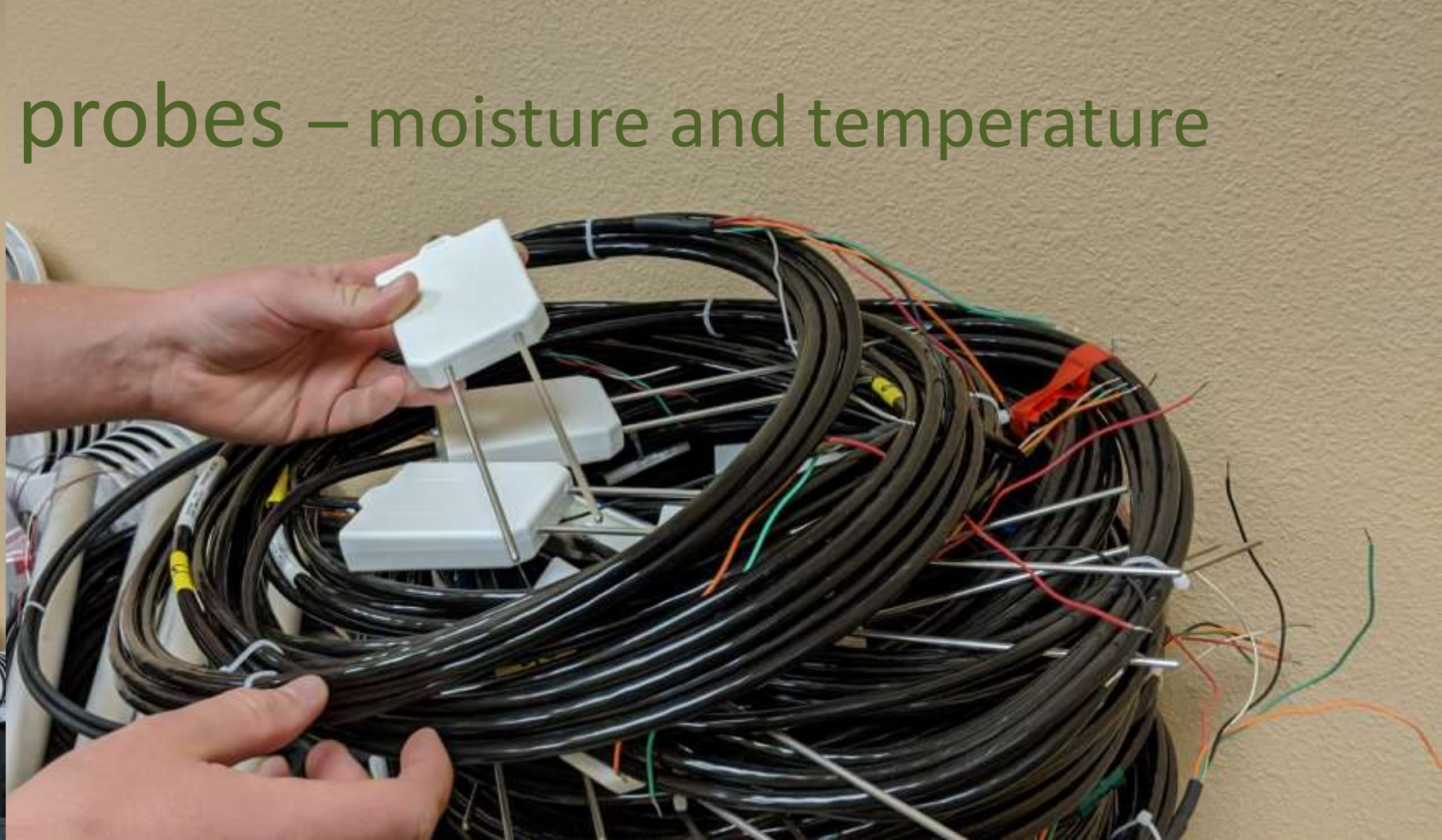
437,280 OCT. 8, 1946; BRITISH NO. 581,873 JULY 6, 1944

4% Slope on Gravel





# Subsurface probes – moisture and temperature



Jonathan Rosencrans - Meteorologist



# Mountrail Location Rat Lake 2021











## **WISE ROAD update 10-2022**

All 4 subsurface probes are in place, one in each of the big 4 counties, and 48 new stations are now in place with maybe 2 more will get installed yet this fall out of the target of 50 new stations for this Project.

Checking in with the weather patterns for the last year or so, the low temps are as follows;:

**Medicine Hole DUNN**– below surfacing - 88, 50, 60, never got to 32 at 6' level (34); 2' 2/11 to 4/20 below 32, then steady rise through July; 4' 32 from 2/26-4/28;

**Epping Williams** low 16- 3/11; high 74 7/18; 72" 6' low only 34 degrees in early May; high moisture maybe difference; 32 at 4' 2/22-4/28

**Banks McKenzie** -2/11 32 at 6' level till 4/19; Jan 4 32 at 4' level, high 87 7/17; low -1 1/1/22,; froze quicker than the cement treated base in Rat Lake.

**Rat Lake Mountrail**– high 87 7/19, low -6 1/1/22 ; at 4' level 32 12/30 to 4/27, 6' 2/15 late April high for summer 55 degrees

This first year of data, we will need 3-5 years minimum to establish some traits to get good information/direction as to when/if the road should be restricted and o which loads.



# NDAWN

- To access the Wise Roads website sign in to get up to date weather data.
- [wiseroadsnd.com](http://wiseroadsnd.com).
- Jonathan Rosencrans is installing 2 more sites one at Manderee and other to be determined. Total of 50.

<https://www.google.com/maps/d/viewer?mid=1Rhc51p2wPupmi6uCRI7cx87etENSw6w&ll=&z=10>

- [48.032402709797914%2C-103.62636472535185](https://www.google.com/maps/d/viewer?mid=1Rhc51p2wPupmi6uCRI7cx87etENSw6w&ll=&z=10)

# Restriction Results 2021

County	Road	Restriction	Rainfall	Start		End		
				Date	Time	Date	Time	
McKenzie	All gravel roads	20,000 GVW		5/8/2021	3:00 PM	5/9/2021	4:00 PM	
Dunn	All gravel roads	12,000 GVW		5/8/2021	3:00 PM	5/9/2021	5:00 PM	
Mountrail	Liberty Twsp roads	20,000 GVW		5/21/2021	9:00 AM	5/22/2021	8:30 AM	
Divide	All gravel roads	12,500 GVW		5/21/2021	Noon	5/23/2021	8:30 AM	
McKenzie	CR 55 from ND 23 to ND 1806	Closed		5/22/2021	1:00 PM	5/24/2021	Noon	
Dunn	28th St SW from Hwy 22 to 98th Ave SW	12,000 GVW		5/22/2021	2:00 PM	5/24/2021	2:30 PM	
Divide	CR 10	12,500 GVW		5/23/2021	8:30 AM	5/27/2021	6:00 PM	
Dunn	All gravel roads	12,000 GVW		5/23/2021	6:00 PM	5/24/2021	8:00 AM	
Billings	All gravel roads	12,000 GVW		5/23/2021	7:30 PM	5/24/2021	8:00 AM	
McKenzie	All gravel roads	20,000 GVW		5/23/2021	10:00 PM	5/24/2021	Noon	
McKenzie	CR 55 from ND 23 to ND 1806	20,000 GVW		5/24/2021	Noon	5/28/2021	Noon	
Divide	All gravel roads	12,500 GVW		5/24/2021	8:00 AM	5/24/2021	2:00 PM	
Williams	All gravel roads and chip seal roads	20,000 GVW		6/11/2021	6:00 AM	6/12/2021	6:00 AM	
Mountrail	All gravel roads	No Over Weight		6/11/2021	6:45 AM	6/14/2021	8:30 AM	
Divide	All gravel roads	12,500 GVW		6/11/2021	7:45 AM	6/12/2021	10:00 AM	
Williams	Strandahl Township roads	No Over Weight		6/11/2021	8:00 AM	6/15/2021	7:30 AM	
Burke	All gravel roads	12,500 GVW		6/11/2021	9:00 AM	6/12/2021	1:00 PM	
Burke	93rd St NW between 75th & 76th Ave NW	Closed		6/11/2021	9:20 AM	6/18/2021	1:00 PM	* Culvert washed out
McKenzie	All gravel roads	20,000 GVW		6/11/2021	#####	6/12/2021	10:00 AM	
Williams	70th St NW from 112th to 110th Ave NW (Co 19)	Closed		6/11/2021	12:30 PM	6/14/2021	3:15 PM	* Power lines over the road
McKenzie	45th St NW between US 85 and 148 T Ave NW	Reduced Speeds		6/11/2021	2:00 PM	6/16/2021	11:00 AM	* Soft and washed out road shoulders
McKenzie	36th St NW between 159th & 158th Ave NW	Closed		6/11/2021	4:00 PM	6/21/2021	4:00 PM	* Culvert washed out
Mountrail	69th Street between 93rd Ave and 94th Ave	Closed		6/11/2021	4:30 PM	6/14/2021	10:30 AM	* Downed trees across roadway
Mountrail	CR4 (74th St) at CR7 (91st Ave) to CR5 (87th Ave)	12,000 GVW		6/11/2021	5:30 PM			
Mountrail	96th Ave between ND1804 and 51st Street	6 Ton/axle - 80,000 max		6/14/2021	8:30 AM			
Mountrail	CR19 between ND23 and 36th Street	8 Ton/axle - 80,000 max		6/14/2021	8:30 AM			
Mountrail	99th Ave from US 2 to S to 60th St	20,000 GVW		6/28/2021	2:00 PM	6/29/2021	4:30 PM	* Culvert collapsed
Mountrail	CR4 (74TH Street) from CR7 (91st Ave) East to CR5 (87th Ave)	12,000 GVW		7/9/2021	9:30 AM	7/12/2021	10:30 AM	



# Partial Restriction Results 2022

County	Road	Restriction	Rainfall	Date	Time		Date	Time	
Williams	Brooklyn Twp - 117th Ave NW from 57th St NW to 60th St NW	Closed		3/15/2022	2:00 PM				* Road Repair
Mountrail	All gravel roads	No Over Weight		3/18/2022	8:00 AM		3/20/2022	12:00 PM	
Williams	Rainbow Township - 125th Ave NW	Closed		4/21/2022	7:20 AM		5/2/2022	4:00 PM	* Bridge Repair
Dunn	All gravel roads	12,000 GVW		4/23/2022	6:00 AM		4/25/2022	1:00 PM	
Billings	All gravel roads	12,000 GVW		4/23/2022	6:00 AM		4/25/2022	3:00 PM	
Mountrail	All gravel roads	No Over Weight		4/23/2022	8:00 AM		4/26/2022	12:00 PM	
Divide	All gravel roads	12,500 GVW		4/24/2022	9:00 AM		5/2/2022	10:00 AM	
Burke	All gravel roads	12,500 GVW		4/25/2022	1:00 PM		4/30/2022	4:00 PM	
McKenzie	All gravel roads	20,000 GVW		4/26/2022	1:30 PM		4/27/2022	10:30 AM	Restricted from 1:30 pm to Midnight every day
McKenzie	All gravel roads	20,000 GVW		4/27/2022	10:30 AM		4/29/2022	9:00 AM	Restricted from 10:30 am to Midnight every day
Williams	All gravel roads	20,000 GVW		4/27/2022	1:00 PM		5/2/2022	6:00 AM	
Williams	Rainbow Township - 125th Ave NW	Closed		5/9/2022	10:30 AM				* Bridge Repair
Divide	All gravel roads	12,500 GVW		5/9/2022	5:00 PM		5/10/2022	5:00 PM	
Burke	All gravel roads	12,000 GVW		5/9/2022	6:00 PM		5/10/2022	5:00 PM	
Williams	All gravel roads	No Over Weight		5/11/2022	12:00 PM		5/11/2022	2:00 PM	
McKenzie	All gravel roads	20,000 GVW		5/11/2022	9:00 AM		5/12/2022	6:00 PM	
Mountrail	All gravel roads	No Over Weight		5/11/2022	8:00 AM		5/15/2022	8:00 AM	* 6 ton/axle 80,000 # max
Billings	All gravel roads	12,000 GVW		5/11/2022	9:00 AM		5/11/2022	5:30 PM	
Dunn	All gravel roads in Zone 1 and 2	12,000 GVW		5/11/2022	10:00 AM		5/11/2022	5:00 PM	
Burke	All gravel roads	12,000 GVW		5/11/2022	11:00 AM		5/15/2022	9:00 AM	
Williams	Champion Township - All gravel roads	20,000 GVW		5/11/2022	12:15 PM		5/17/2022	7:00 AM	
Williams	Brooklyn Township - All gravel roads	20,000 GVW		5/11/2022	1:00 PM		5/17/2022	7:00 AM	
Divide	All gravel roads	12,500 GVW		5/11/2022	4:00 PM		5/15/2022	9:00 AM	
Williams	All gravel roads	6 Ton/axle - 80,000 max		5/11/2022	2:00 PM		5/11/2022	5:00 PM	
Williams	All gravel roads	20,000 GVW		5/11/2022	5:00 PM		5/12/2022	12:00 PM	
Williams	All gravel roads	6 Ton/axle - 80,000 max		5/12/2022	12:00 PM		5/12/2022	4:00 PM	
Williams	All gravel roads	20,000 GVW		5/12/2022	4:00 PM		5/14/2022	12:00 PM	
Billings	All gravel roads	20,000 GVW		5/12/2022	4:00 PM		5/14/2022	8:00 AM	
McKenzie	All gravel roads	20,000 GVW		5/12/2022	6:00 PM		5/14/2022	12:00 PM	
Dunn	All gravel roads -Zone 1	12,000 GVW		5/12/2022	6:00 PM		5/14/2022	6:00 AM	
Stark	All gravel roads	12,000 GVW		5/12/2022	6:00 PM		5/14/2022	9:00 AM	
Dunn	All gravel roads - Zone 2-4	12,000 GVW		5/12/2022	7:00 PM		5/14/2022	4:30 PM	

# Gravel Roadway Properties

plus

# Rainfall Event Data

---

Equates to refined roadway condition data:

# TOWARD 365 Prediction Model



# WISE ROADS 2022

Weather Information System to Effectively Assess Rain Influenced Gravel Road Conditions



Curtis W. Glasoe, PLS/PE  
701-260-9459  
curt.glasoe@ndsu.edu



Project is funded and supported by: NDAWN, WDEA/LoadPass, UGPTI/NDLTAP and a grant from the Oil and Gas Research Council





# ANY QUESTIONS???







THANK YOU