North Dakota Agricultural Weather Network (NDAWN)

Best of Best in Wheat & Soybean Research
Moorhead, MN
2/6/2020

Presented by: James Hyde
What is NDAWN?

We are a public / private partnership between the North Dakota State University (NDSU) AES, the State of North Dakota, and Individual businesses / sponsors.

NDAWN is what is called a Mesonet. A Mesonet is a series of weather stations that span a regional scale, often a state.

- Spacing 10-40 miles apart.
- Between 10-100+ stations.
- NDAWN Current Station # : 137

Other Plains Mesonets:
Manitoba Ag. Weather Network – 109 Stations
South Dakota Mesonet - 27 Stations
Hennipin County (West) – ~15 Stations
Iowa Environmental Mesonet - 19 Stations
Nebraska Mesonet – 68 Stations
NDAWN’s Mission

Monitor and record local weather conditions throughout North Dakota, and disseminate these observations, free to the citizens of North Dakota, via the NDAWN web site.

Provide weather data required for the novel development and sustained use of models and tools to provide a significant return on investment for agriculture.

Assist the state and it’s associated agencies, and the citizens of North Dakota with weather information relating to:

- Accidents
- Crimes and Forensics
- Energy Development
- Hobbyists and Enthusiasts
- Insurance Claims
- Media
- Policy Decisions
- Roads and Transportation
- Resolution of legal questions
- Natural Resource Management
- Utility Planning and Operations
- Storm Damage
- Water Use and Management
- Weather Forecasting & Research
NDAWN Timeline

1988: Started by Dr. John Enz, a Professor of Soil Science at NDSU. Deployed first 6 stations to NDSU Research Facilities for monitoring.

1990: Hourly Records and data-logging begins in partnership with High Plains Regional Climate Center (HPRCC)

1993: Statewide Expansion & First Private Partnerships


2019: Central MN Ag. Wx Network Joins, Bakken / WISERoads project begins.
Growth of NDAWN

NDAWN Station #’s

Central MN Ag. Wx. Network Joins & WISEROADS (Bakken) Micronet

NDAWN Modernization Period 2014 to ~2019

First Private Partnerships & Statewide Expansion (‘93-’96)

Original 14 at NDSU Research Sites
What Makes NDAWN Different?

- Measurements, in the field.
  - Not at city airports!
- Ag focused!
- We Live and Breath Weather.
- Dedicated Support
- Test, Calibrate, Replace. Accuracy is priority.
- We know our stations, personally.

NDAWN was specifically designed, from the beginning, to provide weather data required for the development and use of agricultural models and tools.
What NDAWN Measures

**All Stations Measure:**
- Temperature
- Dew Point / Humidity
- Wind Speed & Direction
- Solar Radiation
- Soil Temperatures (4") (Bare & Turf)
- Rainfall

**Select Sites Have:**
- Temperature (27’, 9’, 3’, 18”, 6”)
- Wind Speed (30’)
- Deep Soil Temperature (2 to 90”)
- Soil Moisture (4 to 40”)
- All Precipitation Gauges (Includes Snow!)
- Aircraft / Drone (ADS-B) Tracking
Where Can I Find Your Data?

Access to NDAWN data via the NDAWN Website & NDAWN App

- Current Conditions
- Maps
- Archives / Map Archives
- Specialty Measurements
- Ag Tools

www.NDAWN.org
NDAWN Website (ndawn.org)

Yesterday’s Weather & Station Information

Yesterday’s Maps
## Current Weather

<table>
<thead>
<tr>
<th>Station</th>
<th>Air Temp</th>
<th>Wind Direction from</th>
<th>Wind Speed</th>
<th>Peak Gust</th>
<th>Relative Humidity</th>
<th>Dew Point Temp</th>
<th>4&quot; Bare Soil Temp</th>
<th>Wind Chill Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minot</td>
<td>1 °F</td>
<td>329° (NNW)</td>
<td>8 mph</td>
<td>13 mph</td>
<td>78%</td>
<td>-4 °F</td>
<td>23 °F</td>
<td>-13 °F</td>
</tr>
</tbody>
</table>

**Last update:** 5:05 PM CST on 13 Jan 2020

Yesterday's Total Rain: 0.00"

Today's Total Rain: 0.00"

Today's Max Air Temp: 11 °F at 0001

Today's Min Air Temp: 1 °F at 1705

Today's Peak Gust: 18 mph at 1548

**Current:**

- Air Temp: 1 °F
- Wind Direction from: 329° (NNW)
- Wind Speed: 8 mph
- Peak Gust: 13 mph
- Relative Humidity: 78%
- Dew Point Temp: -4 °F
- 4" Bare Soil Temp: 23 °F
- Wind Chill Temp: -13 °F

**NDAWN Center**
North Dakota State University

This page is updated every 5 minutes.
NDAWN Current Maps (Update Every 5 Min)
NDAWN Cloud Service

station.ndawn.org
Example: fargo.ndawn.org
NDAWN Deep Soil
NDAWN Ag. Tools
Data and Maps - Since 1990

**Barley:**
- GDD / Growth Stage Estimations

**Canola:**
- GDD / Growth Stage Estimations
- Sclerotinia Risk (NDSU Pathology)

**Corn:**
- GDD

**Potato:**
- GDD / Growth Stage Estimations
- Early & Late Blight (NDSU Pathology)
- NDAWN Potato Phone App

**Soybean:**
- GDD / Growth Stage Estimations

**Sugarbeet:**
- GDD / Growth Stage Estimations
- Herbicide Timing Guidance
- Cercospora (Leaf spot) Infection Risk

**Sunflower:**
- GDD / Growth Stage Estimations

**Wheat & Small Grains:**
- GDD / Growth Stage Estimations
- Wheat Midge DD
- Small Grains Disease Forecaster
  - Scab
  - Rust
  - Tan Spot
Wheat Growing Degree Days / Growth Stages and Midge Degree Days

Get information about wheat growing degree days
Get information about wheat midge

Date | Max Air Temp | Min Air Temp | Total Rainfall (in.) | Wheat GDD (°F) | Wheat AGDD (°F) | Est. Haun Growth Stage | Growth Stage Comment | Wheat Normal GDD (°F) | Wheat Normal AGDD (°F) | Wheat Normal Date | Wheat Normal Year
2019-06-24 | 74 | 49 | 0.22 | 30 | 1520 | 9.9 | 34 | 1818 | -98 | 54 | No
2019-06-25 | 76 | 53 | 0.00 | 33 | 1553 | 10.1 | 34 | 1652 | -99 | 45 | Yes
2019-06-26 | 83 | 48 | 0.00 | 34 | 1587 | 10.3 | 34 | 1801 | -90 | 40E | Yes
2019-06-27 | 84 | 59 | 0.00 | 39 | 1625 | 10.6 | 34 | 1720 | -94 | 41 | Yes
2019-06-28 | 82 | 61 | 0.12 | 39 | 1665 | 10.9 | 34 | 1754 | -89 | 41 | Yes
2019-06-29 | 81 | 60 | 1.71 | 38 | 1703 | 11.2 | 35 | 1789 | -86 | 44 | Yes
2019-06-30 | 80 | 57 | 0.00 | 37 | 1740 | 11.4 | 35 | 1824 | -84 | 43 | Yes
2019-07-01 | 81 | 54 | 0.01 | 36 | 1776 | 11.7 | 35 | 1859 | -83 | 41 | No
2019-07-02 | 79 | 59 | 0.00 | 32 | 1809 | 11.9 | 35 | 1894 | -85 | 34 | No
2019-07-03 | 71 | 63 | 0.00 | 29 | 1830 | 12.1 | 35 | 1929 | -91 | 22 | No
2019-07-04 | 72 | 60 | 0.00 | 29 | 1866 | 12.0 | 35 | 1964 | -88 | 8 | No
2019-07-05 | 77 | 51 | 0.00 | 32 | 1896 | 12.2 | 36 | 2000 | -102 | 1 | No
2019-07-06 | 78 | 54 | 0.00 | 33 | 1931 | 12.2 | 36 | 2036 | -105 | 6 | No
2019-07-07 | 84 | 57 | 0.00 | 38 | 1969 | 12.2 | 36 | 2072 | -103 | 5 | No
NDAWN Special Tools: Maps!


Source: North Dakota Agricultural Weather Network (NDAWN)
https://ndawn.ndsu.nodak.edu
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Inversions

- Inversions are when the atmosphere “flips over” near the ground. Often when going from Day to Night.
Most Common Inversion Scenarios
(And Mis-Conceptions)

**Ideal Conditions + Evening/Night/Early Morning:**
- Clear skies after a day of sunshine
- Calm Winds
- Low Humidity
- Dry Ground

*The Truth?* Inversions are **VERY** common in northern plains. **ANY** of the above conditions most often leads to Inversions.
Time of Day Vs. Inversions

Inversion Distribution Over Time (June 2018)
How We Measure Inversions

- The Detection of an inversion is fairly simple.
- If Temperature(Tall) > Temperature (Short), then Inversion!
How to spot inversions

Inversion conditions are widespread, networks such as NDAWN can detect inversion conditions over a widespread area.

However.

Local (microclimate) conditions can create isolated pockets of inversions.

**Visual Clues:**
- Fog hanging just above the plant canopy.
- Dirt kicked up from road “hangs” & does not rise.

**Auditory Clues:**
- Road noise from passing vehicles seems louder than normal over long distances.

**Sensory Clues:**
- Ground feels cold compared to air when raising your hand above head.
- Air feels colder in ditches / near sloughs.
# NDAWN Inversion Mobile App!

**Welcome!** Please select your stations to receive Soybean Council inversion alerts.

## Inversion Alerts

<table>
<thead>
<tr>
<th>Search</th>
<th>Ada</th>
<th>Bowman</th>
<th>Brampton</th>
<th>Carrington</th>
<th>Cavalier</th>
<th>Crandon</th>
<th>Crosby</th>
<th>Dazel</th>
<th>Edgeley</th>
<th>Fargo</th>
<th>Fingal</th>
<th>Genoa</th>
<th>Grafton</th>
<th>Hope</th>
<th>Kempston</th>
<th>Kennedy</th>
<th>Langdon</th>
</tr>
</thead>
</table>

## Contact

<table>
<thead>
<tr>
<th>WEATHER SITE</th>
<th>Logan Center</th>
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</table>

*Last updated: 8:35 AM 7/25/2019*  
*No Inversion*

## Ag Weather

<table>
<thead>
<tr>
<th>Town</th>
<th>Temperature (°F)</th>
<th>Wind Speed (mph)</th>
<th>Wind Gust (mph)</th>
<th>Wind Direction</th>
<th>Dew Point Temp (°F)</th>
<th>Relative Humidity (%)</th>
<th>Today’s Total Rain (in)</th>
<th>Today’s Max Air Temp (°F)</th>
<th>Today’s Min Air Temp (°F)</th>
<th>Today’s Peak Gust (mph)</th>
<th>Bare Soil Temp (°F)</th>
<th>Turf Soil Temp (°F)</th>
<th>Today’s Total Rain (in)</th>
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<tbody>
<tr>
<td>Langdon</td>
<td>68°F</td>
<td>0 mph</td>
<td>0 mph</td>
<td>0° (N)</td>
<td>65°F</td>
<td>90%</td>
<td>0.01 in</td>
<td>75°F</td>
<td>68°F</td>
<td>23 mph</td>
<td>67°F</td>
<td>63°F</td>
<td>0.09 in</td>
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**DELTA T (°F):**

- 0-3: CAUTION
- 4-14: IDEAL
- 15-18: CAUTION
- 19+: NOT RECOMMENDED
NEW! NDAWN Delta-T For Spraying

- Delta T is a meteorological parameter for precision spraying
- Defined as the difference between the Temperature & Wet-Bulb Temp.
- Adopted in Australia for spraying and an inversion proxy

0 to 4°F -> Caution:
- Spray drops will not aerosolize.
- Potential for over potency.
- May drift.
- Uptake could be reduced, as leaf already moist.

4 to 14°F -> Ideal Spraying

14 to 18°F Caution: -> Small drops will aerosolize. Consider increasing nozzle / drop size.

18+°F -> Danger: Everything will aerosolize. Will evaporate on leaf before uptake.
NEW! NDAWN Delta-T For Spraying

Estimated Delta T for Spraying (°F)

Source: North Dakota Agricultural Weather Network (NDAWN)
https://ndawn.ndsu.nodak.edu
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NDAWN Cameras

NDAWN Camera System Specs:

- Solar Powered *(Daytime Only)*
  - Winter may have reduced schedule
- 1080p Resolution
- ~340° Views (mounting blocks ~20°)
- 3x to 4x Zoom (depending on model)
- HD picture uploaded every 10-15 min.
- Real-Time streaming capable*
  - Limited by cellular bandwidth
- 2 Day on-board video archive
  - Can be remotely downloaded*

[pictures.ndawn.org](pictures.ndawn.org)
NDAWN Cameras
Contact us!

Available Monday - Friday, 6A-5P Central.

Email: ndsu.ndawn@ndsu.edu

Twitter: @ndawnmesonet

Daryl’s Phone: 701-231-8209 (Station Inquiries)
James’s Phone: 701-231-1069 (Website / Station Issues)