



# Climatology of Frozen Ground In Wisconsin

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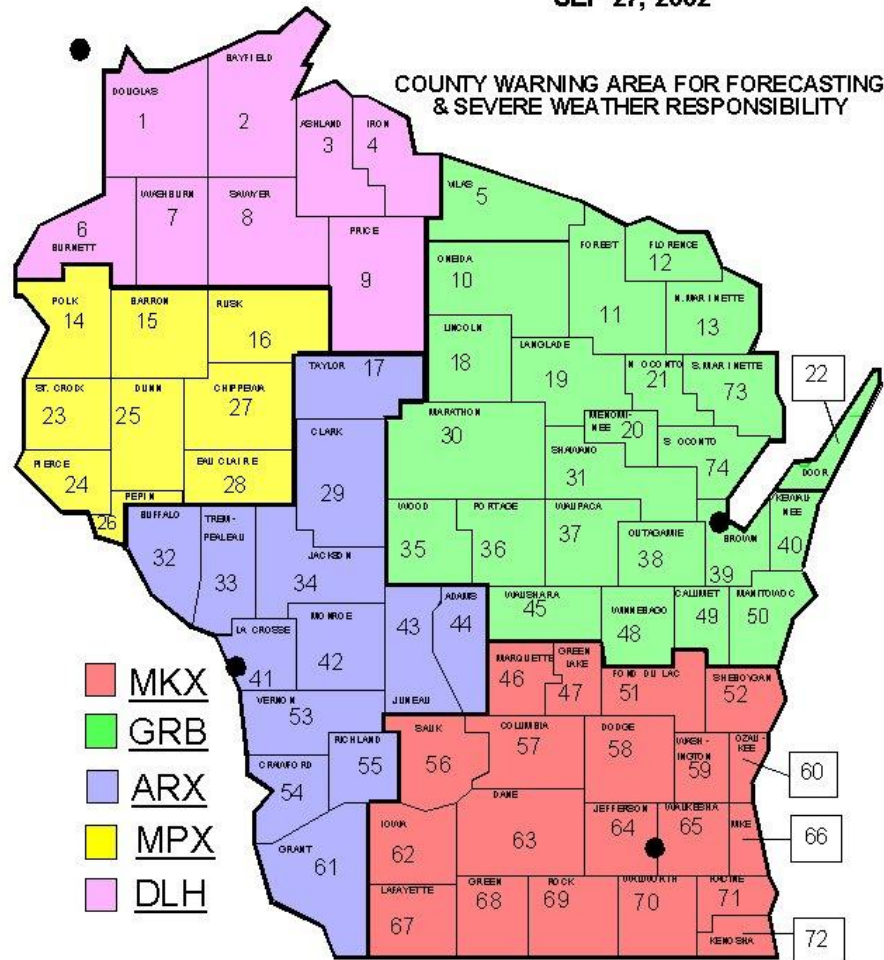
# National Weather Service – Sullivan, WI



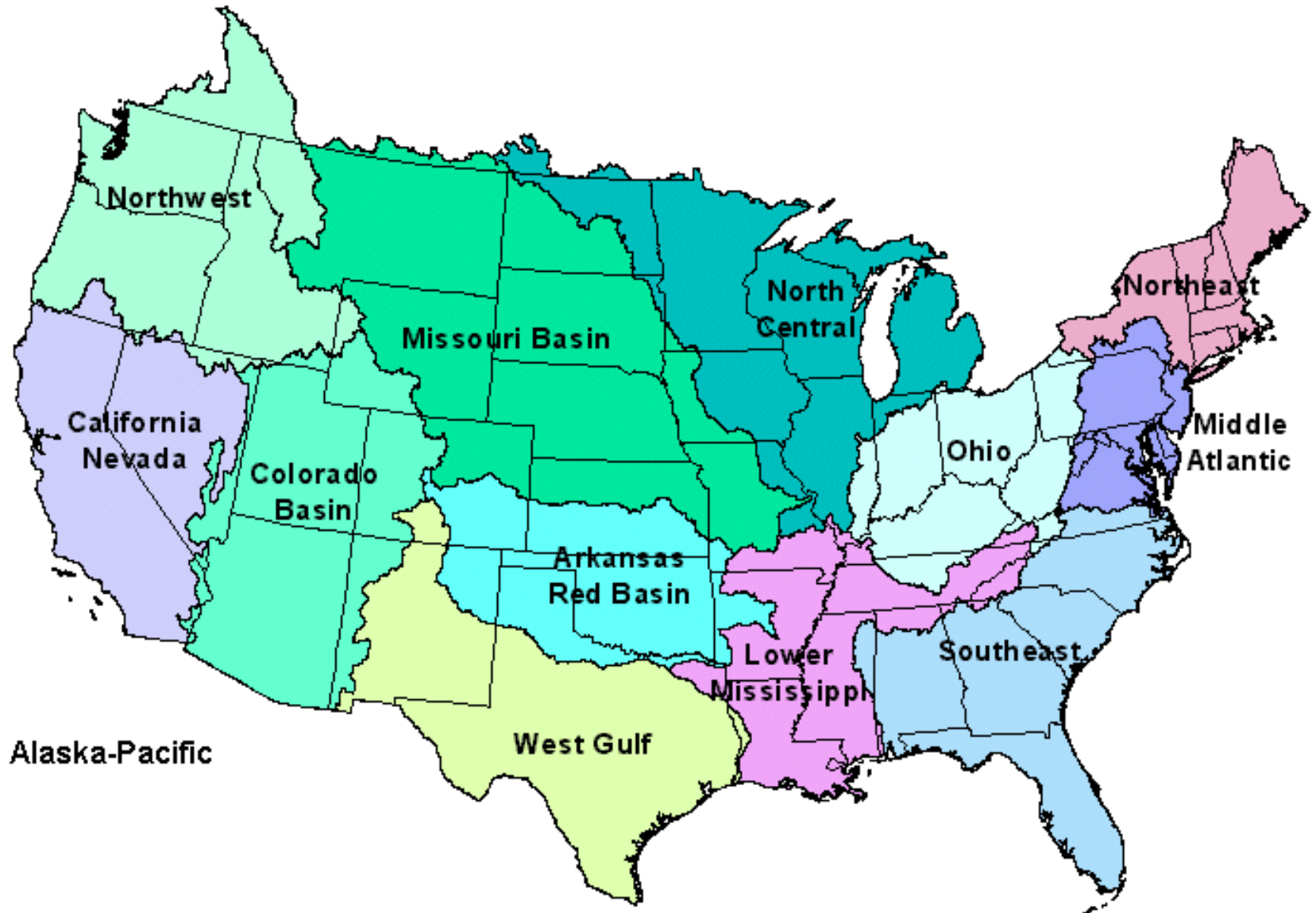
# 5 NWS offices service Wisconsin

## WISCONSIN

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# River Forecast Centers





# River Flood Forecast Points



## Wisconsin Rivers, Flood Forecast Points and Flood Stages

### Chippewa River

- |               |        |
|---------------|--------|
| 1. Eau Claire | 773 ft |
| 2. Durand     | 11 ft  |

### Trempealeau River

- |          |       |
|----------|-------|
| 3. Dodge | 18 ft |
|----------|-------|

### Black River

- |                     |       |
|---------------------|-------|
| 4. Neillsville      | 18 ft |
| 5. Black Riv. Falls | 47 ft |
| 6. Galesville       | 12 ft |

### Kickapoo River

- |                   |       |
|-------------------|-------|
| 7. Ontario        | 16 ft |
| 8. La Farge       | 12 ft |
| 9. Viola          | 12 ft |
| 10. Readstown     | 12 ft |
| 11. Soldiers Gro. | 13 ft |
| 12. Gays Mills    | 13 ft |
| 13. Steuben       | 12 ft |

### Yellow River

- |             |       |
|-------------|-------|
| 14. Babcock | 12 ft |
| 15. Necedah | 15 ft |

### Wisconsin River

- |                 |         |
|-----------------|---------|
| 16. Merrill     | 11 ft   |
| 17. Rothschild  | 25 ft   |
| 18. Wis. Rapids | 12 ft   |
| 19. Castle Rk.  | 30 kcfs |
| 20. Wis. Dells  | 16 ft   |
| 21. Portage     | 17 ft   |
| 22. Muscoda     | 9 ft    |

### Pecatonica River

- |                    |         |
|--------------------|---------|
| 23. Blanchardville | 11 ft   |
| 24. Martintown     | 13.5 ft |
| 25. Darlington     | 13.5 ft |

### Sugar River

- |              |       |
|--------------|-------|
| 26. Albany   | 12 ft |
| 27. Brodhead | 5 ft  |

### Little Wolf River

- |              |      |
|--------------|------|
| 28. Royalton | 5 ft |
|--------------|------|

### Waupaca River

- |             |      |
|-------------|------|
| 29. Waupaca | 6 ft |
|-------------|------|

### Wolf River

- |               |         |
|---------------|---------|
| 30. Langlade  | 11.5 ft |
| 31. Shiocton  | 11 ft   |
| 32. N. London | 9 ft    |

### Fox River

- |            |       |
|------------|-------|
| 33. Berlin | 13 ft |
|------------|-------|

### Crawfish River

- |             |      |
|-------------|------|
| 34. Milford | 7 ft |
|-------------|------|

### Rock River

- |                  |        |
|------------------|--------|
| 35. Watertown    | 5.5 ft |
| 36. Jefferson    | 10 ft  |
| 37. Ft. Atkinson | 6 ft   |
| 38. Lk. Koshk.   | 10 ft  |
| 39. Afton        | 9 ft   |

### Fox River

- |                 |       |
|-----------------|-------|
| 40. Burlington  | 11 ft |
| 41. New Munster | 11 ft |

### Root River

- |              |      |
|--------------|------|
| 42. Franklin | 8 ft |
| 43. Racine   | 7 ft |

### Root River Canal

- |             |      |
|-------------|------|
| 44. Raymond | 9 ft |
|-------------|------|

### Milwaukee River

- |               |       |
|---------------|-------|
| 45. Cedarburg | 11 ft |
|---------------|-------|

### Baraboo River

- |                  |         |
|------------------|---------|
| 46. Rock Springs | 18.5 ft |
| 47. W. Baraboo   | 9 ft    |
| 48. Baraboo      | 16 ft   |

### Menominee River

- |                |       |
|----------------|-------|
| 49. Florence   | 9 ft  |
| 50. Niagara    | 13 ft |
| 51. Vulcan, MI | 15 ft |

### Eau Claire River

- |                |       |
|----------------|-------|
| 52. McAllister | 15 ft |
| 53. Fall Creek | 11 ft |

### Mississippi River

- |                 |        |
|-----------------|--------|
| 54. Alma        | 16 ft  |
| 55. Trempealeau | 647 ft |
| 56. La Crosse   | 12 ft  |
| 57. Genoa       | 631 ft |
| 58. Lynxville   | 625 ft |

### Sheboygan River

- |               |      |
|---------------|------|
| 59. Sheboygan | 8 ft |
|---------------|------|

### Turtle Creek

- |             |      |
|-------------|------|
| 60. Clinton | 8 ft |
|-------------|------|

### Beloit

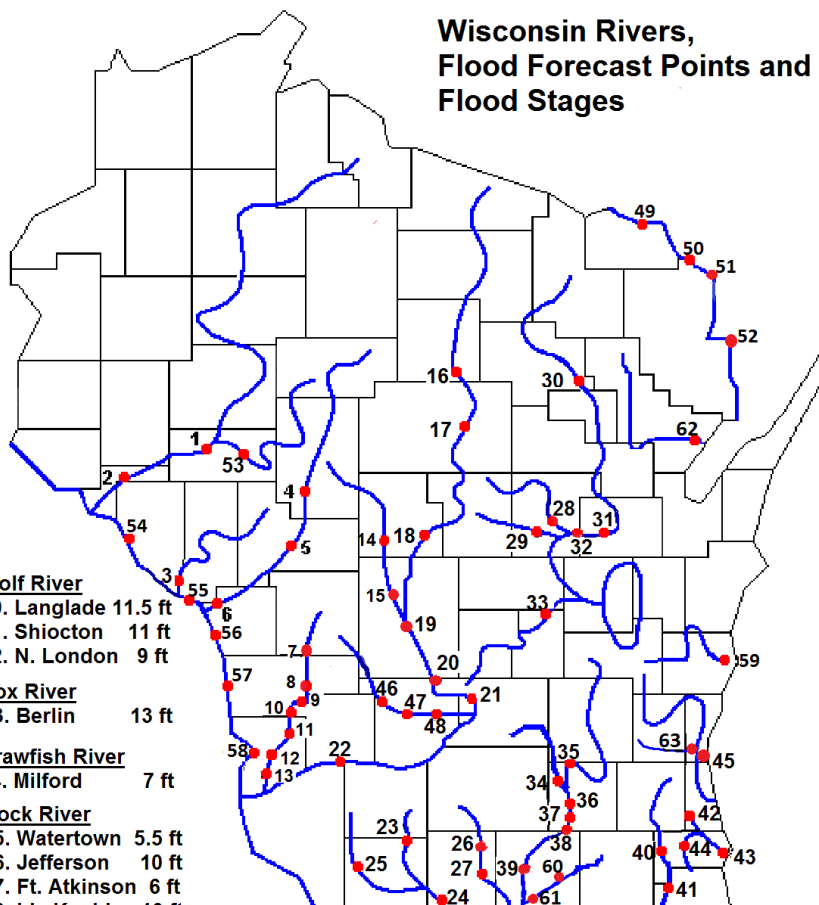
- |            |        |
|------------|--------|
| 61. Beloit | 7.5 ft |
|------------|--------|

### Oconto River

- |            |      |
|------------|------|
| 62. Oconto | 9 ft |
|------------|------|

### Cedar Creek

- |               |       |
|---------------|-------|
| 63. Cedarburg | 10 ft |
|---------------|-------|





# NWS Mission Statement-Hydrology

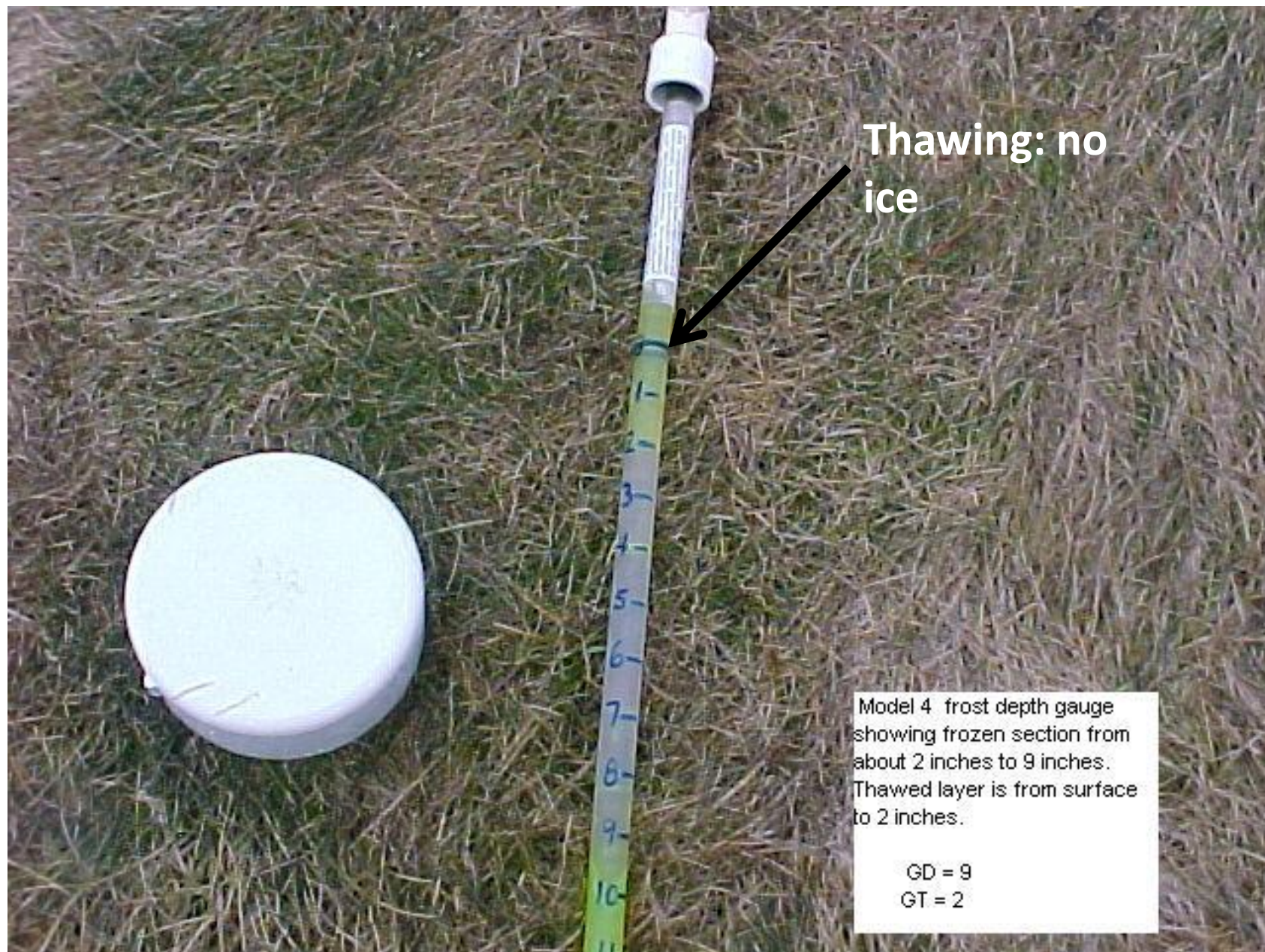
- Provide river and flood forecasts and warnings for the protection of lives and property.
- Provide basic hydrologic forecast information for the nation's environmental and economic well being.

# Training the Observer How to Read Frost Depth Gauge





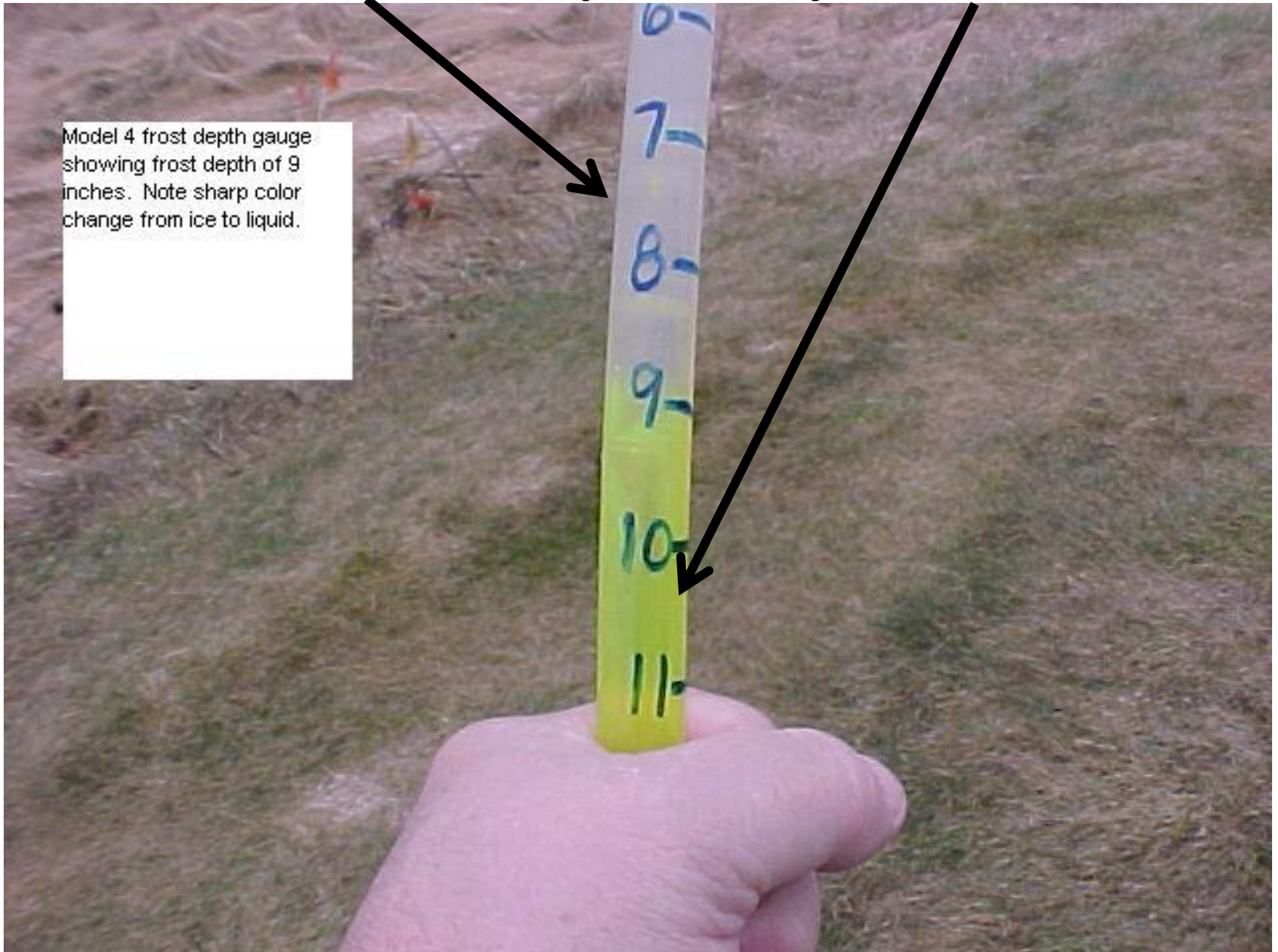
## Example of fluid color change with freezing and thawing





# Ice is clear, liquid is yellowish

Model 4 frost depth gauge showing frost depth of 9 inches. Note sharp color change from ice to liquid.



# Frost depth data on NWS public web site

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Below is information about Wisconsin frost depths (frozen ground) in grassy areas as measured by volunteers with NWS frost depth gages. Conditions are left natural in the area of the gage. Frost depth measurements are requested a minimum of twice weekly-monday mornings and thursday mornings November through March. Data aligned approximately from north to south. Data not available from all areas of the state. M stands for missing data-no report in at least the last 7 days. Comments are welcome. Contact:brian.hahn@noaa.gov EQP means equipment problem.

GD = depth of frost penetration

GT = depth of surface frost thawed

All measurements in inches

ID	County	Location	GD	GT	Time/Date of last report	Today's snow depth (in.)
DLHM5	St Louis	Duluth,MN-Airprt-NWS	6	M	08 AM 03/03	9
FLNW3	Florence	Florence-WWTP-COOP	29	0	07 AM 03/02	M
ARRW3	Florence	Aurora-4W-UCOOP	18	0	07 AM 02/28	M
LNOW3	Vilas	Ld. O Lks-12W-UCOOP	8	M	08 AM 03/04	11
ASTW3	Marinette	Athelstane-UCOOP	21	0	06 AM 03/04	2
MRTW3	Marinette	Marinette-WPS-UCOOP	M	M	M	M
SPOW3	Washburn	Spooner-UW-Ag.-COOP	16	0	08 AM 02/26	M
MLLW3	Lincoln	Merrill-8W-UCOOP	0	0	06 AM 03/04	1
ATGW3	Marathon	Antigo-DNR-UCOOP	M	M	M	M
KSAW3	Menominee	Keshena-UCOOP	M	M	M	M
BMRW3	Chippewa	Bloomer-WWTP-COOP	8	0	08 AM 03/04	2
ROBW3	St. Croix	Roberts-WWTP-COOP	1	0	09 AM 03/04	0
DRDW3	Pepin	Durand-WWTP-COOP	0	0	09 AM 03/03	M
BOWW3	Shawano	Bowler-4 E-COOP	4	0	08 AM 03/03	M
PLOW3	Portage	Plover-So.-UCOOP	7	0	07 AM 03/04	2
AMDW3	Portage	Almond-5 NE-UCOOP	5	0	08 AM 03/02	M
SUAW3	Brown	Suamico-3 SW-UCOOP	16	0	07 AM 03/02	4
RNBW3	Brown	Green Bay-NWS	10	5	08 AM 03/02	5
DRYW3	Outagamie	Darboy-UCOOP	1	0	07 AM 03/02	M
CHIW3	Calumet	Chilton-WWTP-COOP	3	0	08 AM 03/04	3
NFDW3	F. Du Lac	No. FDL-WWTP-UCOOP	M	M	M	M
ARX	La Crosse	La Crosse-NWS	15	9	12 PM 03/03	4
LODW3	Columbia	Lodi-WWTP-COOP	3	0	07 AM 03/04	2
WSFW3	Dodge	B Dam-Westford-COOP	2	0	07 AM 03/04	5
SVLW3	Ozaukee	Saukvil.-UWM-UCOOP	1	0	07 AM 02/27	M
GATW3	Ozaukee	Grafton-WWTP-COOP	0	0	07 AM 03/04	0
WTBW3	Washington	W. Bend-City-COOP	0	0	07 AM 03/04	4
GRTW3	Washington	Germantown-1NE-UCOOP	2	0	06 AM 03/03	M
HSEW3	Dodge	Hustisf.-WWTP-COOP	1	0	12 AM 03/03	M
STOW3	Dane	Stoughton-WWTP-COOP	0	0	07 AM 03/02	M
WATW3	Jefferson	Watertown-WWTP-COOP	0	0	07 AM 03/04	1
FATW3	Jefferson	Ft Atkin.-WWTP-COOP	3	0	07 AM 03/04	0
MXK	Jefferson	Sullivan-3 SE-NWS	4	0	05 PM 03/03	0
ONCW3	Waukesha	Oconom.-So.-UCOOP	2	0	08 AM 03/04	1
MNOW3	Waukesha	Eagleville-UCOOP	0	0	07 AM 03/04	0
WPKW3	Milwaukee	Whit.Pk-Boern.-COOP	3	0	07 AM 03/03	M
ALBW3	Green	Albany-Vill-UCOOP	26	20	07 AM 03/02	M
LANW3	Grant	Lancaster-UW-COOP	0	9	08 AM 03/02	M
CBCW3	Lafayette	Cuba City-WWTP-COOP	4	M	08 AM 03/03	M
BOIW3	Rock	Beloit-P Works-UCOOP	0	M	06 AM 03/02	M

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Below is Wisconsin frost depth information from other sources

# Factors influencing frost depth

- Air Temperature.
- Snow depth. Snow is an insulator. Snow depths were not a part of the analysis.
- Type of soil. Soil types at gauge locations are unknown for the purpose of this analysis.
- Conditions are left natural in area of gauge.



# Items of Climatological Analysis

1. Average date that frost first forms in ground (but does not necessarily last long-temporary)
2. Average date of longer term frost forming in ground.
3. Average deepest frost depth
4. Average date of deepest frost depth penetration.
5. Average date that frost leaves the ground in Spring.

# Climatological Analysis of Frost Depth Data

Data broken down into 3 sections of the state: Southern, Central, Northern for 18 frost depth gauge sites with periods of record from 5 to 13 years.

Avg. date of first temporary 1" frost	Avg. date of first long term 1" frost	Avg. deepest frost depth	Avg. date of deepest frost depth	Avg. date of last frost
<hr/>				
	<u>Southern Wis.</u>	(avg. of 7 gauge sites)		
11/22	12/17	17"	2/19	3/24
<hr/>				
	<u>Central Wis.</u>	(avg. of 6 gauge sites)		
11/24	12/6	21"	2/13	3/31
<hr/>				
	<u>Northern Wis.</u>	(avg. of 5 gauge sites)		
11/22	12/2	34"	3/3	4/13