NATIONAL WEATHER SERVICE GREEN BAY

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Winter 2018
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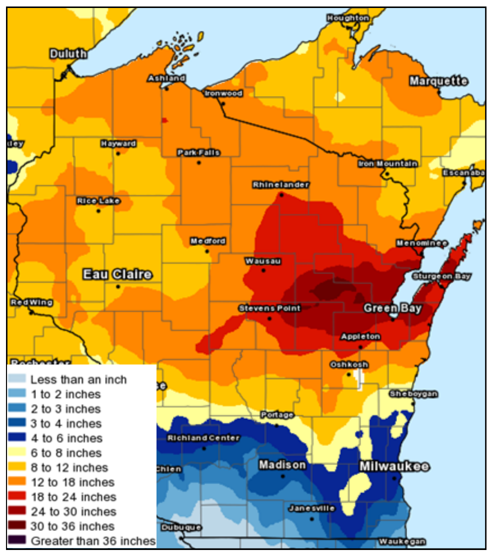
LATE SEASON BLIZZARD PUMMELS NORTHEAST WISCONSIN, BREAKS ALL-TIME RECORDS

BY: JEFF LAST

A historic, late season blizzard pummeled northeast and north-central Wisconsin on April 13-15, 2018. A large area of 15 to 30 inches of snow (see image on right) and winds gusting over 40 mph, rewrote the record books for many locations across the area. The heavy weight of the snow caused several roofs to collapse and made snow removal difficult. Part of a roof at a motel in Green Bay collapsed over the pool area, and roofs of several barns in Brown and Outagamie counties were damaged.



Storm total snowfall from April 13-15, 2018

The storm brought blizzard or near-blizzard conditions to much of the area making roads impassable from time-to-time. Winds of 40 to 50 mph caused sporadic power outages and created waves of 10 to 16 feet on Lake Michigan. The persistent northeast wind also created shoreline erosion along the western shores of the lake.

Many businesses were closed for part or all the weekend.

Here is a partial list of the records set in the larger cities across the region:

Drifts nearly 10 feet tall in Oconto Falls. Photo by Thomas Thomson.

Green Bay

Largest April snowstorm - **24.2"** (Previous record was 11.0" on April 4-5, 1977)

2nd largest snowstorm on record - **24.2"** (Behind the 29.0" that fell March 1-2, 1888)

Snowiest April on record - **36.7"** (Previous record was 15.1" in 1907)

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WANT MORE INFORMATION ON THE APRIL BLIZZARD?

ON PAGE 2, WE DIVE INTO THE DETAILS ON HOW MUCH OF AN ANOMALY THE APRIL BLIZZARD REALLY WAS!

Appleton

Largest April snowstorm - **21.2"** (Previous record was 12.3" on April 15-16, 1904)

Largest snowstorm on record - **21.2"** (Previous record was 19.5" on December 12-14, 1909)

Snowiest April on record - **30.8"** (Previous record was 26.0" in 1907)

Wausau

Largest April snowstorm - **20.7"** (Previous record was 12.1" on April 15-16, 1993)

2nd largest snowstorm on record - **20.7"** (Behind the 22.1" that fell March 5-6, 1959)

Snowiest April on record - **34.5"** (Previous record was 25.5" in 1909)

Rhinelander

Largest April snowstorm - **18.2"** (Previous record was 13.0" on April 3-4, 1945)

3rd largest snowstorm on record - **18.2"**

THE APRIL 13-15, 2018 BLIZZARD – AN APRIL ANOMALY

BY: GENE BRUSKY & TIMM UHLMANN

Introduction

The main challenges in snowfall forecasting are determining where, how quickly, and how much snow will fall. Forecasters not only look at the latest model forecast weather patterns, but also **compare model forecasts to climatology.** Such comparisons help forecasters put the forecast into a historical perspective, helping them evaluate whether the model may be forecasting an unusual, extreme, or anomalous event. We will look at the April 2018 blizzard from this climatological perspective, focusing on model forecasts of large-scale patterns that resulted in the historic snowfall amounts.

The April blizzard was a long-duration event, separated into two phases, that blasted northeast Wisconsin over the course of a three-day period. The first phase of the storm occurred over an 18 hour period ending around noon on Saturday, April 14, dumping 12 to 18 inches of heavy, wet snow across parts of northeast Wisconsin, along with copious amounts of sleet. After about a 6 hour lull, the second phase brought a pummeling of heavy snow to northeast Wisconsin from 6 pm Saturday, April 14, through mid-afternoon on Sunday, April 15. An additional 12 to 18 inches of heavy, wet snow fell, accompanied by blizzard conditions.

The factors that led to the heavy snow during the first phase were atypical, in that the heavy snow was associated with narrow and intense snow bands that developed well ahead of the main low pressure system. We will focus primarily on the first phase of the storm.

The stage was set by the upper-level jet

The large-scale upper-level pattern forecast over North America centered on phase 1 of the winter storm is shown in Figure 1. This

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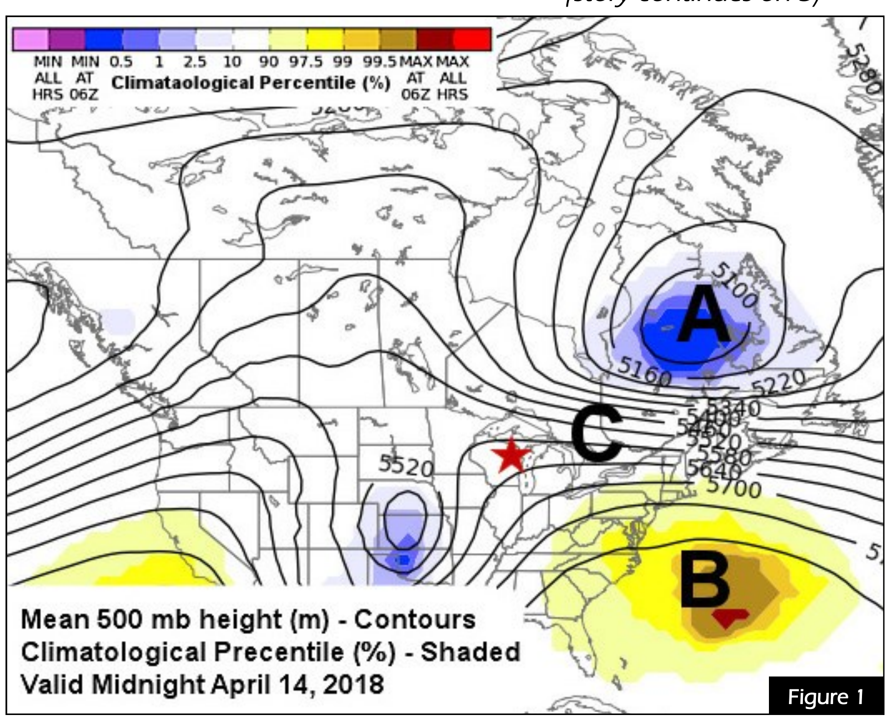

Figure 1

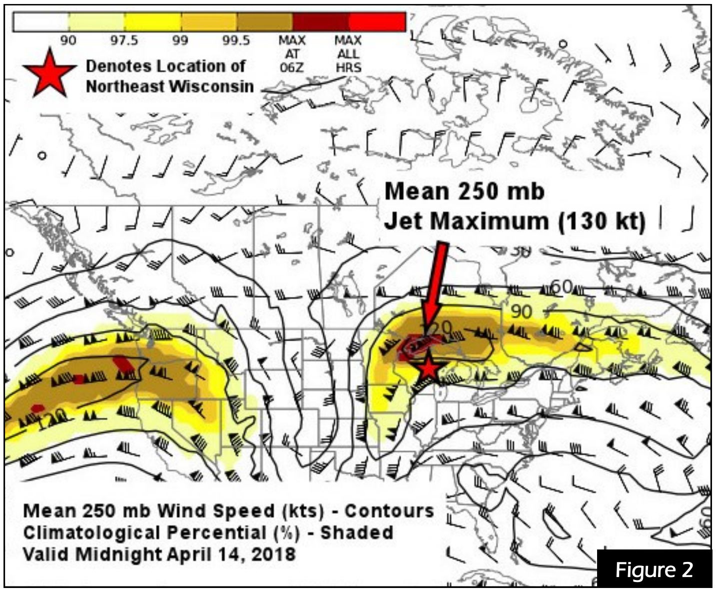

Figure 2

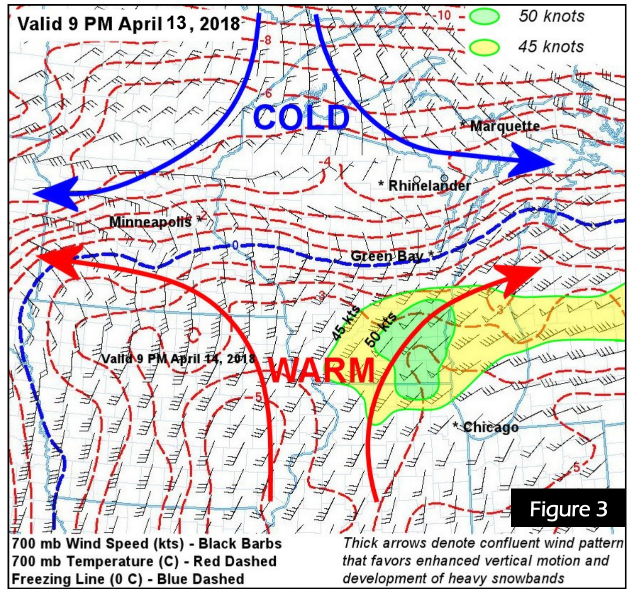

Figure 3

analysis includes information that allows forecasters to compare the weather pattern to 30 year climatology for the middle of April. This type of analysis helps forecasters not only get a feel for the large-scale pattern, but more importantly, how much the forecast pattern deviates from what would typically be expected for the middle of April. Note that this is not a single model forecast, but rather depicts the average of several forecasts (referred to as an ensemble mean) all valid at the same time (midnight April 14, 2018). Ensemble forecasts, such as that shown in Figure 1, give forecasters more confidence of the likelihood of a pattern occurring compared to looking at a single (deterministic) forecast.

The shaded areas in Figure 1 indicate where the mean 500 millibars (mb) heights (usually around 18,000 feet) deviated significantly from April climatology. The dark blue shades denote regions where the 500 mb heights (location A) were forecast to be unseasonably low for the middle of April, and the yellow/brown shades (location B) denote regions where the 500 mb heights were forecast to be unseasonably high. The main take away from this anomalous 500 mb height pattern is that it favored the development of an unusually strong jet stream over the Great Lakes (location C).

The ensemble forecast mean upper-level wind speeds at 250 mb (around 30,000 feet) also valid at midnight April 14, 2018, is shown in Figure 2. The red shading indicates the 130 knot wind speeds just north of Wisconsin were forecast to be near the maximum ever observed at that location based on the mid-April climatology. This is important because northeast Wisconsin (denoted by red star) was forecast to be just to the south of the strong upper-level jet. This is an area of the jet that favors sustained large-scale upward motions often leading to heavy precipitation!

The influence of confluence

Another interesting aspect of the weather pattern associated with phase 1, was that it was strongly frontogenetic over northeast Wisconsin. A frontogenetic pattern often favors strong (focused) vertical motion that can further organize precipitation into narrow bands normally associated with the most intense snowfall rates.

Figure 3 depicts an analysis of wind and temperature lower down in the atmosphere at 700 mb (around 10,000 feet). Note how the winds at this level are coming together (i.e., confluent) over north-central Wisconsin. When comparing the wind to the temperature field, we see how the pattern favors compaction of the isotherms (lines of equal temperature shown in dashed red lines in Figure 3). As this frontogenetic process occurs in an unstable atmosphere, upward motion can become focused and intense, often leading to narrow heavy snow bands. Note in Figure 3, the southerly flow (red arrows) was very strong, exceeding 50 knots over southeast Wisconsin (green shaded area). The moist and unstable southerly flow ascended rapidly over the cold air coming from the north, causing the heavy snow bands to form.

The radar images (Figure 4) depict the evolution of the heavy snow band during the late evening of Friday, April 13. Initially, there were two distinct bands (4A). The northern band mainly produced light snow, while the southern band produced rain, freezing rain, and heavy sleet showers. Six hours later, the bands congealed into one

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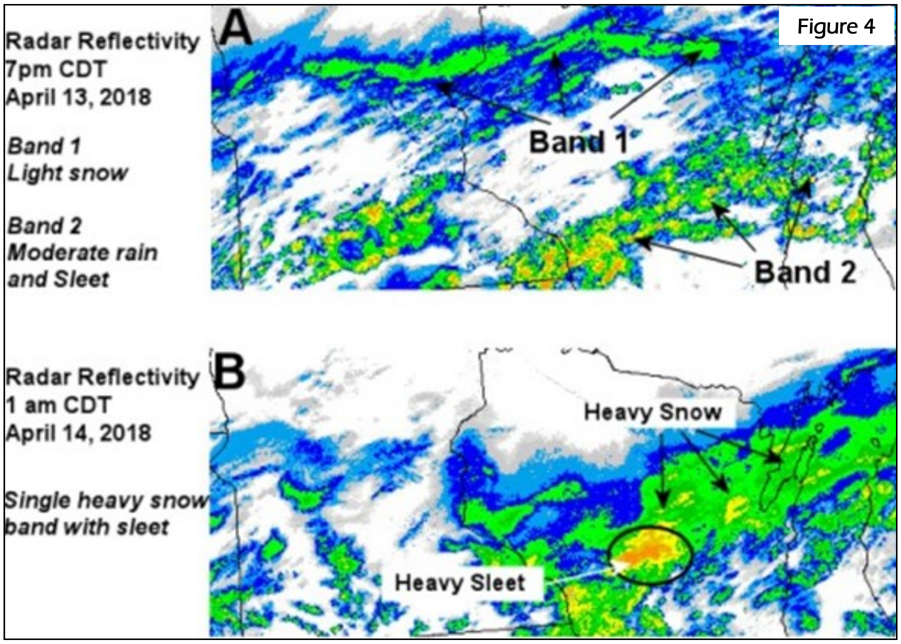


Figure 4

as temperatures began to cool. Heavy snow occurred across the northern portion of the area while heavy sleet continued across parts of central Wisconsin (Figure 4B). The sleet would change to snow later in the event.

Surface low had nowhere to go

As discussed earlier, the historic April 2018 winter storm was characterized by two phases that seriously impacted Wisconsin. The second phase of the event was more typical, in that heavy snow occurred on the northwest side of the surface low as it passed to the south of Wisconsin (Figure 5). What was somewhat unusual was the slow movement of the surface low from the Central Plains toward Lower Michigan. This slow movement was partly due to an approaching upper-level disturbance from the west, and an anomalously strong surface high pressure system anchored to the north of Wisconsin (Figure 5). In fact, the strength of the surface high pressure system at that location was forecast to be near the 30 year climatological maximum (brown/red shaded area) for the middle of April! The strength of this high contributed to a tight pressure gradient over Wisconsin leading to very strong northeasterly low-level winds. These winds brought a continuous feed of cold air into Wisconsin, ultimately changing the mixed precipitation from earlier in the event to a prolonged period of snow, accompanied by blizzard conditions. The radar image (Figure 6) depicts the snow area over northeast Wisconsin early Sunday morning, April 15. The snow persisted for the next 12 hours resulting in another 12-18 inches of heavy, wet snow, associated with blizzard conditions and winds gusting over 50 mph!

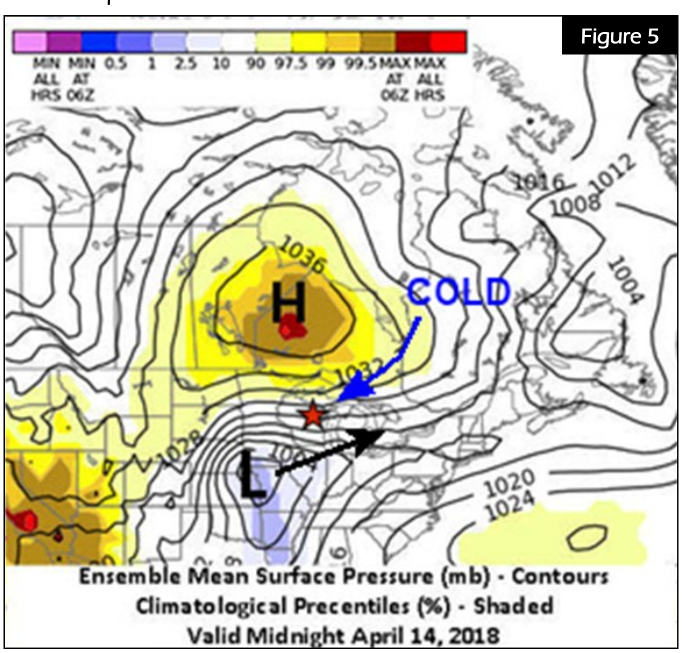


Figure 5

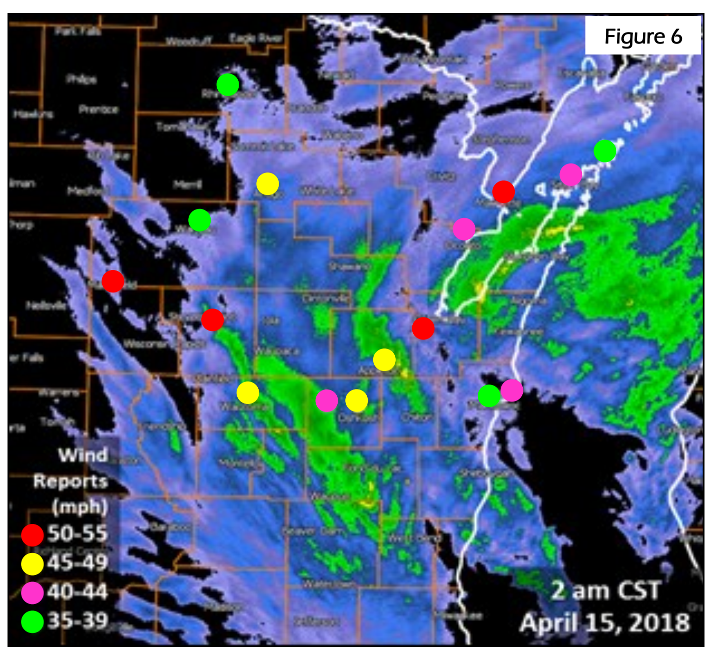
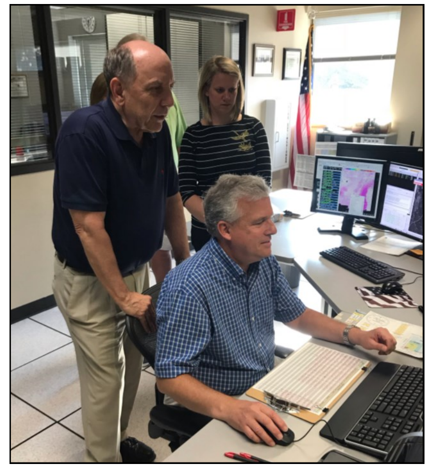


Figure 6

NWS DIRECTOR VISITS NWS GREEN BAY

BY: JEFF LAST

Dr. Uccellini (right) helps with the balloon release



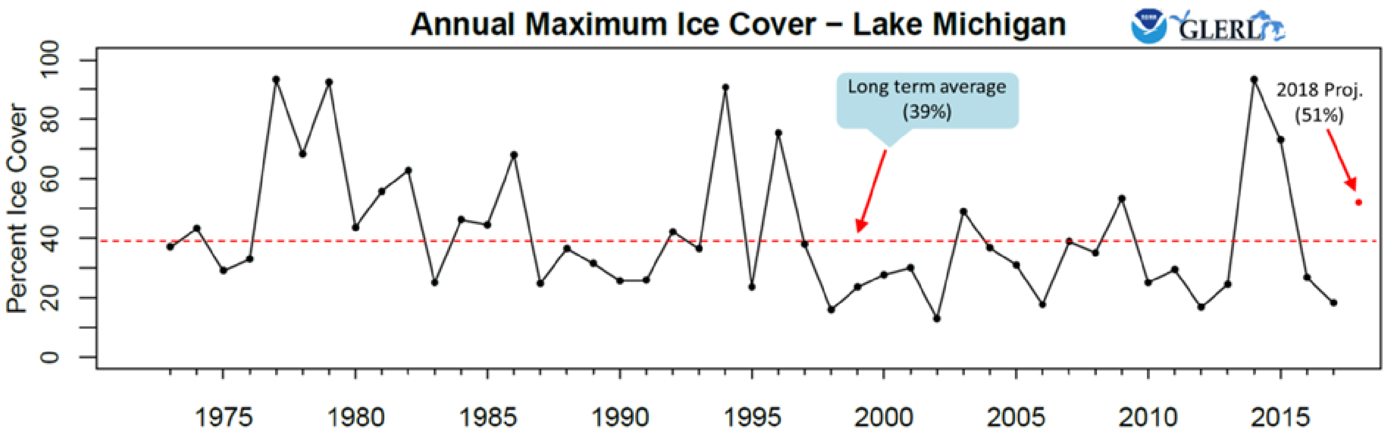
Dr. Uccellini (standing on the left) looks over weather data

Dr. Louis Uccellini, Director of the National Weather Service, spent a day at NWS Green Bay in July as part of his visit to Wisconsin, which included time at EAA AirVenture 2018.

NWS Green Bay staff briefed Dr. Uccellini on local projects and the wide variety of work the office does with local partners in emergency management, media, and the public. Later in the day, he helped release a weather balloon and monitored the live data as the balloon ascended through the atmosphere. His visit to Green Bay ended at Lambeau Field, where he and NWS Green Bay staff enjoyed dinner and exchanged stories of past storms.

A LOOK AT LAKE MICHIGAN ICE COVER CLIMATOLOGY

BY: MIKE CELLITTI



Maximum ice cover on Lake Michigan can vary wildly from year to year. From 1973 to 2017, the annual maximum ice cover averaged around 39 percent. The highest estimated maximum ice cover occurred in 1977 and also in 2014, when it peaked at 93.1 percent. Following the peak in the winter of 2014, the maximum ice cover plummeted each year until it bottomed out at 16.7 percent in 2017. However, in 2018, ice cover rebounded on Lake Michigan, reaching its maximum during the second week in February at 51 percent. This rebounding of ice cover was not limited to Lake Michigan. In fact, ice cover increased across all of the Great Lakes in early 2018, and above the long term average. Seasonally, ice cover typically peaks during the third to fourth weeks in February, before falling abruptly in March and April.

ICE SAFETY

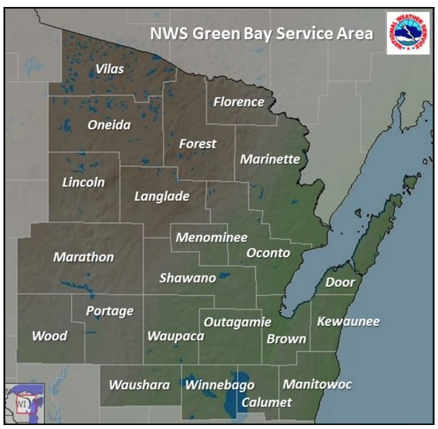
During the winter months, ice fishing is a popular activity across northern Wisconsin. But before heading out on the ice this winter, be sure to take proper precautions. It is important to let a friend or family know your plans, including where you plan to fish and when you plan to be home. Also, it is a good idea to talk to local bait shops or fishing clubs to get the most up-to-date information in regards to ice thickness and areas that may be dangerous. Avoid fishing near inlets and outlets, as currents are often stronger in these areas and can weaken the ice. The image on the left shows how deep the ice should be before safely venturing out. For more ice fishing safety information, visit www.dnr.wi.gov.

SCIENTISTS GONE SOCIAL

BY: KIRA BENZ

Did you know the National Weather Service is active on Facebook and Twitter? That's right, a bunch of scientists taking on the social media world! So don't forget to add us to your daily weather and science round-up.

The National Weather Service forecast office in Green Bay posts daily to Facebook (facebook.com/NWSGreenBay) and Twitter (@NWSGreenBay), and we're not only focused on Green Bay. Even though our office is located in Green Bay, we forecast and issue weather warnings for 22 counties across central, northern, and northeast Wisconsin.



Our social media sites serve as your direct connection to us. We're here 24 hours a day. Don't hesitate to ask us questions on the forecast or meteorology topics. Feel free to send us storm damage reports, let us know how much snow you received, or even share a picturesque scene you recently snapped – like this one we received from Alisa Halone-Couture after an ice event.

On Facebook, we post information about current and upcoming high-impact weather, the area forecast, record-breaking weather, unique satellite imagery, educational posts and resources, our newly created photo contest, recreational and marine forecasts, or whatever else might be happening in the weather or at the office.

On Twitter, we post similar forecast information, focusing more closely on the near-term with frequent radar and warning updates during active weather.

We're here to interact with you, and your reports and information are a tremendous help to us! Stop by our virtual world and say hello!

NWS Green Bay on Facebook: facebook.com/NWSGreenBay

NWS Green Bay on Twitter: @NWSGreenBay

Website: weather.gov/grb

GREEN BAY FIRE DEPARTMENT VISITS NWS GREEN BAY

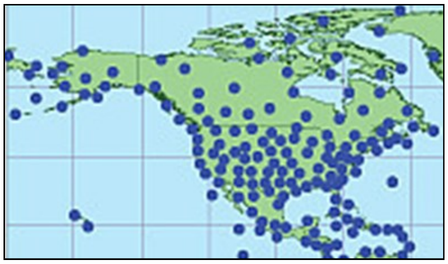
BY: ED KINDRED

On September 14, NWS Green Bay had a visit from the Green Bay Fire Department. The purpose of the visit was to make sure the ladder truck could safely reach the top level of our radar dome (around 100 feet off the ground) in case of an emergency, and to plan future training opportunities for the fire department. As seen in the picture, the ladder truck had no problem reaching the radar dome platform. Battalion Chief Ryan Gibbons and Captain Jordan Waack discussed a training scenario where the fire department would perform first aid in the dome and remove the victim from the top of the tower. Planning for the training is in the early stages and is anticipated to take place in the spring of 2019.

UP, UP & AWAY!

BY: REBECCA HYKIN

Twice a day, everyday, the National Weather Service (NWS) supports weather balloon launches from 10 sites in the Caribbean and 92 sites around North America, including our office in Green Bay.



NWS Upper Air Locations

The balloons are launched by Upper Air Certified Observers at 2300 UTC (5 PM CST or 6 PM CDT) and 1100 UTC (5 AM CST or 6 AM CDT). If hurricanes are forecast to make landfall or severe weather is expected to impact an area, additional launches can also be authorized.

How do we collect the weather data?

Since the late 1930s, the NWS has used radiosondes to collect temperature, relative humidity, and pressure; however, if a radiosonde is tracked to also obtain wind data, it is called a rawinsonde. The radiosonde, weighing about 250 to 500 grams, is tied to a small, orange parachute and a weather balloon, filled with either helium or hydrogen gas. Once the balloon is launched, the position of the instrument is tracked using GPS or a radio direction-finding antenna, which then sends all weather information back to the launch site. If erroneous data is plotted, the upper air observers edit the data before it is sent to the National Center for Environmental Information (NCEI). After about 2 hours from the initial launch, the weather balloon will ascend nearly 100,000 feet into the atmosphere, before it expands to a diameter of roughly 6 to 8 meters (20 to 25 feet) and bursts!

Rawinsonde

Why is this weather data helpful to forecasters?

To put it simply, the observation from a launch, called a sounding, is a snapshot of the atmospheric conditions along its ascent through the troposphere. In order to understand and accurately predict changes in weather patterns, forecasters rely on these observations. These observations are used in a multitude of applications including: computer-based weather prediction models, local severe storms, aviation, fire weather, marine forecasts, weather and climate change research, input for air pollution models, and ground truth for satellite data. Locally, soundings are also very useful in the winter season for forecasting and determining precipitation type, like snow, freezing rain/drizzle, sleet, or rain.

What do we do differently in Green Bay?

Due to the proximity of Austin Staubel International Airport to our balloon launch site, observers are required to call the airport tower and scan the skies for any inbound or outbound aircraft before launching. Depending on the time of the year, observers have to dress appropriately and fight the elements to obtain the valuable data. Green Bay observers have launched balloons in frigid temperatures, wind chills of 20 below zero, blowing snow, freezing

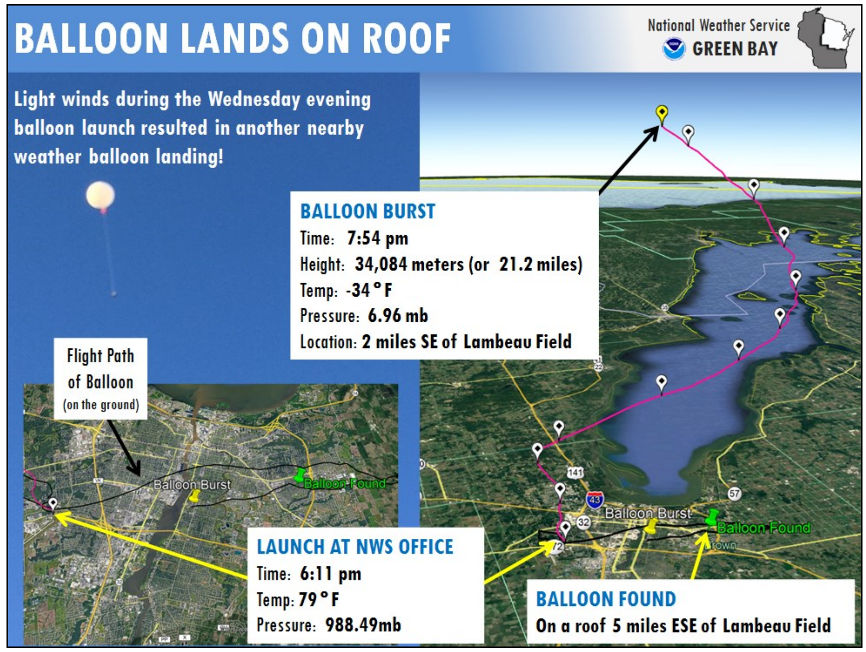
rain, heavy rain, and wind gusts up to 55 mph! In some cases, to prevent the radiosonde from bouncing on the ground, observers have to run with the instrument, dodging snow drifts, or sometimes even use two people to release the balloon. Under no circumstances are observers authorized to launch a weather balloon when a thunderstorm is present. This is for the safety of the observer and to prevent erroneous sounding data that cannot be used in forecast models. Occasionally, Green Bay observers encounter wildlife near the upper air building, such as deer, wild turkeys, hawks, field mice, muskrats, or even a cat.

(story continues on page 9)

Where do they go?

Once the balloon bursts, data is no longer transmitted, so we don't know exactly where they land. If you come across one, don't panic! They are harmless. In fact, you can send it to the NWS Reconditioning Center in an attached postage paid mailbag.

At the Green Bay office, we've created a way to plot a balloon's flight path in 3-D on Google Earth. The 3-D graphic shows how far the balloon traveled and the location above the surface where the balloon burst. You can find this graphic on our Facebook page, facebook.com/NWSGreenBay, and Twitter page, @NWSGreenBay.



For more information on the NWS Upper Air Program, please visit:

https://www.weather.gov/upperair/

or https://www.weather.gov/jetstream/radiosondes

NWS PROVIDES WEATHER SUPPORT TO EAA AIRVENTURE

BY: JEFF LAST

The annual Experimental Aircraft Association (EAA) AirVenture in Oshkosh continues to be the largest aviation outreach opportunity for the National Weather Service. AirVenture 2018 saw a record 601,000 people in attendance. More than 10,000 aircraft arrived at Wittman Regional Airport and surrounding airports, including nearly 3000 show planes. Each year's event, held during the last week of July, is truly unique and this year was no exception. The participation of the G-IV Hurricane Hunter aircraft with six crewmembers, the attendance of NWS Director Dr. Louis Uccellini, and the implementation of onsite weather decision support services for law enforcement and the FAA control tower, were some of the prominent activities.

National Weather Service booth at EAA AirVenture.

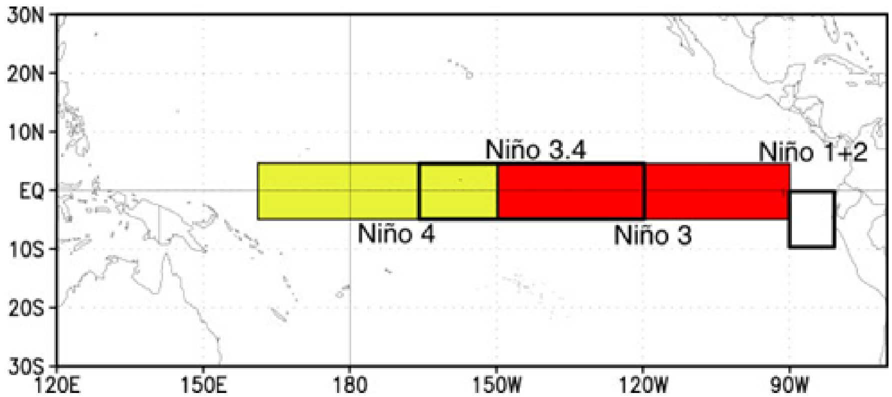
Thousands of visitors stopped by the NWS outreach booth, which provided many opportunities for NWS meteorologists to interact with pilots and the public answering questions and sharing stories.

Weather always has the potential to be a huge factor at the event due to the volume of air traffic and the tens of thousands of daily attendees. The NWS Green Bay forecast office provided enhanced aviation forecasts and weather support to law enforcement at the onsite emergency operations center. Meteorologists gave real-time briefings to decision-makers as weather systems moved in during the week-long event. In addition, this year's inclusion of decision support services for the FAA tower was a big step forward in increasing collaboration between EAA and the NWS.

Safety briefing at the EAA Winnebago County Sheriff Department emergency operations center.

WINTER 2018-19 OUTLOOK: EL NIÑO EXPECTED

BY: ROY ECKBERG



Niño regions for monitoring water temperature anomalies.

Water temperature anomalies across the Equatorial Pacific Ocean, known as the El Niño Southern Oscillation (ENSO), can have a significant impact on winter time temperatures and precipitation across the western Great Lakes. Climate forecasters usually look at the Niño 3.4 region along the equator as an indicator for El Niño or La Niña conditions. El Niño occurs when water temperatures are warmer than normal, while La Niña conditions occur when water temperatures are cooler than normal.

For the upcoming winter (2018-19), there is a 70 percent chance of a weak to moderate El Niño occurring in the equatorial Pacific Ocean. During an El Niño winter, the polar jet stream is farther north than usual, which allows for fewer intrusions of arctic air into the western Great Lakes.

Local research indicates the stronger the El Niño, the greater the chance for above normal winter temperatures across north-central and northeast Wisconsin. With warmer than normal temperatures expected, there should be less days of subzero temperatures and more days of temperatures warming to or above freezing. Along with the warmer temperatures, there is an increased chance for more rain/ mixed precipitation events and lower than normal snowfall this winter compared to a normal winter. Other impacts of El Niño across the United States include a stronger southern tropical jet stream, which can lead to wetter and stormier conditions from Texas and Louisiana east to the Carolinas, Georgia, and Florida. In some El Niño winters, California can experience wetter than normal conditions posing a threat for flooding and mudslides.

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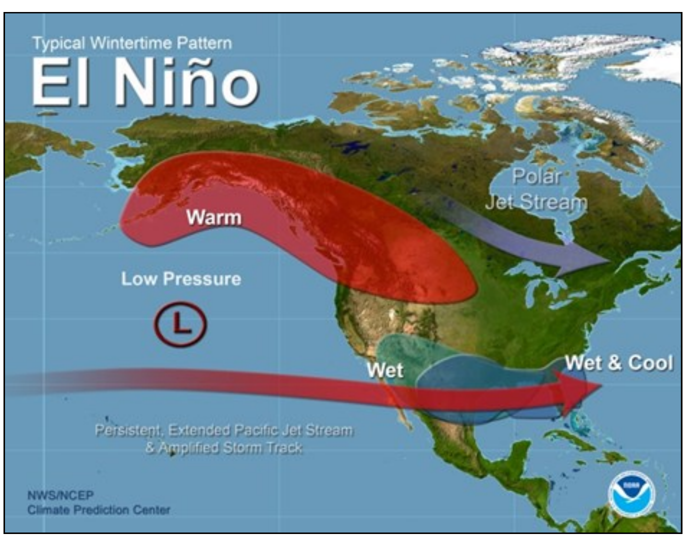
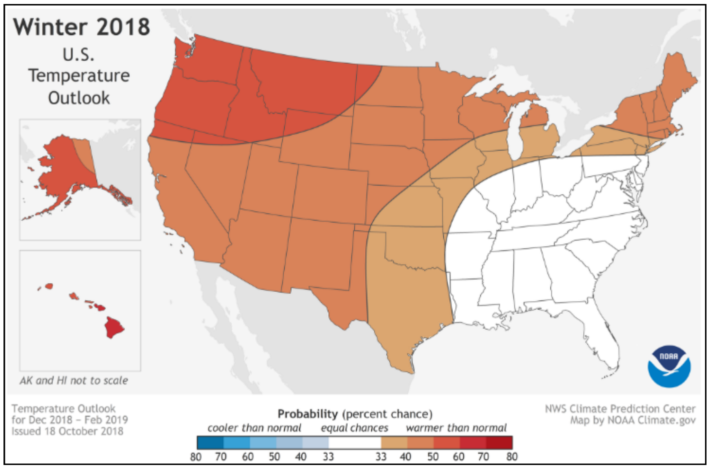


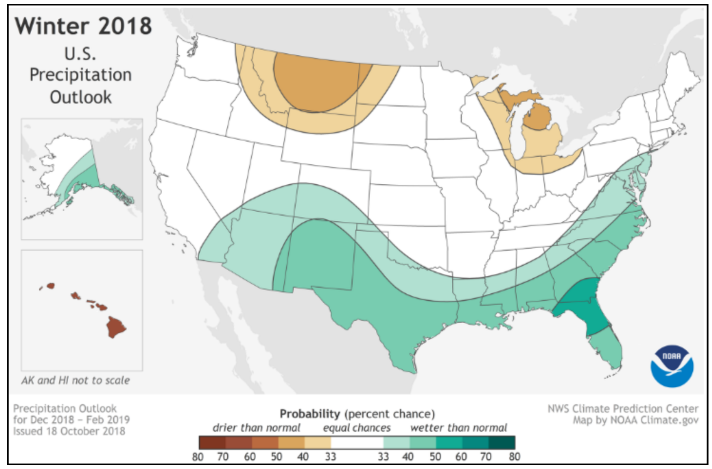
El Niño jet stream pattern / La Niña jet stream pattern

So, what is the latest winter forecast from the Climate Prediction Center? The latest climate model forecasts indicate a greater chance of above normal temperatures across Wisconsin, and across much of the northern and western United States. The climate models indicate a greater chance for below normal precipitation across the Great Lakes and northern Rockies. Wetter than normal conditions are expected from the four corners region eastward into the southeastern United States .

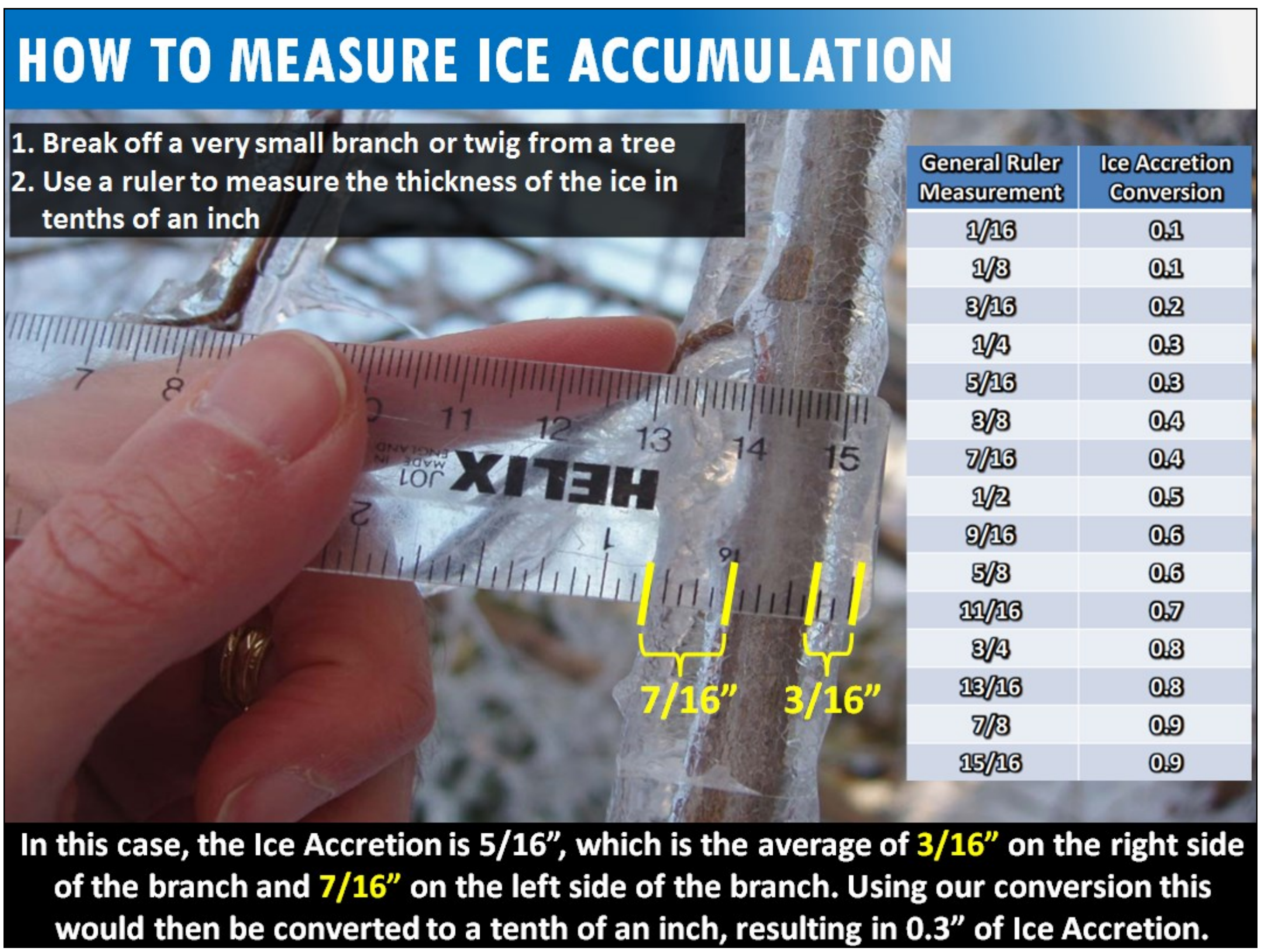
Before you know it, winter will be upon us!



CPC Winter Temperature Forecast



CPC Winter Precipitation Forecast



General Ruler Measurement	Ice Accretion Conversion
1/16	0.1
1/8	0.1
3/16	0.2
1/4	0.3
5/16	0.3
3/8	0.4
7/16	0.4
1/2	0.5
9/16	0.6
5/8	0.6
11/16	0.7
3/4	0.8
13/16	0.8
7/8	0.9
15/16	0.9

NWS GREEN BAY TO TEST NEW WARNING SOFTWARE

BY: PHIL KURIMSKI

National Weather Service (NWS) forecast offices currently use several different pieces of software to issue watches, warnings, and advisories to the public. For long-fused products, such as winter weather or flood watches, we utilize the Graphical Headline Generator (GHG). For short-fused products, such as Severe Thunderstorm, Tornado, or Flash Flood Warnings, we use software called WarnGen. For river flood points, we use another application called the River Product Formatter (RiverPro). As you can imagine, utilizing and maintaining three separate applications, all written in different computer coding languages, is at best a tedious process. Enter Hazard Services, a bold project set out to unify all three pieces of software into one easy to use interface using one programming language, Python.

Hazard Services has been a multi-year project, pulling together experts from several different NWS offices, NWS Headquarters, the Warning Decision Training Division (WDTD), the Global Systems Division (GSD), and Raytheon. After numerous workshops and tests utilizing these experts, the software is now ready for use at select NWS offices for a beta test period before being deployed across the entire country. Out of 122 forecast offices across the country, only 16 were selected to take part in the beta test, including NWS Green Bay.

The Hazard Services software will initially focus on hydrology, since it encompasses short-fused, long-fused, and river products. The picture below shows how the main interface can look with several hydrology products in effect. The software will incorporate several new enhancements not available in the current software, such as "recommenders." The flash flood recommender will alert the user when a basin exceeds flash flood guidance for a specified period of time. In future upgrades, there will be "recommenders" that use the forecast database, called the Grid-Based Recommender, which will alert the user when certain thresholds are met or exceeded in the forecast such as a Winter Storm Warning, Wind Chill Advisory, or Gale Warning.

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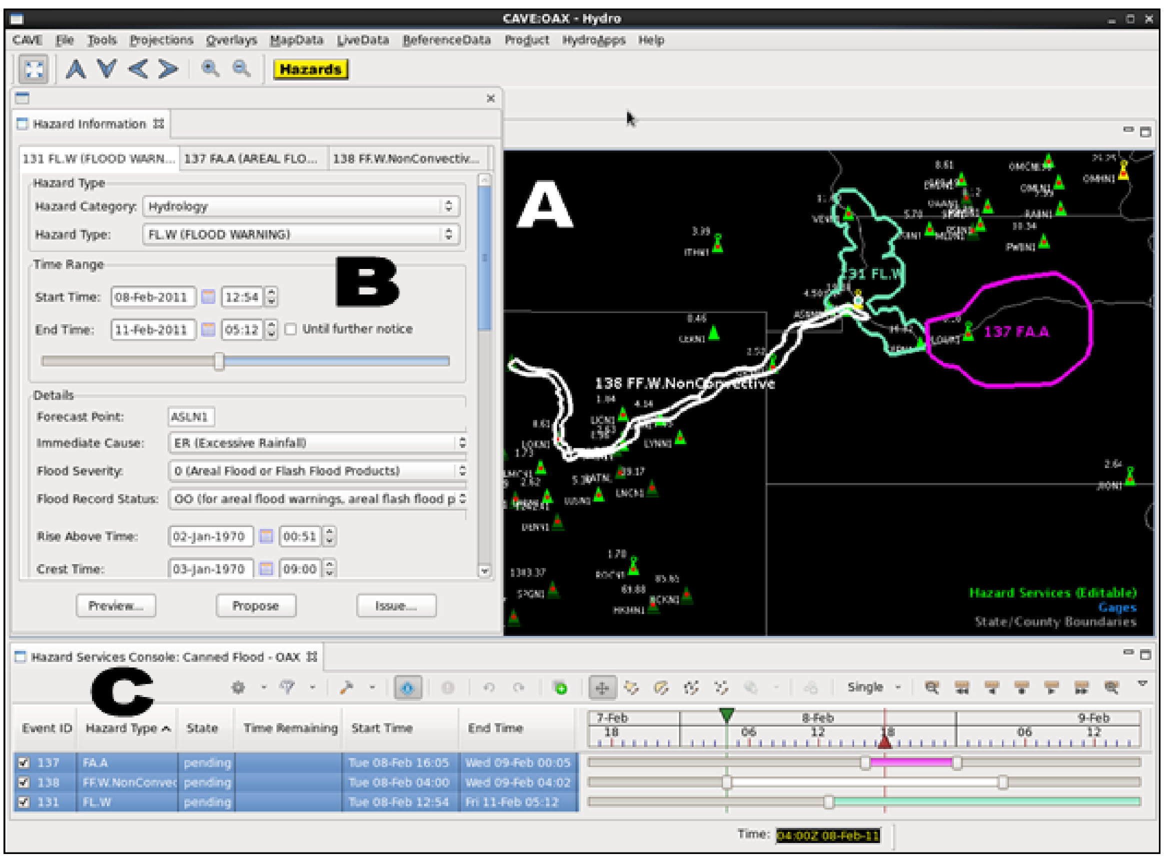

The Hazard Services Hazard Information Display showing: (A) The spatial display with several hydrology products in effect from the test site in Omaha, NE, such as a Flash Flood Warning (white), a Flood Warning (teal), and a Flood Watch (purple); (B) the Hazard Services Hazard Information dialog box where the user can select the time a hazard is in effect, as well as the type of hazard they want to issue; and (C) the Hazard Services Console, which shows the start and end times for products in effect.

These "recommenders" will draw a first guess for areas that may need a weather headline, making collaboration and coordination with nearby offices more efficient.

The beta test for the software begins this fall and will continue through the winter months with deployment slated for late 2019. The winter weather aspect is slated to be tested and deployed in 2020 or 2021. Severe weather is then expected to be tested and deployed sometime in 2021 or later. Marine, tropical, and fire weather would be incorporated during the same time period or shortly thereafter.

As the Hazard Services software is tested and deployed, the legacy software applications (GHG, WarnGen, and RiverPro) will be decommissioned, allowing forecasters to issue all products using one program instead of three. This consolidation will make using and maintaining the software, along with training personnel, easier as everything will be done on one interface and in the same programming language.

THANK YOU COOP/UCOOP/COCORAHS OBSERVERS!

BY: SCOTT CULTICE & SCOTT BERSCHBACK

Happy Fall!

We wanted to personally thank each of you for your dedicated snow measuring efforts during the Blizzard of April 13-15. It was a historic storm for many locations, and we could not have done it without you!

Your dedicated, timely, and accurate measurements allow us to provide better service to our partners and the public, and in some cases, immediate life-saving action. In addition, the observations provide important data for research and advancements in forecast and warning services.

As we look ahead to the new winter season, you can find many helpful reminders on measuring snow/ice and water equivalent online:

Slide Shows:

https://www.cocorahs.org/Content.aspx?page=training_slideshows

Videos:

https://www.youtube.com/user/cocorahs

Have a safe fall and winter! If you have any questions, please send us an e-mail or give us a call. Thanks again!

COOP AWARDS

75 Year Institution Award

Dan Konopacky — Wisconsin Valley Improvement Company — Lake Tomahawk, WI

50 Year Institution Award

Walt Kaszynski — WOCO Radio Station — Oconto, WI

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NWS GREEN BAY COMINGS AND GOINGS

BY: LINDA SKOWRONSKI

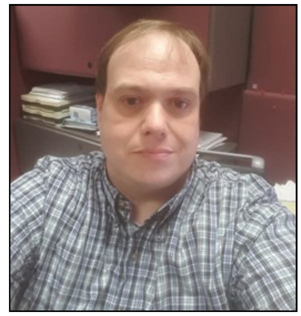
BERDES JOINS NWS GREEN BAY AS INFORMATION TECHNOLOGY OFFICER

Roman Berdes II joined the Green Bay National Weather Service staff as the Information Technology Officer on June 10, 2018. In this position, Berdes is responsible for developing and implementing software applications used by the entire staff, with special emphasis on forecast operations.

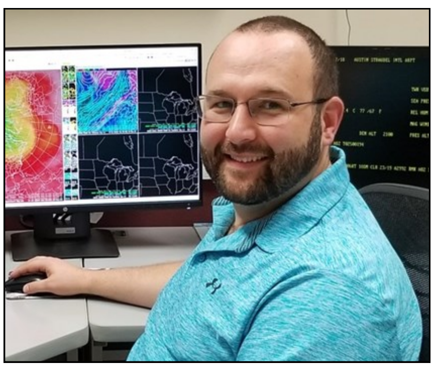
Berdes began his National Weather Service career as a Meteorologist Intern in Glasgow, Montana, eventually being promoted to General Forecaster. After holding that same position in the Duluth, Minnesota office, he decided to focus more on the information technology portion of forecast operations. Berdes went on to pursue his interest in information technology by accepting an Information Technology Officer position at Caribou, Maine and subsequently at the Detroit, Michigan office before arriving in Green Bay.

Berdes graduated from the University of Wisconsin - Milwaukee with a Bachelor degree in Meteorology. He is happy to be back in his home state near family.

Welcome to Green Bay Roman!



COOLEY JOINS NWS GREEN BAY AS SENIOR FORECASTER



Keith Cooley joined the Green Bay National Weather Service staff as a Senior Forecaster on August 5, 2018.

Cooley began his career in March of 2011 as a Meteorologist Intern at the National Weather Service office in Marquette, Michigan. In September of 2016, he was promoted to General Forecaster at the Marquette office. While at Marquette, Cooley was actively involved with their fire weather program, as well as the marine program, with an emphasis on beach hazards and water safety.

Cooley earned his Bachelor and Master degrees in Meteorology from the University of Missouri in Columbia. A native of Missouri, he and his wife, Christie, have moved into a home in the Green Bay area.

Welcome to Green Bay Keith!

HELMAN RETIRES FROM NWS GREEN BAY

After almost 34 years of federal government service, Thomas Helman retired from the National Weather Service on April 28, 2018.

Helman arrived at the Green Bay, Wisconsin office in October 1998, through a promotion to Senior Forecaster. During his time in the Green Bay office, Helman was the hydrology program manager in addition to his forecasting duties. Prior to coming to Green Bay, Helman was a General Forecaster at the National Weather Service office in Milwaukee/Sullivan.

Helman received his meteorology degree from the University of Wisconsin - Madison. With his Wisconsin roots, he was fortunate to be able to work and live in his home state. Now that working rotating shifts are behind him, Helman and his wife, Diane, will be able to relax and enjoy more activities with family and friends.

We wish Tom and Diane well as they start a new chapter in their lives.

Thomas Helman (left) receives his Certificate of Service award from Kenneth Rizzo, retired Meteorologist-in-Charge from the Milwaukee/Sullivan office, during his retirement party attended by family, colleagues, and friends.

10 Fun Facts About Snow

#1 All snowflakes have six sides.

#2 An incredible 1,140 inches (95 feet) was recorded at Mount Baker Ski Area in Washington state (4,200 feet elevation) during the July 1, 1998 to June 30, 1999 snow season.

#3 The most snow measured in 24 hours was 75.8 inches, which fell in Silver Lake, Colorado April 14-15, 1921, enough to bury most people from head to toe.

#4 Snow crystals are translucent, not white. The white coloring is caused by sunlight that is reflected off the crystals. All visible colors are reflected, which together, look white.

#5 Most snowflakes fall at a speed of 2 to 5 feet per second, roughly the same speed as a person casually walking through a park.

#6 Official snowfall and snow depth measurements include snow, sleet and ice pellets - in the summer, hail will also be recorded as a trace of snow if it is on the ground when the observation is taken.

#7 Did you know a blizzard can occur without falling snow? If winds speeds remain higher than 35 mph and the visibility is also reduced to less than 1/4 mile* for three hours or more, then it's classified as a blizzard.

* as a result of blowing or falling snow

#8 A cubic foot of snow (12" on a side) may contain between 1 and 2 million individual snowflakes.

#9 Thundersnow is simply a thunderstorm with snow as the precipitation type. It typically occurs where there is really strong upward motion inside a winter storm.

#10 All 50 states have recorded snowfall. In Hawaii, snow is observed on the tallest volcano summits every year, and light snow (mainly trace amounts) is an almost yearly occurrence in northern Florida.


5 Things to Know
about Winter Weather Forecasts
NATIONAL WEATHER SERVICE
1
Snow or ice totals can vary greatly over short distances
A heavy snow band may form, dropping more snow in one location while significantly less snow falls just a few miles away.
Rhinelander 16.9"
Green Bay 9.1"
Madison 0.4"
29°
2
Winter forecasts can change frequently
Forecasts may change as new model data becomes available. Always check weather.gov for the latest information.
3
Focus more on the winter storm's impacts
Don't focus too much on exact numbers, and consider the full range of possibilities.
Warning
Watch
Advisory
4
Know your winter weather terminology
If a Watch is issued, get prepared for hazardous weather. If a Warning or Advisory is issued, take action – hazardous weather is occurring or will occur soon.
5
Rely on a dependable source for weather info
Choose your information sources wisely, and follow a name or organization you know and trust.

WORD SEARCH

S	U	R	I	N	G	E	M	S	U	S	O	Y	P	L	A	G	A	G	W
R	X	Y	F	C	D	D	L	J	T	Y	E	I	A	N	F	C	E	A	K
E	A	G	L	E	R	I	V	E	R	E	K	K	E	B	A	U	U	G	T
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A	P	P	L	E	T	O	N	T	R	M	S	E	U	L	A	E	D	Z	R
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E	T	T	E	N	I	R	A	M	K	B	W	F	L	S	E	D	I	R	C
S	D	I	P	A	R	N	I	S	N	O	C	S	I	W	P	N	N	O	G
J	T	X	W	J	R	A	R	H	E	B	I	A	W	L	E	O	W	A	K
Q	J	L	X	F	X	H	U	L	S	T	O	I	N	L	C	O	I	E	L
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M	B	H	M	C	Y	T	Z	B	W	E	N	A	S	N	N	V	X	X	K
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S	T	U	R	G	E	O	N	B	A	Y	F	E	M	R	J	C	N	W	M

ALGOMA
ANTIGO
APPLETON
EAGLE RIVER
GREEN BAY
KESHENA
KEWAUNEE
LAONA

LAND O LAKES
MANITOWOC
MARINETTE
MERRILL
MINOCQUA
OSHKOSH
PLOVER
RHINELANDER

SISTER BAY
STEVENS POINT
STURGEON BAY
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WAUPACA
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NATIONAL WEATHER SERVICE
GREEN BAY

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Green Bay, WI 54313
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NWS Green Bay during the April Blizzard

Can you spot the two meteorologists in the photo?