

Shareholders Report 2021

NATIONAL WEATHER SERVICE
INDIANAPOLIS, INDIANA

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GREETINGS FROM NWS INDIANAPOLIS!

Ted Funk - Meteorologist in Charge

Welcome to our second annual National Weather Service (NWS) Indianapolis (IND) Shareholders Report! As a Federal Government agency, our mission statement is as follows:

PROVIDE WEATHER, WATER, AND
CLIMATE DATA, FORECASTS, WARNINGS,
AND IMPACT-BASED DECISION SUPPORT
SERVICES FOR THE PROTECTION OF LIFE
AND PROPERTY AND ENHANCEMENT OF
THE NATIONAL ECONOMY.

Despite the ongoing COVID-19 pandemic in 2021, the dedicated IND employees never swayed from meeting the NWS mission for the 39 counties we serve in central Indiana! This report summarizes some of our 2021 activities, accomplishments, and weather events.

In 2021, we employed innovative methods within our office and remotely to ensure no services were left behind for our customers, partners, and communities. We continued to reflect as individuals and teammates on how we can provide the top quality service and awareness that you expect and need from us to support your personal and professional weather decisions! Your feedback is vital in this effort.

We reorganized our operations area to facilitate improved communication and awareness, including a wall of new large monitors to display weather data, webcams, and other information, analogous to a local or state Emergency Operations Center (EOC). We also provided onsite and/or briefing support for numerous community events, initiated

the Indiana Pathfinders program with Indiana Department of Transportation (INDOT), led or participated in partner tabletop exercises, and worked with many valued partners on various initiatives. We are very thankful for our professional relationships and look forward to more great interaction and service in 2022 and beyond!

During 2021, we experienced a few staff member changes as well. First, meteorologist Joe Skowronek retired at the end of October after 31 years of excellent federal service. Second, in late 2021, meteorologist Tara Dudzik was promoted to Lead Forecaster at the NWS Marquette, Michigan office. Finally, around Thanksgiving we welcomed Randy Bowers, a meteorologist from the NWS Norman, Oklahoma office as IND's new Lead Forecaster. We wish Joe all the best in retirement, and look forward to exceptional leadership from Tara and Randy in their new positions! Finally, in March 2022, we will also welcome three new meteorologists to the IND weather family!

If you have any feedback, please email us at nws.indianapolis@noaa.gov. Or catch us on the web at [weather.gov/ind](https://www.weather.gov/ind), Facebook at [facebook.com/NWSIndianapolis](https://www.facebook.com/NWSIndianapolis), Twitter at [@NWSIndianapolis](https://twitter.com/NWSIndianapolis) (#INwx), and YouTube at [youtube.com/user/NWSIndianapolis](https://www.youtube.com/user/NWSIndianapolis).

Lastly, I am grateful to those IND staff members who contributed to this Shareholders Report, and especially to meteorologist Kacie Hoover who did a fantastic job assembling it!



Help us build
a Weather
Ready
Nation!



WEATHER READY NATION AMBASSADORS MAKE A DIFFERENCE

Jason Puma - Lead Meteorologist

The National Weather Service has a national program called the Weather Ready Nation Ambassador initiative. This program is designed to formally recognize National Oceanic and Atmospheric Administration (NOAA) partners who are improving the nation's readiness, responsiveness, and overall resilience against extreme weather, water, and climate events.

Here at NWS Indianapolis, we have over 200 Weather Ready Nation Ambassadors participating within the initiative. These Ambassadors range from schools and businesses, to local government organizations and large corporations across Central Indiana. We communicate hazardous weather threats with our NWS Ambassadors on a daily basis, allowing them to prepare their organizations for any potential hazards or threats. NWS Ambassadors are also encouraged to become a "Force of Nature" by being a leader in their communities, helping to build a nation that is ready, responsive, and resilient to the impacts of extreme weather and water events. This can be accomplished by:

- Promoting Weather Ready Nation messages and preparedness information to their organization and community
- Engaging with NOAA personnel on potential collaboration opportunities
- Sharing their success stories of preparedness and resiliency
- Serving as an example by educating employees on workplace preparedness

Our Weather Ready Nation Ambassadors across Central Indiana continue to prepare and communicate weather safety information to their organizations and strengthen their relationship with the National Weather Service in Indianapolis. The recent Midwestern and Southern tornado events of December 10, 2021 are a prime example of where Weather Ready Nation Ambassadors can make a difference in assisting the National Weather Service in protecting lives and property, by sharing preparedness and safety information and being ready when hazards strike.

We are always looking for new businesses and organizations to join the Weather Ready Nation Initiative. You can apply to join at: www.weather.gov/wrn/amb-tou.



A YEAR IN REVIEW AT INDIANAPOLIS INT'L AIRPORT

	2021	Yearly Average*
Max Temperature	94° (Aug 12, 24)	95°
Min Temperature	0° (Feb 7)	-5°
Total Precipitation	49.75"	43.60"

*Climate Normal Period 1991-2020

43 years of
Federal
Public
Service



NWS DIRECTOR RETIRES AFTER LONG CAREER IN FEDERAL SERVICE

Sam Lashley - Warning Coordination Meteorologist

On January 1, 2022, Dr. Louis Uccellini officially retired from federal service after a long and illustrious career of over 50 years in meteorology, and 43 of those years as a federal public servant. Dr. Uccellini served as the National Oceanic and Atmospheric Administration's Assistant Administrator for Weather Services, and Director of the National Weather Service, for nearly 9 years. It was under his direction that the NWS adopted the Weather Ready Nation (WRN) initiative as well the Impact-based Decision Support Services (IDSS) model. Dr. Uccellini also oversaw the NWS transition to the Collaborative Forecast Process and the implementation of the National Blend of Models (NBM) that is now used by most NWS weather forecast offices.

Dr. Uccellini's primary reason for retiring is to spend more time with his family and to pursue his interests that he has avoided as a busy public servant. Dr. Uccellini also said a major factor for retiring now is that "we have accomplished what I hoped we could do, providing a strategic, budget and governance framework that has supported the continuing advancements envisioned with the onset of building a Weather Ready Nation."

Dr. Uccellini will be missed but his tireless efforts and dedication to the agency's mission has left the NWS in a great position moving forward. In his absence, Mary C. Erickson will take on the role as acting director until a permanent replacement is announced. Ms. Erickson had been serving as the Deputy Director of the National Weather Service.

To read more about Dr. Uccellini's career and retirement, see www.noaa.gov/news-release/louis-w-uccellini-director-of-us-national-weather-service-to-retire.

Because Every Drop Counts



COCORAHS

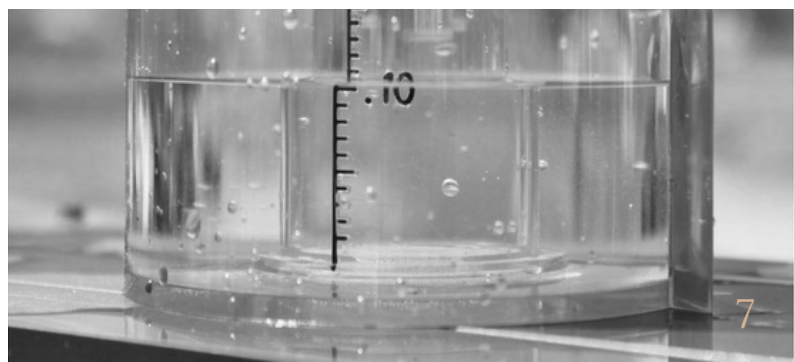
Andrew White - Meteorologist

2021 was a record year for the Community Collaborative Rain, Snow, and Hail Network (CoCoRaHS) for the state of Indiana, and we would like to thank all of the observers both across our forecast area and across the state in helping us reach this point. The month of July set the record for the most observations for Indiana in the history of the program which stretches back to 2006. As a state, we averaged 455 daily reports through the year which was also a record and 41 reports higher than in 2020.

Locally, the NWS Indianapolis office has acted as one of the three state coordinators for the program and all three coordinators work closely with the Indiana State Climate Office to put together a monthly newsletter. The Indiana CoCoRaHS team also conducted 4 training webinars over the course of 2021 focusing on both warm and cold season reporting.

We take pride in quality controlling the data and strive to ensure that all the reports are accurate to allow for the data to be used across the country for both research and in the operational setting. Our meteorologists check the data daily with more thorough checks performed on a weekly basis. We also continue to push for growth in the network both to increase density in areas already covered and to try to ensure that we have at least one active observer in each county for our forecast area.

For more information on Indiana CoCoRaHS, visit cocorahs.org/state.aspx?state=in or reach out to Andrew.j.white@noaa.gov





WHAT IS THE ROLE OF A WCM IN THE NWS?

Sam Lashley - Warning Coordination Meteorologist

Have you ever wondered what exactly the Warning Coordination Meteorologist (WCM) does at a National Weather Service office? The answer is simple, the WCM does a lot of everything, but not without a team of hard working individuals who keep the NWS mission of the protection of life and property as their motivation.

The NWS defines the WCM position simply as the person who coordinates the warning function of the Weather Forecast Office (WFO) with the outside world. This would include heading the Skywarn Program, conducting weather spotter training, and being a voice to the local media for the office. But the role of the WCM is much more encompassing as this person is also responsible for planning, coordinating, and carrying out the WFO area-wide public awareness program designed to educate the public to ensure the mitigation of death, injury and property damage or loss caused by severe natural hydro-meteorological events. The WCM also leads and coordinates WFO staff efforts and provides direction, guidance, instructions, and assistance to the staff in the conduct of weather service operations. Following severe weather and tornado events, the WCM must coordinate damage surveys with local Emergency Management officials to determine the cause of damage, and if due to a tornado, the appropriate Enhanced Fujita (EF) scale rating.

The WCM cannot complete all of the requirements for this position alone. It requires a team of dedicated individuals from within the office who in addition to their primary roles of issuing life saving forecasts and warnings, use their precious supplemental shifts during

times of quiet weather to lead important office programs that fall under the WCM umbrella and the NWS mission. These critical programs include Weather Ready Nation Ambassadors, StormReady, Warning Verification and StormData, Impact-based Decision Support Services, Core Partner Exercise and engagement opportunities, school talks and outreach requests, media interviews, and many other activities.

During the pandemic driven year of 2021, the NWS Indianapolis staff did not slow down or skip a beat, participating in over 400 events in addition to their routine, around the clock, 24/7/365 warning and forecast duties. A sample of activities the NWS Indianapolis staff worked on this past year included a mix of virtual and in-person meetings, talks, and outreach with core partners, schools, businesses, and civic organizations; newspaper, radio and television interviews; tabletop, functional, and full scale exercise planning and participation with Indiana Department of Homeland Security; Indiana drought monitoring team participation; weather education talks to the Indiana Department of Education School Safety Specialists Academy; semi-annual partner workshops with local emergency management and media; skywarn spotter training; IDSS onsite support for public safety with the Speedway police department at the Indianapolis Motor Speedway; Indiana Silver Jackets monthly meetings; and many more partnership engagement activities, too numerous to mention.

The NWS Indianapolis staff and WCM team members remain committed to protecting the lives and property of the citizens of Indiana. We look forward to even more meetings, engagement, training and educational opportunities in 2022 and beyond.



Helping Communities Prepare for Weather Events



CLIMATE

Mike Ryan - Lead Meteorologist

National Weather Service Indianapolis continues to be a trailblazer for climate services in the NWS, leading one of the few statewide teams dedicated to climate services in the country. The climate team was started in 2012 as a collaboration from all areas of the weather enterprise that serves the Hoosier state with climate needs. The team consists of over 30 members from the 6 NWS offices that cover Indiana, the Midwest Regional Climate Center (MRCC) and the state climatologist located at Purdue University, and other state and regional officials such as the Indiana Department of Homeland Security, the Indiana Department of Natural Resources, Agricultural Extension Offices, the Purdue Climate Change Research Center, and the Environmental Resilience Institute at Indiana University.

The Indiana Climate Services team maintained quarterly conference calls with additional webinars dedicated to climate service related topics in 2021. Members of our team were instrumental in contributing to a statewide drought planning and preparedness workshop in April and a state climate summit focused on agricultural needs in June. Both endeavors were led by the state climatologist's office and helped not only to enhance existing relationships but engage new partners across the state as well. Our team also incorporated new 30-year normals and analyzed the changes in temperature, precipitation, and snowfall normals as the period transitioned from 1981-2010 to 1991-2020.

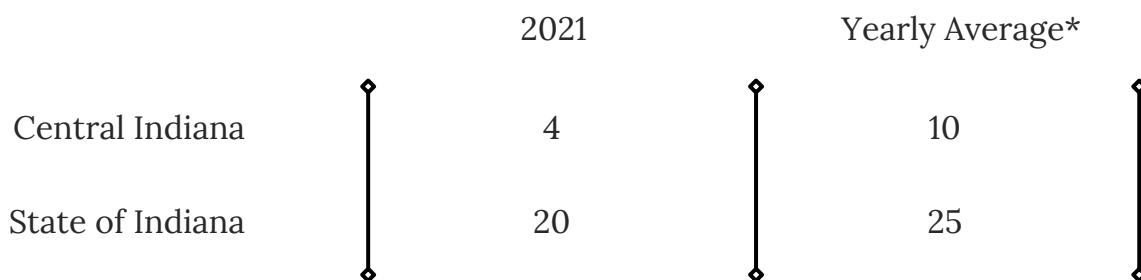
The Drought Mitigation team continued to interact regularly throughout 2021 with drier than normal conditions impacting parts of the state for much of the year. Calls are led by the Indiana Department of Homeland Security and conducted monthly, and at times weekly when needed, to assess evolution of drought conditions and their potential impacts across the state and to develop specific guidance to share with the National Drought Mitigation

Center. NWS Indianapolis is an important part of this team as well, providing specific information on precipitation trends and forecasts that are incorporated into the drought guidance developed each week. The partnerships formed on these teams will continue to grow, enabling them to expand efforts further in 2022 and the years to come.

One big change that occurred in 2021 was the relocation of the MRCC from the University of Illinois to Purdue University. Our Climate Services team has always enjoyed a close relationship with the MRCC, but with them now located in West Lafayette, there will be increased opportunities for collaboration on multiple projects moving forward. In 2022, ongoing research projects including the development of a statewide Severe Weather Climatology, and studying extreme precipitation trends across the state will continue. In addition, a new project will begin focusing on ways to provide decision support for seasonal and sub-seasonal time periods. These efforts support our goal of longer range decision support services for local, state, and regional partners in an effort towards creating a Weather Ready Nation.



2021 TORNADOES



*Climate Normal Period 1991-2020

THE NEW NORMALS

Alexander McGinnis - Meteorologist

Often times when describing the forecast or a past or upcoming stretch of weather, forecasters will compare that to the normal in order to give a reference to what is, well, normal for the given location and time of year. The National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI) is the official source for Climate Normals across the United States. These temperature and precipitation values exist for hundreds of first-order airport sites across the country, including seven in central Indiana: Bloomington, Indianapolis, Indianapolis - Eagle Creek, Lafayette, Muncie, Shelbyville, and Terre Haute. Following the end of each decade, these daily, monthly, seasonal, and yearly normals are derived from the preceding 30 years of data. Normals are created through a several month process of data verification and validation, as well as official documentation and archival processes, before a final communication plan is implemented within the NWS. The current normals, which are for the period from 1991 to 2020, were released in May 2021.

Annual normal temperatures across central Indiana mainly rose around 0.5°F, with significant December-February warming being the main contributor. Indianapolis followed this pattern, with December exhibiting the greatest monthly increase of +1.7°F. Annual precipitation changes varied between the central Indiana locales, although the summer season's normal precipitation was about the same or wetter for five of the seven first-order climate sites. Indianapolis' annual precipitation normal increased the most of any first-order site by +1.19 inches. As for Indianapolis' snowfall, downward snow trends in October, December and February are largely responsible for the yearly normal dropping by 0.4 inches.



EXERCISES

Andrew White - Meteorologist

During 2021, the National Weather Service office in Indianapolis worked with the Indiana Department of Homeland Security (IDHS) and local county emergency managers in 3 exercises. The first exercise of the year gave the NWS and county emergency management an opportunity to discuss and test technology related to response during and after a significant severe weather outbreak. We were able to showcase an internal chat software we have with our emergency management community while learning more about how they respond to hazards as they arrive.

Another exercise this year was simulating the cascading impacts from a significant solar storm and resulting long term power outage. The exercise showcased how significant the planning needs to be for the logistics of power outages and how to best create plans when coming up with how to respond when we experience these long term outages.

The final exercise of the year was a hands-on drill simulating how to conduct damage assessment after a tornado impact. It provided a great avenue for the NWS to teach how we conduct tornado surveys while learning more about how damage assessment works on the local level. We were able to discuss how we can work together more closely in the future and how to collaborate on making damage assessment more efficient from the NWS and local levels.

We greatly value the partnership and collaboration that is built upon during exercises like these and look forward to where 2022 takes these relationships and the lessons learned.

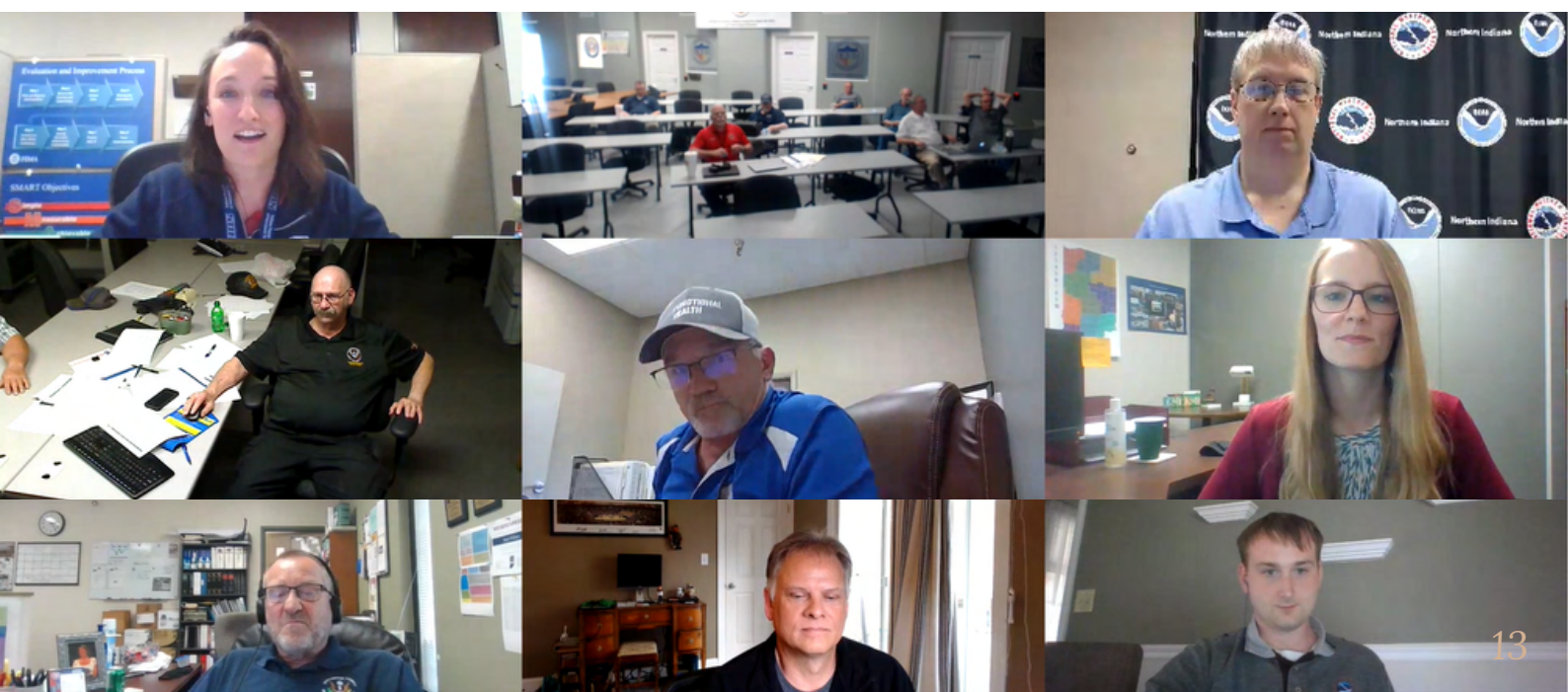


Photo 1: Old river gauge location at Crawfordsville. The old gauge house is on the left, with staff gauges on the right.



CHANGES ARE AFOOT AT CRAWFORDSVILLE

Crystal Pettet - Hydrologist

The river gauge at Crawfordsville on Sugar Creek has undergone a recent move. Previously, the official gauge was located just upstream of the bridge at U.S. 231 and upstream of a low head dam, on the river bank in front of the old power plant (photo 1). The removal of the low head dam, which increases public safety and improves the health of the stream, began the week of September 5th (photos 2 and 3), and resulted in the gauge being unable to obtain readings. Prompt response by the USGS returned the gauge to service the next week, but the resultant readings were different than before, including showing negative stage heights. But how could a river stage be negative? This is because the river stage is not an absolute measure of the depth of the water in the channel, rather it is a depth with respect to a historical datum level. This leads to another important term—gauge zero height.

Gauge zero height is the height that is used to indicate a stage of zero on a river gauge. When the Crawfordsville gauge was first established, the gauge zero height was set at the top of the low head dam, meaning the stage height would be zero when the water was just at the top of the dam (figure 1). Removal of the dam meant that readings could now be negative (figure 2), and the previous rating curve developed by the USGS used to convert flow to stage/gauge height was no longer valid. With the change in the river itself due to the dam removal and the need to establish new datum and a new rating curve, the USGS, in conjunction with local officials, decided to relocate the official Crawfordsville gauge



Photo 2:
Low head
dam
removal



Photo 3:
Dam
removal
almost
completed

downstream to the bridge at Lafayette Avenue (photo 4). This new location allows for easier service to the gauge and it should provide a better representation of flow along Sugar Creek in the Crawfordsville area.

What are the short term impacts of this move? Soon (date TBD) the public data feed will be transferred from the old location to the new location, and the equipment at the old location will be removed. With the new location downstream at a slightly lower elevation and new datum just below the bottom of the stream bed for a gauge zero height (which allows for potential future natural stream variability and changes), the previously established flood stage height will no longer be applicable. An ongoing effort is underway between local officials, NWS Indianapolis, and the Ohio River Forecast Center (OHRFC) to determine flood stage for the new location. The impacts one could previously anticipate at a particular gauge height will be different for the new gauge as well. Because of the changing nature of the river, there is not an easy conversion from the impacts at the old site to those at the

Figure 1

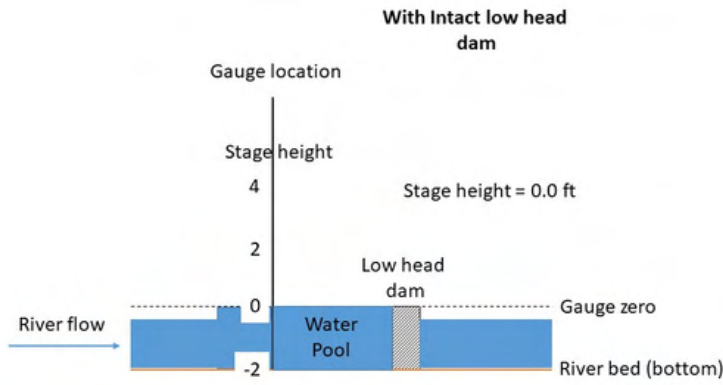
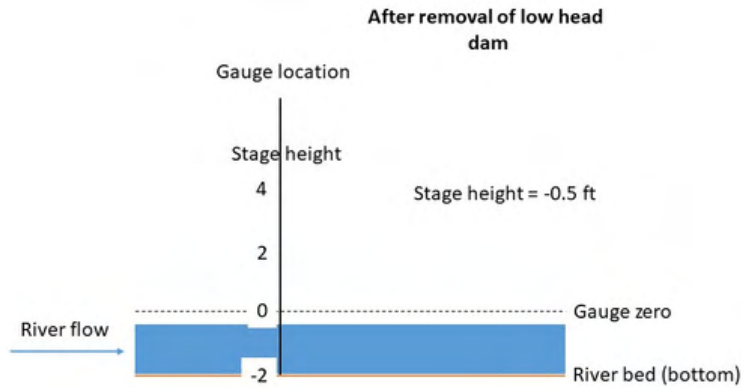


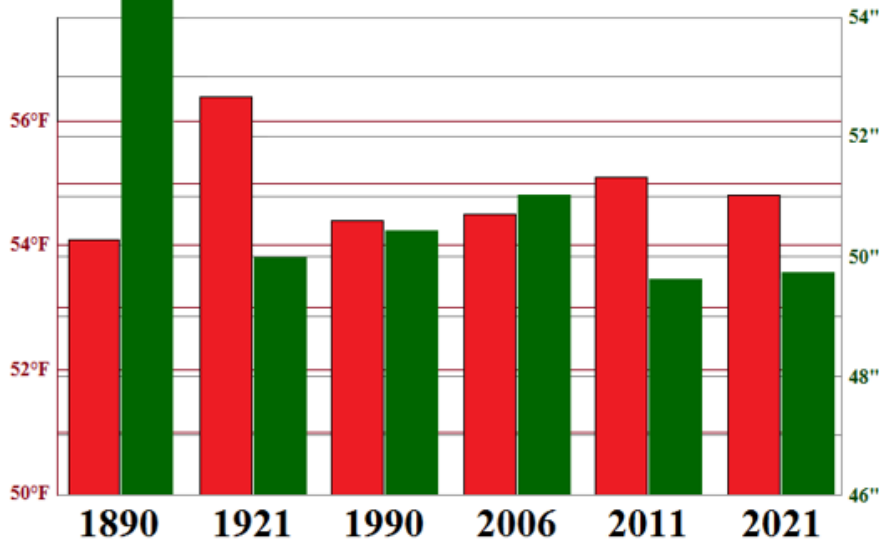
Photo 4: New gauge location on Lafayette Ave bridge

Figure 2



new site. This means it will take time and some high water events to learn and establish what impacts occur at what stage height. If you live in the Crawfordsville area near Sugar Creek, you can help with this process by emailing us at nws.indianapolis@noaa.gov with any flood or high water impacts you observe going forward, and the time and date they occur.

Years with Well Above Normal Temperatures & Precipitation at Indianapolis (1871-2021)



2021 was decidedly above normal in both temperature (red) and precipitation (green); the year finished in the 90th and 89th percentiles, respectively. While not reaching the top 10 for either, this was still a rare tandem of continually mild and wet conditions, with only 5 other years since 1872 also featuring this overall combination.

Drone footage of
a July 29, 2021
tornado path
courtesy of
Shelby County
Emergency
Management



FINDING PAST EVENTS

Chad Swain - Lead Meteorologist

If you need to find past severe weather or winter weather events on our website (www.weather.gov/ind), here are some tips:

- Locally, NWS Indianapolis archives significant weather events for 5 years. Historic events are kept indefinitely. This can be found in the “Climate and Past Weather” menu on our website or in the Site Map at the bottom of the page, under “Climate”. The address for these events is www.weather.gov/ind/events
 - Once on the events page, click on the Thunderstorm/Tornadoes, Flooding, Winter, Heat/Cold, and Other tabs to see a list of links to various event summaries.
- To search for storm reports for any event back to 1950, visit www.ncdc.noaa.gov/stormevents/
 - On that site, you can narrow searches down to county level.
- Information on past tornado events for each county in central Indiana and Indiana state tornado records can be found on the Tornado Climatology page, www.weather.gov/ind/tornadostats
- For general climate statistics on rainfall, temperatures, etc for Indianapolis, visit www.weather.gov/ind/localcli
- For general climate statistics for other locations around central Indiana, visit www.weather.gov/wrh/climate?wfo=ind



NWS workstation
used during both
training
operations and
active hazardous
weather



NWS INDIANAPOLIS FORECAST TRAINING THIS PAST YEAR

David Beachler - Science and Operations Officer

Each year forecasters reflect on weather events, forecasts, warnings, and explore an in-depth analysis on what went well and what could be improved upon. This is not uncommon, as it is within the mission of the National Weather Service to continue to refine and improve our services to the communities we serve and partners that rely upon the NWS.

As the Science and Operations Officer (SOO), it is imperative that I be flexible with each staff member and recognize that a one size fits all approach isn't always the best when it comes to training. This is where hosting office hours for forecasters and discussing past events, training, new tools, and professional development or leadership can pay dividends for each employee. While challenges this past year continued, there was opportunity to think broadly on how training and improvement could occur.

This past year, forecasters and other SOO's from the NWS that serve the Ohio Valley came together virtually to conduct joint forecast office training sessions. The goal of this training was to train forecasters about several new ensemble tools we can use to help us diagnose the potential for unusual or extreme events among the ever increasing amount of model data we have to look at. Explanations were given for each tool, and applied to a recent extreme winter event from early in 2021.

Another initiative the NWS is working to improve upon is how we message weather events

to the general public and partners. Weather language can be rather difficult to explain, especially when it comes to probabilities and/or confidence. During this training session forecasters were presented with a scenario and given examples of how to apply the use of new tools and conveying confidence graphically and through text.

The example below represents what we could send out in our area forecast discussions as well as on our social media channels.

Messaging Ideas:

Area Forecast Discussion:

Ensemble model guidance is beginning to highlight a period of abnormally cold temperatures settling into the region next weekend. This would certainly be the coldest air of the winter season and could put a few records in jeopardy given return intervals in excess of 30 years (ensemble situational awareness tables) for Valentine's Day.

Graphical Messaging:

Prolonged Period Of Very Cold Weather Across The Midwest
Lasting through Mid-February

Below Normal Temperatures Favored

6-10 Day Temperature Outlook
Feb 11 - Feb 15, 2021

A prolonged period of unusually cold weather will become established late this weekend and continue through mid-February. Here are some highlights:

- Overnight temperatures falling at least into the single digits
- Well below zero wind chills
- Many days in a row where temperatures remain below freezing

Near Record Cold Temperatures This Weekend

Another shot of Arctic air moving through the Midwest over Valentine's Weekend will put records in jeopardy and give us the coldest air we've seen this season.

In the winter months, when a winter weather event is about to impact or produce hazardous weather conditions, forecasters utilize many playbooks to determine how best to message those hazards to the partners and public. At the conclusion of this training session, forecasters were presented with different scenarios and asked what is the most appropriate headline to utilize. The emphasis in every case is upon communication internally with forecasters at the local office and those in neighboring forecast offices, but also externally with our weather and emergency management partners.





THE COOP PROGRAM

Earl Breon - Observations Program Leader

The National Weather Service maintains a network of volunteer observers that take daily temperature, precipitation, and evaporation readings. There are several thousand such observers across the Nation, Puerto Rico, and our Pacific Island protectorates.

These observations play a vital role in many aspects of our daily lives. They are used by federal agencies to monitor drought, maintain flight safety, help guide flood control decisions, make agricultural aid decisions, and assess environmental impacts. State, county, and city governments use the data to plan projects, influence building codes, and make road maintenance decisions. Energy and Insurance entities use the data to predict rates, monitor usage, and make payout decisions.

Here in central Indiana we have approximately 70 such observers. Many of these observers have been taking their readings for a long time. Join me in recognizing these outstanding Hoosier volunteers for their years of citizen scientist service:

40 Years

Phil Tharp - Farmland
Daniel Bush - Perrysville

30 Years

Richard Abel - Kokomo
Ann Abel - Kokomo
Bill Niehoff - Marshall
Greg Bierly - Terre Haute
Indianapolis International Airport

25 Years

Sam Sievers - Vincennes
Alan Sievers - Vincennes
Roger Bartelett - Oolitic

20 Years

Dale Walker - Brazil

15 Years

Jerry Davis - Muncie
David Kuhn - Morristown
Kenny McIntosh - Elliston
John Pickering - Lewisville
Frieda Pickering - Lewisville
Ken Killion - Bowling Green

10 Years

Donna Monroe - Seymour Highway Garage
Patrick Whitaker - Frankfort Disposal



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NWS - INDIANAPOLIS, INDIANA

Contact Us

www.weather.gov/ind

nws.indianapolis@noaa.gov

317-856-0664

6900 West Hanna Ave.
Indianapolis, IN
46241